

# CHAPTER I

## PRELIMINARY

### 1.1 Background

The development of technological science requires quality human resources who are able to face various challenges and compete. Quality human resources can be generated through quality education. Education is the most important field in determining the quality of a nation. Education can be accepted in both the academic environment and the community. School is an academic environment to obtain formal education where formal education is the existence of subjects given at the school and is regulated by the curriculum. According to *Permendikbud nomor 103 Tahun 2014* states that:

*“Pembelajaran merupakan suatu proses pengembangan potensi dan pembangunan karakter setiap peserta didik sebagai hasil dari sinergi antara Pendidikan yang berlangsung di sekolah, keluarga dan masyarakat.”*

Mathematics is one of the compulsory subjects in formal education and plays an important role in the world of education. Mathematics is a universal science that underlies the development of modern technology, has an important role in various disciplines and advances human thinking. Rusffendi (in Suherman 2001:18) states that mathematics is formed as a result of human thought relating to ideas, processes, and reasoning.

Realizing the importance of mathematics for students, everything must be done so that mathematics can be easily learned by students. Courant and Robbins (1996) on their book titled “What is Mathematics” state that mathematics as an expression of the human mind reflects the active will, the contemplative reason, and the desire for aesthetic perfection. Its basic elements are logic and intuition, analysis and construction, generality and individuality.

The low quality of mathematics education in Indonesia is caused by various factors such as students who still do not understand the material being taught,

teachers who are less competent, the learning strategies used and the learning environment that are interconnected with one another. Another factor that also plays an important role is the mistaken assumption of teachers who still think that mathematical knowledge can be completely transferred from the mind of the teacher to the mind of the students. The teacher only teaches mathematical concepts and operations without removing and expanding the relationship of the field of study, the teacher does not introduce students to the relationship between material and concrete situations. Vrsaljko and Ivon (2009) cite the definition of good teacher as the person as the person who owns the primary image that guides its actions and opinions, accepts her/himself firmly, accurately and realistically; uses their full potential; is aware of other people, is sensitive to them and responds to people, ideas and events; has a sense of insecurity and uncertainty, tolerates ambiguity; a person who is a student. They also state that good teachers show satisfaction with the job and try to develop creativity in their students. It means the teacher has to find an idea to improve the students' creativity ability.

In essence, during the mathematics learning process students are required to be able to think logically, critically, mathematically and think creatively in solving problems. According to Kanematsu and Barry (2015), creativity can be defined as the ability to produce original ideas and new items. Creativity is the ability to produce original work and ideas. It starts with a creative person using a creative process to make a creative (new) product.

Realizing this, it takes efforts to foster and develop students' creative thinking skills through learning. But in reality, the education system in schools still uses classroom learning practices that have not been seriously developed to provide opportunities for intelligent students and develop their creativity.

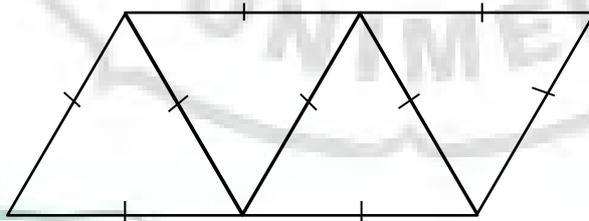
The low level of student creativity shows that teachers in schools pay less attention to the ability to think creatively in students, even though creative thinking is very important for students to solve problems in mathematics and in everyday life. Torrance in Sarsani (2005 : 5) states that creativity as a process of becoming sensitive to problems, deficiencies, gaps in knowledge, missing elements, disharmonies and so on, identifying his difficulty, searching for solution making

guesses or formulating hypothesis and possibly modifying and re-testing them; and finally communication the result.

