

CHAPTER I

INTRODUCTION

1.1 Background

Mathematics is a basic science that has a very important role as an effort to improve the quality of human life. Hudojo states that "mathematics is abstract ideas that are given symbols are hierarchically arranged and deductive reasoning, so learning mathematics is a high mental activity". While James states that mathematics is the science of logic about the shape, structure, quantity, and other related concepts with the number of which is divided into three fields, namely algebra, analysis and geometry (Hasratuddin).

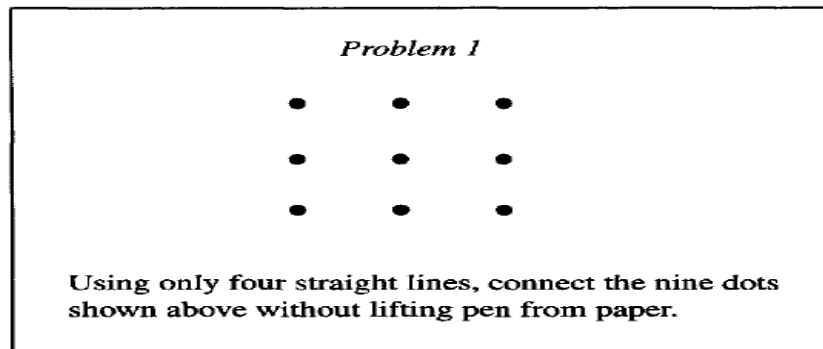
Mathematics is needed in various aspects and various circles, both for daily life and in the development of science and technology (IPTEK). Mathematics as a medium to help students to facilitate solve a problem. Essentially mathematics education requires students to think critically, logically, analyze, systematic, objective, responsible, openness and able to apply mathematics in daily life.

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. Learning problem solving requires the process of thinking critically, logically, and systematically. Problem solving aims to train students 'mindset abilities and students' ability to solve problems rationally, effortlessly and thoroughly.

This vision has not been implemented yet, however, in practical lesson in school Mathematics. Many teachers still use only exposition, but discussion between teacher and pupils and between pupils not yet to be well organized. Cockroft reported this in his statement: "Yet we are aware that although there are some classrooms in which the teaching includes, as a matter of course, all the elements which we have listed, there are still many in which the mathematics teaching does not include even a majority of these elements." (Ibid, paragraph 243) Orton (2004: 94) found that "Very few people, including university students

of mathematics, are able to solve Problem 1 within a limited time period. It is necessary to draw lines which go outside the shape implicitly defined by the nine dots”.

Figure 1.1 One of The Problems Proposed by Orton (2004: 93)



It seems that people work under the assumption that the four lines must lie entirely within the shape, although no such restriction was stated in the question.

Specifically, based on the explanation of the principle of SMP Negeri 1 Bilah Hulu, Labuhan Batu, Mrs. H. Harahap, S.pd, there is a problem in which pupils are still difficult to solve mathematical problems. It can be understood because pupils are less involved in instructional process. In other direction, teacher also pays less attention to pupils in the instructional process in which the learning is still in conventional mode. This reason is acceptable for which no pupil in 7th grade of the school can solve the exemplary problem above within five minutes that must be highlighted to be other crucial point of their low experience.

Actually, as a reference to the real facts above, Mink (2010: 188) proposes that there are seven difficulty factors in learning problem solving: (1) wrong order; (2) key words; (3) extraneous numbers; (4) hidden word numbers; (5) implied numbers; (6) multiple steps; and (7) exact mathematical vocabulary. It is clear now that learning problem solving is not without challenges and difficulties. Solving problems improves critical and creative thinking. Pupils are intended to create their own thinking during the process of problem solving.

Problem solving is a basic human activity in life because in order to survive and develop human beings are always dealing with the problem. education

is expected to help students' have good problem solving abilities in order to resolve issues and questions relating to the subjects, especially mathematics. In fact, according to most students as mathematics is a science and a mere abstract formula. The students' perceptions makes the subjects of mathematics instruction are not well liked by the students so the effect on students' ability to master and have an impact on the ability of mathematical problem solving. Mathematics is part of the science that has great contribution in the development of science and technology (Ronnis, 2000). The rapid development of science and technology have a positive impact of improving the welfare of society but unconsciously also had a negative impact on the development of science and technology one of which is the pollution of the river were not immediately stopped eating will reduce water quality and increase the chances of flooding.

