CHAPTER I

INTRODUCTION

1.1 Background of Research

Nowadays, information communication Technology (ICT) has been growing rapidly in all aspect life, in education, the technology can be used as an alternative in the selection of instructional media. One of media that can be used is the mathematical software, mathematical software can help pupils to understand the mathematics concept, and make learning mathematics fun and not be boring, students gain new experiences and new discoveries that can facilitate pupils to understand mathematics. So many mathematical software are available to help us to do something, one of that is Autograph software.

Autograph is a dynamic graphing package incorporating coordinate and transformation geometry in 2D and 3D, statistical graphing and other data-handling features.

Mathematics also is one of subject matter that taught in each level of education both in elementary, junior, and senior high school even in college level, the basic knowledge for science and technology progress, so that mathematics is considered as the structured and integrated knowledge. The knowledge about patterns and relationship, knowledge about the way of thinking to understand world around. It is asserted in government of Peraturan menteri pendidikan nasional (PerMenDiknas) No. 22 year 2006 about the standart for satuan pendidikan dasar dan Menengah (Depdiknas 2006) that mathematics underlie of development technology progress, has role in variety of disciplines, and advancing power thinking of human. Mathematics is given early in the school to provide pupils with the ability of logical, analytical, systematic, critical, creative thinking, and also the ability in corporate each other. All the abilities is the provision and assert that necessary in building their challenges in future life.

However, unfortunately nowadays many pupils encounter the difficulties in mathematics learning. Pupils have no wonder to effort and thinking in higher level to look for the solution in each difficulties that they found but as fast as possible to avoid from the learning difficulties, as the result the learning mathematics otcome be low.

One of the reason the low point or outcomes of mathematics learning is many pupils consider that mathematics is difficult and the characteristic of mathematic that abstract then pupils think that mathematics is frightening scourge, it is strengthened by Sriyanto stated that mathematics often considered as frightening scourge and as the difficult subject for apart of pupils. Russefendi (1991) also stated that in general, mathematics is unpleasant subject, as the difficult and complicated knowledge.

Many factor that influence pupils to think that mathematics as difficult subject: they are: 1) learning process still in direct instruction (conventional), it just using explanation, giving the example, giving exercise and also homework, that all is application of concept or formula in numbers without application in daily life, 2) the limitation of pupils' ability in mathematics and, 3) the limitation of problem solving ability of pupils. Whereas in curriculum 2004 (Depdiknas, 2003) said that pupils must have the competence that needed to achieve by mathematics learning that begin from elementary school until senior high school, they are:

1. Showing the concept understanding that learned, explain the relationship of some concept that comprehensive, accurate, efficient, and compatible in problem solving
2. Have the ability to communicate idea using symbol, table, graph, or diagram to clarify or explain the problem.
3. Using the reflection in pattern, characteristic or doing the mathematics manipulation to make generalization, explain idea and mathematical statement.
4. Showing the strategy ability in making (formulate), compile mathematics model in problem solving.

5. Have the characteristic in using mathematic in daily life.

From the description above is appear that problem solving should gotten by pupils in mathematics learning in the school. Problem solving is the process of applying the knowledge that have gotten before in to the new situation that have not known or introduced in order to make pupils more challenged and motivated to learn mathematics.

To solve the problem is needed some strategies named problem solving. Mathematical problem solving is a process which involved the method solutions is unknown in advance. To find the solution, Pupils should map their knowledge about mathematics. There are four important phase to solve mathematics problem. In this research, problem solving ability according to Polya (2004) will be measured through pupils' ability to complete a problem by using problem solving steps are follows:

1. Understanding the problem

   From this step, pupils should understand the problem that can be looked from being able to point out what the data, what the condition, and also what the problem showed.

2. Devising a plan

   From this step, pupils make plan how to solve the problem, which solution that corresponds to the problem. Finding the connection between the data and the unknown.

3. Carrying out the plan

   From this step, pupils implement the plan of what they have planned before.

4. Looking Back

   pupils able to derive the result differently and use method for some other problem.

For a long time, mathematics learning was impressed because not connected with problem solving substance. Pupils tend to memorize mathematics concept so the pupils ability to solve the problem is limit. This statement is supported by Krismiati (Kristanto, 2015: 5) stated that problem solving ability

and creative thinking of pupils is so low. And also (Garden 1987; McKnight) stated that the average of value in National test in Geometry, algebra, calculus, and other mathematics topic more.

Actually problem solving in mathematics also can be solved using mathematical software to increase the mathematical interesting in learning mathematics.