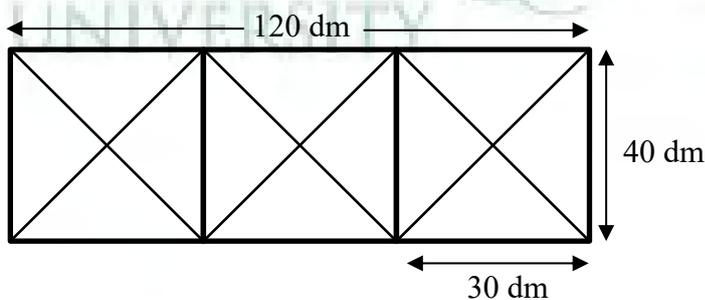
In this research, the mathematical creative thinking process is based on the aspect of indicators of fluency, flexibility, authenticity and detail. Therefore, the researcher made an observation to see the students' mathematical creative thinking skills and the learning model used by the teacher every day with the following questions:

### DIAGNOSTIC TEST

1. Rudi is playing guessing math with his friends. When Rudi got his turn to ask questions, Rudi drew a circle with a diameter of 28 cm on the blackboard. Then, ask his friends to make a flat shape with the same size as the circle. Make as many shapes as you can find!
2. Dito saw the roof of the house in the form of a parallelogram consisting of 4 triangles as shown in the picture. If the dimensions of the sides of the triangle are the same, i.e. 4 m, what is the area of the triangle?



3. Dad wants to make a house window frame designed like the picture below. What length of wood does dad need?

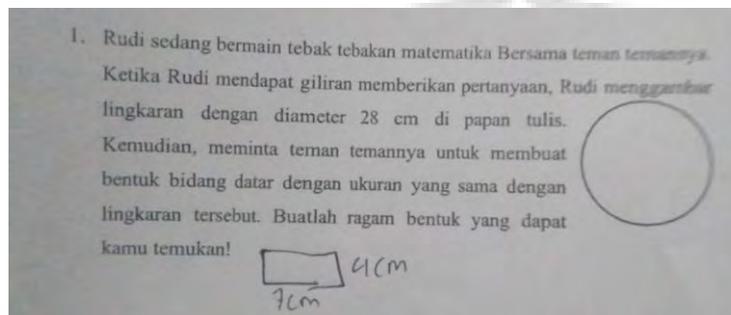


4. Uncle has a rectangular garden of 294 m<sup>2</sup> in his yard. If the ratio of the length to the width of the garden is 3:2, find the perimeter of the garden.

From the results of diagnoses carried out by researchers in grade IX SMP Negeri 35 Medan where the ability to think creatively based on the four aspects of these indicators is still low, which is expressed as follows :

1. The percentage of students' creative thinking ability in the aspect of fluency is 48,3% which is still in the low category
  - Descriptively in general, students are able to provide a solution to the problem and lead to the correct answer
  - If students are able to provide a lot of problem solving at least 2 then one of them is wrong
  - Only a few are able to give as many solutions as at least 2 and lead to the correct answer
2. The percentage of students' critical thinking skills on flexibility aspect was 42% which was still in the low category
  - In descriptively, generally students are able to solve problems from a point of view that are not different and lead to the correct answer
  - Some of the learners Are able to solve problems from no different points of view and lead to wrong answers
  - Very few are able to solve problems from a different point of view and lead to the correct answer
3. The percentage of students' critical thinking skills in the originality aspect was 45% which was still in the low category
  - In Descriptive, generally students have difficulties to solve problems using existing methods (methods taught by the teacher)
  - Very few are able to solve problems on their own terms
4. Students' creative thinking ability on the elaboration aspect was 45% which was still in the very low category. Descriptive in general, students are not able to develop or detail a situation in detail in solving problems.

From the process of students' diagnostic answers, it turns out that students can only answer in the poor category. The answers to low ability students are shown in Figure 1.1.