Branca (Krulik and Reys, 1998) suggests that solving the problem of having three interpretations, that is: problem solving (1) as the main purpose; (2) as a process, and (3) as a basic ability. Thirdly it has implications in mathematics. *First*, if problem solving is an objective he regardless of the issues or a specific procedure, also regardless of the material of mathematics, the most important is how to solve the problem until it succeeds. In this case the problem solving as the main reason for learning mathematics. *Second*, if problem solving as a process point of view, the emphasis is not solely on the results, but rather how the methods, procedures, strategies and measures were developed through reasoning and communication to solve the problem. *Third*, problem solving as basic abilities or life abilities (*life skills*), because every human being should be able to solve its own problems. So problem solving is the basic abilities should be owned by every students'.

In addition, the results of mathematics learning in Indonesia is still very low. The low learning outcomes of mathematics students are influenced by the difficulties experienced by students in learning mathematics. Difficulties in learning mathematics resulted in low student learning outcomes. Related to learning outcome and mathematical problem solving ability Sugiman, et al (2016: 190-192) said there are some problems faced at this time that is (1) erroneous

perceptions about problem solving, (2) weak problem solving ability of student mathematical.

International academic quality through the *Programme For Internasional Student Assesment (PISA) 2012* : “shows that the math score of students in Indonesia drops to 371 and Indonesia is at 64th position out of 65 countries”. So far, Indonesia still has not been able to escape from the row of low-ranking residents.

Rusman (2012 : 229) said that “teachers are required to choose a learning model that can spur the spirit of every student to actively participate in the learning experience. Selection of a good and varied learning model also needs to be considered. Selection of less varied learning model causes students to feel the learning situation is boring and less active in teaching and learning activities. This can affect the student's mathematics learning outcomes.

Similar statements about learning developed by teachers are also shared by (Wina, 2016 : 5) that :

“Proses pembelajaran yang terjadi di dalam kelas dilaksanakan sesuai dengan kemampuan dan selera guru. Padahal pada kenyataannya kemampuan guru dalam mengelola pembelajaran tidak merata sesuai dengan latar belakang pendidikan guru serta motivasi dan kecintaan mereka terhadap profesinya. Ada guru yang dalam melaksanakan pengelolaan pembelajarannya dilakukan dengan sungguh-sungguh melalui perencanaan yang matang, dengan memanfaatkan seluruh sumber daya yang ada dan memperhatikan taraf perkembangan intelektual dan perkembangan psikologi perkembangan anak. Guru yang demikian akan dapat menghasilkan kualitas lulusan yang lebih tinggi dibandingkan dengan guru yang dalam pengelolaan pembelajarannya dilakukan seadanya tanpa mempertimbangkan berbagai faktor yang biasa mempengaruhi keberhasilan proses pembelajaran.”

Selection appropriate of learning model 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 no longer just sit still listening to the material

submitted by the teacher absolutely. So the ongoing teaching-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 is essentially a means to achieve the learning objectives as well as to develop and enhance the activities undertaken by teachers and students. But in fact the student's learning activity is still low in math lesson this is because students do not play an active role during the learning process of 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.

PBL exists a teaching method grounded in the ideals of constructivism and students' centered learning. When using PBL, teachers help students' to focus on solving problems within a real life context, encouraging them to consider the situation in which the problem exists whrn trying to find solutions. The majority of research examining PBL focuses on its use in medical schools, wih the key features being (a) the use of collaborative small group work, (b) a student centered approach, (c) the teacher as facilitator and (d) the use of real – life problems as the organizing focus.

To measure the ability of solving mathematical problems required several indicators. The indicator according Sumarmo (2012) asthe following:

(1) identify the elements that are known, asked, and the adequacy of the elements,(2) create a mathematical model, (3) implement a strategy to solve the problem within / outside of mathematics, (4) to explain / interpret the results, (5) complete the mathematical model and real problems, (6) use math significantly. According to George Polya explained in *How toSolve It* outlines put forward four main steps in solving the problem, namely: *Understanding the problem*, *Devising a Plan*, *Carrying out the Plan*, and *Looking Back* (Massek, 2010).