The limitation of Problem solving ability is supported also by test result that is enganged by researcher on observation in grade VIII SMP Negeri 2 Pagaran on January, 16^{th} 2017 in form of one problem or exercise in linear system with two variable as follows:

Seluruh Kelas VIII SMPN 2 Pagaran disuruh untuk membuat taman kelas masing-masing. Taman tersebut berbentuk persegi panjang, dengan keliling taman itu adalah 20 meter. Jika selisih antara panjang dan lebar taman itu adalah 2 meter, tentukanlah 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. *Sanggam berpendapat bahwa panjang taman itu adalah 6 meter dan lebarnya 4 meter,sedangkan Tasya berpendapat bahwa panjang taman itu 6 meter dan lebarnya 2 meter. Menurut anda pendapat siapakah yng benar?*

From the answers given by students obtained

1. Pupils could not understand the problem

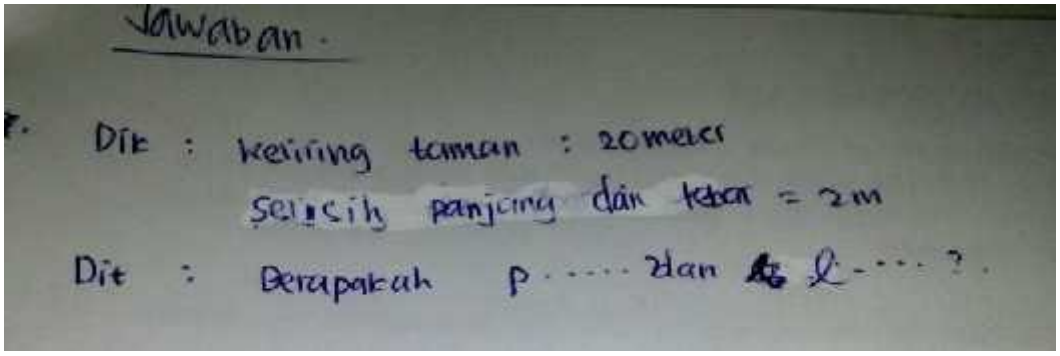

Figure 1.1 Pupils' Sheet in Understanding the Problem Step

From Figure 1.1, pupils were able to identify what is asked but they did not able to identify what is known. Pupils did not know clearly what is known, and did not write what is known in pupils' sheet. In this step, there are 20 from 30 pupils could not understand the problem.

2. Pupils could not devise a plan in problem solving strategies

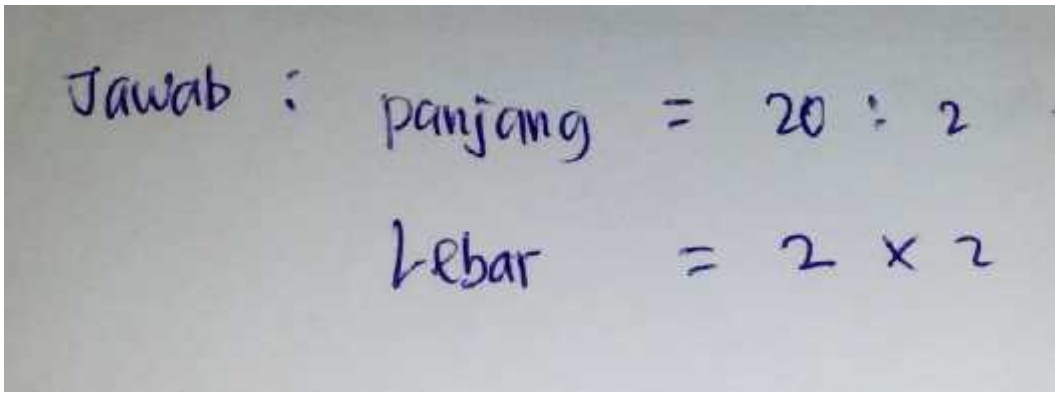

Figure 1.2 Pupils Sheet in Devising a Plan

From interviewing some of pupils about how they devise a plan, researcher got that most of them did not know which Formula that suitable to the problem and which formula can be used. It happened because they did not understand the problem clearly, so that they could not make a formula which matched and trust their selves that can solve the problem. And from figure above Can described that pupils just guessing the plan and the answer of the problem. in

this step there are 20 from 30 which could not able to find the connection between data and unknown.