**Figure 1 1** Students' Answer Sheet 1

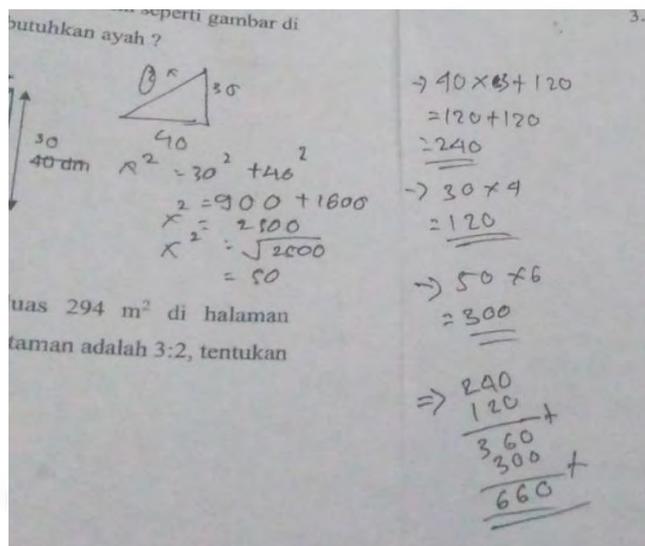
Furthermore, the answer process for students with medium abilities was not maximal as shown in Figure 1.2.

①.  $a = 4 - 2$   
 $= 16 - 4$   
 $= 12$   
 $a = \sqrt{12}$   
 $= 2\sqrt{3}$

$L = \frac{1}{2} \text{ alas} \times \text{tinggi}$   
 $= \frac{1}{2} \times 4 \times 2\sqrt{3}$   
 $= 4\sqrt{3} \times 4$   
 $= 16\sqrt{3}$

**Figure 1 2** Students' Answer Sheet 2

Likewise, the answer process for high-ability student diagnostic tests, although there are many student answers, it is still not optimal where the aspects of student mathematical creativity shown in Figure 1.3 have not been maximized in every aspects.



**Figure 1 3** Students' Answer Sheet 3

In this case, the answer to the unique student diagnostic test has not been found where students have been able to provide answers in their own way and are rarely used by other students.

Creative thinking is a human ability that plays an important role in life. This ability is based a lot on intellectual abilities, such as intelligence, talents and learning outcomes and is also supported by affective and psychometric factors so that creativity plays an important role in the series of high-level mathematical creative thinking.

The facts show that students' mathematical creative thinking skills are low. Based on the results of the Trend International Mathematics and Science Study (TIMSS), it is stated that the level of creative thinking skills of students in Indonesia is classified as low because only 2% of Indonesian students can work on high and advanced category questions that require creative thinking skills in solving them.

Until now, learning to improve comprehension skills and creative thinking skills in solving problems has not been so entrenched in the classroom. Most students are accustomed to learning activities in the form of memorizing without being balanced with the development of understanding and creative thinking skills. To address this problem, it is necessary to make learning efforts based on cognitive theory which includes constructivism learning theory.

In Indonesia, learning thinking skills in improving mathematical creative thinking skills has several obstacles. One of the obstacles is the too dominant role of the teacher in the school as a disseminator of knowledge or a source of knowledge, making students only considered as a container to be filled with knowledge by the teacher. Another obstacle that is actually quite long and is indeed difficult to solve is the student achievement assessment system which is mostly based on tests that test low-level cognitive abilities. Students who are labeled as smart students are students who are able to pass the test. This is an old problem which is still a polemic that is quite popular in the world of education in Indonesia. In addition, learning mathematics in class is also not meaningful and does not emphasize student understanding, so that students' understanding of the concept is very weak. That is, there are many facts in the field that still show learning mathematics as monotonous and procedural learning, namely where the teacher explains the material, gives examples, gives assignments to students to do practice questions, neglects the thinking process of students. The fact shows that so far, most teachers use conventional learning models and are dominated by teachers. So, a learning model is needed that gives students the opportunity to have good activities where the teacher becomes a motivator and facilitator. A possible alternative is a problem-based learning model.

There are many learning models that can be used in an effort to develop mathematical creative thinking skills. One of the learning models that is thought to be in line with the characteristics of mathematics and the expectations of the current curriculum is the problem-based learning model (PBL). Arends (2012) states that problem-based learning is characterized by students working in pairs or small groups to investigate puzzling, real-life problems based on the premise that puzzling and ill-defined problem situations will arouse students' curiosity and thus engage them in inquiry.