In this research, problem solving capabilities will be measured through students ability to solve a problem by using the steps in solving problems by Polya, namely: (1) *understand the problem*, (2) *plan the solution*, (3) *execute a*

plan settlement issues, and (4) *lookings back*, arguing that strategy commonly used.

Problem solving ask the students to recognize and formulate the problem, determine the adequacy and consistency of data, using strategies, data and relevant mathematical models, using the reasoning in a new sting, assess the validity and feasibility of the answers. Problem solving situations require students to associate all of their mathematical knowledge about concepts, procedures, reasoning and representation ability / communication. The learning process in the classroom which conditions students to learn to solve and rediscover this will make the students accustomed to investigate and find something. With this kind of activity, it is expected that students will be able to understand the concepts, formulas, principles and mathematical theories while learning to solve problems. Bottom line, a formula, a concept, or principle in mathematics, at least it was rediscovered by the students under the guidance of teachers.

In an effort to improve mathematical problem solving ability of students, teachers should endeavor to train and familiarize students perform troubleshooting form in learning activities. In addition, to improve students' problem-solving abilities needed role to enhance the problem solving ability of students takes an active role of students. How active learning is a way of learning that is required of the students so that they can improve learning achievement. Therefore, it is necessary to arrange an approach to learning that enable students in the learning process. According Sadirman (2009:97) "In learning are indispensable activity. Without activity, the learning process can not take place properly ". However, in reality there are many teachers who don't give space for students to be active in the learning process. Teachers at the center of learning while students just do according to that thought by teachers. Students are only passive, just follow the steps to resolve the problem that is similar to the problem that is done the teacher, and if replaced with another matter and students will be confused to do it.

Rohani (2004:7) said that "In the classic style schools, teachers who are active, who do everything for learners. Passive learners, applying what is given

and has been considered by the teacher ". Many facts indicate when learning takes place mostly less enthusiastic students receive, students are more passive, reluctant, afraid or embarrassed to express their opinions. Conditions activity student that lower also in found class VII SMP Negeri 1 Bilah Hulu, through observation made by the students, it is known that from 38 of students nothing student is responding to the material being studied, the teacher who was active in the learning. If the teacher provides questions only one person who is active in answering the questions given by the teacher. Not infrequently the activity that occurs somewhat forced example new students answered questions teacher when it got the order and appointed by the teacher. No student who dared to ask the teacher about things that are less understood. Researchers also found several facts, there are problems of mathematical problem solving ability of students found researchers from the students' answers on the subject of social arithmetic.

Previous researchers gave about, namely:

Sarah bought a bicycle for 250,000.00, then sold to Pinta with price Rp300.000,00, how much the percentage that got by sarah?

- Write down what is known and questioned on the matter?
- What is the formula that will be used to solve the above problems?
- How to determine which asked the question?
- Nova found Sarah percent gain was 20% and Tina argue percent gain Sarah is 30%, what do you think whom opinion is right?

From the answers given students obtained:

- Students can not understand the problem so that students are not able to determine what is known and asked the question.

Figure 1.2 Sample of Student's Answer Sheet 1st

The image shows a student's handwritten answer on lined paper. The text is as follows:

$$\begin{aligned} \text{Harga beli} &= \text{Rp. } 250.000,00 \\ \text{Harga jual} &= \text{Rp. } 300.000,00 - \\ & \text{Rp } 50.000,00 \end{aligned}$$

- (2) Students can not choose the correct concept to solve the problem even though the students have been able to understand the problem

Figure 1.3 Sample of Student's Answer Sheet 2nd

2. Tuliskan apa yang diketahui dan ditanya pada soal?

Jawab:

Dik = Rp. 250.000,00 \Rightarrow HB
 = Rp. 300.000,00 \Rightarrow HS

Dk = $\frac{Rp. 50.000}{300.000} \times 100\%$

untung = 20%

- (3) Students don't carry out problem solving very good

Figure 1.4 Sample of Student's Answer Sheet 3rd

2. Dik : Sarah membeli sepeda seharga Rp 250.000,
 Kemudian dijual kepada Anta seharga Rp 300.000.

Dit : Berapa persentase untung yang diperoleh Sarah

Persentase Untung = $\frac{11}{HB} \times 100\%$

= $\frac{50.000}{250.000} \times 100\%$

= 20%

From all of the student answers the researchers found constraints on problem solving abilities 7th grade students of SMP Negeri 1 Bilah Hulu containing 38 students were given a test on the subject of social arithmetic as follows:

Results of students' answers on initial tests given can be described on students' level of mathematical problem solving ability as follows :

1. Students' ability to write down what is known and what is unknown from the problem related to social arithmetic. The number of students who

received score $\geq 2,33$ (minimum in Medium stage) as many as 15 students by 38 students. The average value obtained was 2,39. Furthermore can be seen in the following table :

Table 1.1 The Percentage of Understanding Problem Aspect from Students' Mathematical Problem Solving Ability Test(Initial)

Criteria	Ability of level	Total of Students	Percentage of students
$3,66 \leq \text{score} \leq 4,00$	Very High	0	2,39
$2,66 \leq \text{score} < 3,66$	High	15	
$2,33 \leq \text{score} < 2,66$	Moderate	0	
$1,33 \leq \text{score} < 2,33$	Low	21	
$0 \leq \text{score} < 1,33$	Very Low	2	

2. Students' ability to plan the problem solving from the problem related to the social arithmetic . The number of students who received score $\geq 2,33$ (minimum in Medium stage) as many as 10 students by 38 students. The average value obtained was 1,78. Furthermore can be seen in the following table :

Table 1.2 The Percentage of Divising Plan from Students' Aspect Mathematical Problem Solving Ability Test(Initial)

Criteria	Ability of level	Total of Students	Percentage of students
$3,66 \leq \text{score} \leq 4,00$	Very High	0	1,78
$2,66 \leq \text{score} < 3,66$	High	10	
$2,33 \leq \text{score} < 2,66$	Moderate	0	
$1,33 \leq \text{score} < 2,33$	Low	10	
$0 \leq \text{score} < 1,33$	Very Low	18	

3. Students' ability to implement the problem solving plan from the problemrelated to the social arithmetic . The number of students who received score $\geq 2,33$ (minimum in Medium stage) as many as 12 students by 38 students. The everage value obtained was 1,59. Furthermore can be seen in the following table :

**Table 1.3 The Percentage of Implementing Problem Solving Plan Aspect
From Students Mathematical Problem Solving Ability Test(Initial)**

Criteria	Ability of level	Total of Students	Percentage of students
$3,66 \leq \text{score} \leq 4,00$	Very High	0	1,59
$2,66 \leq \text{score} < 3,66$	High	7	
$2,33 \leq \text{score} < 2,66$	Moderate	5	
$1,33 \leq \text{score} < 2,33$	Low	6	
$0 \leq \text{score} < 1,33$	Very Low	20	

4. Students' ability to look back to the answer is very low. Problem solving plan from the problemrelated to the social arithmetic . The number of students who received score $\geq 2,33$ (minimum in Medium stage) is no one. The everage value obtained was 0,80. Furthermore can be seen in the following table :

**Table 1.4 The Percentage of Looking Back Aspect from Students'
Mathematical Problem Solving Ability Test(Initial)**

Criteria	Ability of level	Total of Students	Percentage of students
$3,66 \leq \text{score} \leq 4,00$	Very High	0	0,80
$2,66 \leq \text{score} < 3,66$	High	0	
$2,33 \leq \text{score} < 2,66$	Moderate	0	
$1,33 \leq \text{score} < 2,33$	Low	6	
$0 \leq \text{score} < 1,33$	Very Low	32	