3. Pupils could not carry out the problem solving strategies

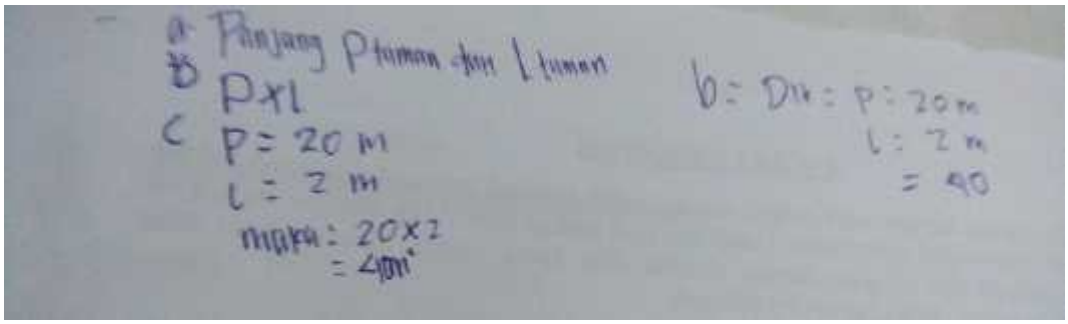

Figure 1.3 Pupils Sheet in Carrying Out the Plan

Pupils could not find an appropriate strategy to solve the problem. From Figure 1.3, we can see that pupils could not do the exact completion based on the plan that has been made and also they did not check each step clearly and carefully. In this step, there are 17 from 30 pupils could not implement problem solving strategy.

4. Pupils did not look back the solution carefully and they could not derive the solution differently.

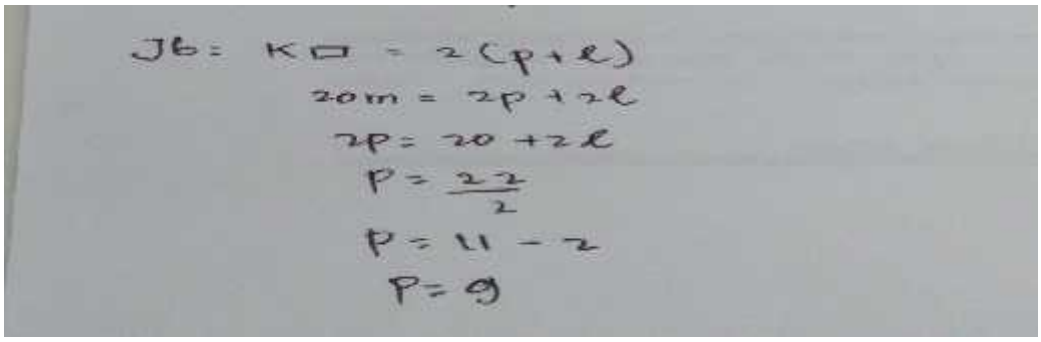

Figure 1.4 Pupils Sheet in Looking Back the Solution

From Figure 1.4, we can describe that pupils not look back for the solution that has written in their sheet. They not try to connect the answer that has gotten with the known in the question or problem before.

From the description above, the researcher can conclude that pupils still not proficient in solving the mathematics problem so this is the causes the lack of mathematics problem solving ability.

Cockroft's Report (1982), in paragraph 243, says that:

> Mathematics teaching at all levels should include opportunities for: exposition by the teacher; discussion between teacher and pupils and between pupils themselves; appropriate practical work; consolidation and practice of fundamental skills and routines; problem solving, including the application of mathematics to everyday situations; investigational work.

This vision has not implemented yet, however, in practical lesson in SMP Negeri 2 Pagaran, when researcher talked or interview with one of mathematics teacher in SMP Negeri 2 Pagaran, Mr. J. Aritonang, evidently in generally researcher found that learning model that used by the teacher still " teacher oriented". Teachers use only exposition, but discussion between teacher and pupils and between pupils not yet to be well organized. Teacher just give explanation, and information about the concept of the matter that will be taught meanwhile the pupils just listen and discuss some exercise from the teacher, consequently the pupils not active in learning process. Teacher also not use the technology to interest pupils in learning mathematics like Autograph that can interest pupils to learn mathematics. 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."