Learning with a problem-based learning model is one that is student-centered while the teacher becomes a facilitator. Taylor states in Sinaga (2007:3); in practice, there is no learning model that is most appropriate in all situations and conditions Problem-based learning is learning that uses real-world problems as a context for students to learn creative thinking and problem-solving skills, as well

as to acquire essential knowledge and concepts of learning material. The contextual problems given aim to motivate students, arouse students' enthusiasm for learning, increase student learning activities, focus on problem solving so that students are interested in learning, find concepts that are in accordance with the subject matter and with the interaction of various knowledge between students and students, students with teachers, as well as students with the environment, students are invited to be active in learning.

One of the main features of the problem-based learning model is that it focuses on inter-disciplinary linkages, with the intention of the problems presented in problem-based learning that may be centered on certain subjects but students can review these problems from many aspects or link them with other disciplines to solve them. By implementing problem-based learning (PBL) it encourages students to learn actively, with enthusiasm and students will be more open to mathematics, and will realize the benefits of mathematics because it does not only focus on certain topics that are being studied.

Based on the description of the background above, the researcher is interested in conducting research with the title “Analysis of students' creative thinking skill in problem solving using problem-based learning methods “.

## **1.2 Problems Identification**

Based on the background description that has been stated, the problems in this study can be formulated as follows:

1. Mathematics is still considered a subject that is difficult for students to understand
2. Less variation in the use of learning models carried out by teachers in class with the aim of increasing students' mathematical understanding and creative thinking abilities
3. Student responses to mathematics learning activities are still low
4. The learning model used by the teacher is still conventional and not yet innovative

5. Students still feel confused about applying mathematical concepts in everyday life.
6. The questions given are routine questions that do not improve students' creative thinking skills.
7. Students are not used to giving answers on their own terms
8. The low ability of students in solving creative thinking problems.
9. The results of the student answer sheets are not good in the problem-solving process.
10. Students have difficulty solving creative thinking problems

### **1.3 Problem Boundaries**

To make sure the research is clear and directed so that it achieves the expected goals, the authors limit the problem to measuring students' creative thinking abilities, that are :

1. To analyze students' creative thinking skills in problem solving using problem-based learning methods.
2. Tube and cone learning material is a fairly flexible material scope. Where by using this material, questions related to the material can be presented in the form of open-minded questions
3. Therefore, in this study, mathematics learning was carried out using a problem-based learning model. This learning model is expected to improve students' mathematical creative thinking.

### **1.4 Problem Formulation**

Based on the background of the problem, problem identification, and problem boundaries that have been described above, the problem formulations in this study are:

1. What is the level of student ability in problem solving creative thinking in problem-based learning?

2. How do students' answer sheets in the problem-solving process with the application of problem-based learning?
3. How are students' difficulties in solving creative thinking problems in the application of problem-based learning?

### **1.5 Research Purpose**

The purpose of this study was to obtain an overview of mathematics learning by instilling active individual awareness and developing students' mathematical creative thinking skills. In accordance with the research problems and questions above, the objectives of this study are:

1. Knowing the level of student ability in problem solving creative thinking in problem-based learning.
2. Knowing students' answer sheets in the problem-solving process with the application of problem-based learning.
3. Knowing students' difficulties in solving creative thinking problems in the application of problem-based learning.

### **1.6 Benefits of Research**

This research is expected to provide benefits to the development of the world of education. These benefits include the following:

1. For students, to be aware of the level of ability to think creatively in solving problems of mathematics.
2. For teachers, as a matter of consideration for implementing an effective, innovative learning model and in accordance with the needs of students.
3. For researcher, as self-development and input to be applied in the future.
4. For other researchers, as a reference and reference material for conducting further research.
5. For the school, as input and consideration in the existing teaching and learning system in schools.

### 1.7 Operational Definition

So that there is no misunderstanding of the interpretation of the terms used, several terms that are defined operationally with this research will be presented. The terms used in this study are :

1. Learning model problem based learning is learning done by exposing students to real problems in everyday life, so that students can compile their own knowledge in solving problems and seek various kinds of solutions.
2. Creative thinking ability, namely the ability to see a problem from a different perspective and then solve the problem with a different concept.