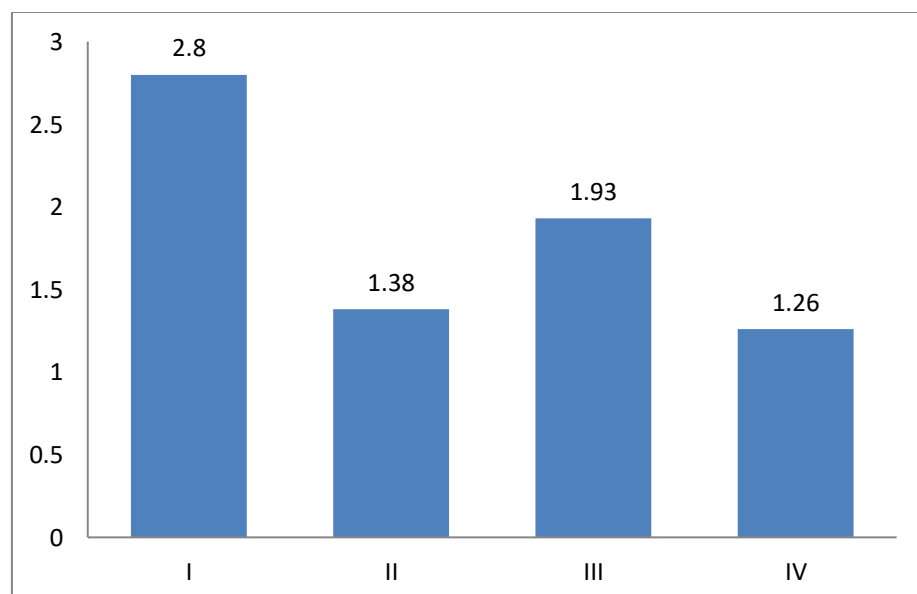
The results of initial test to 38 students with a mathematical problem solving ability earned an average of 1,64 with 7 students (18,42%) who gain mastery value $\geq 2,33$. Furthermore can be seen in the following table :

Table 1.5 The Percentage of Students' Mathematical Problem Solving Ability Test (Initial)

Criteria	Ability of level	Total of Students	Percentage of students
$3,66 \leq \text{score} \leq 4,00$	Very High	0	1,64
$2,66 \leq \text{score} < 3,66$	High	0	
$2,33 \leq \text{score} < 2,66$	Moderate	6	
$1,33 \leq \text{score} < 2,33$	Low	19	
$0 \leq \text{score} < 1,33$	Very Low	12	

Overall, the students' ability of mathematical problem solving on initial tests considered low, with an average value of 1,64 with 7 students (18,42%) who gained the score $\geq 2,33$ or achieved the mastery learning.

Figure 1.5. The Result of Students' Mathematical Problem Solving Ability Test (Initial) for Each Indicator



Note :

I	: Understanding problem
II	: Devising plan
III	: Implementing the plan
IV	: Looking back

Note :

Indikator	Score :
I	2.39
II	1.78
III	1.59
IV	0.8

In addition, from the results of interviews have been conducted with Mrs. H. Harahap, S.pd one mathematics teacher in grade VII SMP Negeri 1 Bilah Hulu, it is known that the students are still difficulties in solving a story that illustrates the problems associated with social arithmetic and many students the play and was not serious when teachers apply the method of discussion. Only a some students are active in learning. Based on observations and interviews obtained by solving capabilities and activities of daily life and increase the activity of students in the learning of mathematics in particular the subject of social arithmetic. Problem Based Learning can used as an alternative indigenous expected to enable students in the learning process. In the sense of the students to be active, interact with friends, exchange information and solve problems that no student is passive in solving the problem lesson, that there is to complete the learning material. So can improve students' mathematical problem solving and student activity. In the process PBL implemented systematically and their interactions as proposed Howard (in Amir 2009:21):

"Problem Based Learning is the curriculum and the learning process. In the curriculum, designed problems that students obtain important knowledge, making them understand in solving the problem, and it has its own learning strategies and have the skills to participate in the team. The learning process uses a systemic approach to solve a problem or face a challenge that is later required in daily life ".

Problem Based Learning is one instructional model that starts with giving problems to the students. The characteristics of the learning problem is to involve problems that have real world context, enabling ability students to solve

problems, develop knowledge through guidance material and the provision of learning resources. This model is made in groups to formulate the problem and solve the problem.

As said that Arends (2012: 43) "Characterized of PBL by students who work together with other students, most often in pairs or in small groups". While more teachers facilitate rather than giving material.