Other problems in learning problem solving are the difficulties and obstacles faced by pupils. "Mathematics problems are really difficult. I did not know how to do it. That's why I did not finish. I don't like Maths" "I was bored learn mathematics, all about numbers". These statements are quite familiarly heard when students are inquired about their homework. They seem to be struggling with their homework especially on mathematics problem-solving. Mathematics problem solving is not a topic but a process underlie the whole

mathematics program which contextually helped concepts and skills to be learned (Ibrahim 1997). Many mathematics skills were involved in problem-solving. However, large numbers of students have not acquired the basic skills they need in mathematics (Mohd Nizam & Rosaznisham 2004; Berch & Mazzocco 2007). As a result, many students were reported to face difficulties in mathematics particularly in mathematics problem solving (Tay Lay Heong 2005; Tarzimah 2005; Mohd Johan 2002; Zalina 2005; Lim See Kiat 1995). If teaching and learning process is not equally effective for all students, the difficulties in acquiring mathematics skills by the students could get worsen. Understanding students' difficulties in mathematics ability needed in problem solving is one of the way to assist this group of students (Kristanto, 2015: 4)

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. This point is still important to highlight that pupils are in

Regular thinking is not enough to solve the problem and pupil must develop their ideas and connect them into other ideas. Pupils must be also identifying to which factors they tend to be very low. This is crucial because teacher should know in which case pupils are learning, so that teacher can help pupils effectively and efficiently.

Lubis (2013: 3) said that that the problem that is encountered by pupils and teacher in class when learn mathematics are the limitation of pupils in make daily life sentences become mathematical sentences. This problem caused by pupils have no describe of the condition to connect real condition that they have found with corresponding mathematics sentences. This condition make pupils not active to use reasoning power in problem solving.

Sierpinska (1994: 160) stated that “In a mathematics class, when teaching [problem solving], the teacher will point to information that is relevant from the mathematical point of view, and discard that which is irrelevant”. This is important in learning problem solving for pupils, in pupil will learn meaningfully because teacher has discard unnecessary information. The role of teacher must in duty of helping pupils. It is not realized yet in SMP Negeri 2 Pagaran.

Based on the background that has explained before, problem solving ability is the important desire of mathematics and as the one learning model that engage the pupils to do the problem solving in mathematics that is *Problem Based Learning* model. So is needed to make the research about “**The Difference of Pupils’ Mathematical Problem Solving Ability Taught by Problem Based Learning And Project Based Learning Using Autograph in Grade VIII SMP Negeri 2 Pagaran A.Y. 2017/2018**

1.2 Problem Identification

Identified problems based on the background of research above are:

1. Pupils’ mathematical problem solving ability in SMP Negeri 2 Pagaran tends to be low.
2. Pupils assume that mathematics is difficult.
3. Media of learning software is never used in the classroom because the limitation of teacher’s knowledge about the software, that is made teaching and learning process was bored
4. Autograph is never used in teaching and learning of mathematics in SMP Negeri 2 Pagaran
5. The direct instruction model of teaching who pupils are more passively learning, is still conducted in learning process so that pupils cannot enhance their ability in solving problems independently.

1.3 Problem Limitation

Problem limitation of the research have to be clear and focused on to provide description in research. The research is limited on pupils’ mathematical problem solving ability in SMP Negeri 2 Pagaran using Problem Based Learning and

Project Based Learning model using Autograph for linear system with two variable equations unit.

1.4 Problem Formulation

Based on the limitation of problem, the writer formulate the problems as follows:

"Is pupils' mathematical problem solving ability that is taught by Problem Based Learning higher than pupils' mathematical problem solving ability taught by Project Based Learning model using Autograph?"

1.5 Research Objective

Specifically, objectives of the research is to study if pupils' mathematical problem solving ability in the classroom taught by using Problem Based Learning higher than pupils' mathematical problem solving ability that taught by using Project Based learning .

1.6 Research Benefits

1. For teachers mathematics:

   To be an alternative idea for teachers in selecting an appropriate instructional model in the classroom to enhance pupils' mathematical problem solving.

2. For school:

   To be an alternative suggestion for other teachers to repair their instructional models in enhancing pupils mathematical problem solving.

3. For pupils:

   To motivate pupils to do mathematics meaningfully and make them to be more active in order to enhance their mathematical problem solving and apply it in their life.

4. For other research workers:

   To be inspiration or comparison to do or develop the similar research.

1.7 Operational Definitions

1. Pupils' mathematical problem solving ability is the ability of pupils in solving problems in mathematics, starting from understanding the problem, devising the plan, carrying out the plan till looking back to the problem.
2. Problem – Based Learning is a student – oriented instructional model that involves pupils to construct their own knowledge through the steps of pupils are oriented to the problem, pupils are organized to study, assisted in independent and group investigation, pupils develop and present artifacts, analyze and evaluate the process.
3. Project- Based Learning is Learning is a student – oriented instructional model that involves pupils to construct their own knowledge through the steps of pupils are by project.
4. Media Autograph Software

   Autograph is a dynamic graphing package incorporating coordinate and transformation geometry in 2D and 3D, statistical graphing and other data-handling features.