In mathematics learning in junior high school, a social arithmetic subject matter is closely related to daily life. Problem Based Learning Model are on issues close to the students' world is very suitable for this social arithmetic material for simulating buying and selling close to the daily lives of students. In this study will be given to students issues concerning the process of selling - buying, how to gain / profit and loss of the process of selling - buying it, how to determine interest in the bank and determine the amount of taxes to be paid someone to be a special experience for the students. Problems are often encountered in social arithmetic is also a story about who can train students' problem-solving abilities. In the process of solving problems, students are required to be active in the learning activities to solve the problem provided by the teacher. Students must follow the lessons from start to finish in accordance with the existing measures in order to solve a problem solving a given problem. As a result, students will inevitably have to participate in it and participate actively. Indirectly during the students carry out learning activities to find solutions for the problem, the students have studied mathematics well and understand the subject matter does and eventually students successfully finding a solution of the problem provided. After students successfully seeking to resolve the problem of students will feel happy because they feel that they can follow the math well and can motivate them to always participate actively in the learning of mathematics.

Many teachers have difficulty in teaching children how to solve problems (often called stories) so that many children also have trouble learning it. This difficulty usually arises because the paradigm that the final answer as the sole purpose of solving the problem. Children 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 how we solve the problem is far more important and fundamental. When the final answer is preferred, the child may only learn to solve one specific problem, but when the process is emphasized, the child seems 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 of less precise learning models. The use of improper learning model can lead to boredom, lack of understanding of the material being taught and ultimately can reduce the motivation of learners in learning, it is necessary appropriate learning strategy, which is choosing a model of learning in accordance with the ability of students in the class, for example by using the model of problem based learning.

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

Based on the above problems, it is clear that learning with Problem Based Learning model in advance of a problem, then students are trained to analyze a problem. Then, the students figure out how to solve the problem. In this learning model, the problems that have become 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 reinforcing their new ideas in their respective groups as learning experiences students. Based on the above, the authors are interested to conduct research with the title: **“The Effort To Improve**

VII Grades The Students Mathematical Problem Solving Ability Through Problem Based Learning In SMP Negeri 1 Bilah Hulu”.

1.2 Problem Identification

Based on the background of the problem that have been mentioned above then becomes identifying that causes of the low ability of mathematical problem solving are :

1. Mathematical learning is still teacher centered.
2. Student's mathematical problem solving ability still low.
3. Students' mathematics learning outcomes in class are still low.
4. Teachers are less varied using learning models.
5. Learning activities of students in teaching and learning process is still passive.

1.3 Problem Limitation

Seeing many aspects of problems 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 improve the problem solving ability of student mathematics by applying the model of Problem Based Learning on Arithmetic material in Grade VII SMP Negeri 1 Bila Hulu.

1.4 Problem Formulation

Based on the background above, the writer formulates the problem as follows :

1. Does the process of implementation Problem Based Learning (PBL) improve VII grades mathematical problem solving ability in of SMP Negeri 1 Bilah Hulu ?
2. How is the improvement VII grades of students' mathematical problem solving ability in SMPN 1 Bilah Hulu after implementing the problem Based Learning Model ?

1.5 Research Objectives

This research was conducted with the following objectives :

1. To know whether the process of implementation Problem-Based Learning improve VII grades the students' mathematical problem solving ability in of SMP Negeri 1 Bilah Hulu.
2. To know the improvement VII grades of students' mathematical problem solving ability in SMPN 1 Blah Hulu after implementing the Problem Based Learning Model.

1.6 Research Benefits

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

1. For teachers, it can broad the knowledge of Problem-Based Learning model to help students in solving mathematics problem.
2. For students, through Problem-Based Learning model expected gives positive learning attitude and creative in solving problems.
3. For 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 benefit to take 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 operational definition in this study are as follows :

1. Mathematical problem solving ability is students' abilities in solving mathematical problem with regard the processes of understanding the problem, planning to solving the problem, implementing the plan and

looking back or checking the truth. The students' mathematical problem solving ability will be measured by the problem solving ability test.

2. Problem-Based Learning (PBL) Model

Problem based learning is a student-centered pedagogy in which students learn about a subject through the experience of problem solving process. Students will be given the problem illustration aimed to train their problem solving ability. While the teacher just acts as facilitator.