

# CHAPTER I

## INTRODUCTION

### 1.1 Background

Mathematics is one of the subjects that must be studied by students starting from the early education stage to the secondary school level to the university level. Mathematics learning is given to equip students with the ability to think logically, systematically, analytically, creatively, critically, and the ability to work together (Kidjab et al., 2019). In schools, learning mathematics involves a teaching and learning process that emphasizes knowledge and understanding. By providing a series of knowledge and understanding of the concepts in mathematics, they are able to apply it in solving problems in everyday life (Zulaiha et al., 2023). One of the objectives of learning mathematics at school is contained in Permendiknas No. 22 of 2006, namely that students have the ability to solve problems, which includes understanding problems, designing models, solving problems, and interpreting solutions (Latifah & Luritawaty, 2020).

This is in line with the objectives of learning mathematics stated in the Merdeka Curriculum (2022) so that students are able to: 1) understand mathematics learning in mathematical problem solving, 2) use mathematical reasoning and proof, 3) solve problems mathematically, 4) communicate and present ideas in the form of mathematical models, 5) relate mathematical material to life, and 6) have an attitude of appreciating the benefits of mathematics in life. Mathematics has an important role for survival, so it is expected that all students are able to master mathematics and have good mathematical abilities in solving problems related to the field of mathematics (Rahma Putri, 2021). In order to achieve these goals and the importance of mathematics in human life, every interrelated element has worked hard and made various efforts in improving the quality of educations.

However, in practice, there are many students who experience difficulties in learning mathematics and students who feel fear in learning mathematics which has

an impact on students' low ability to solve mathematical problems. This certainly affects the low quality or quality of mathematics education that occurs today. Based on the results of the Program for International Study Assessment (PISA), in 2003 Indonesia ranked 39th out of 41 countries, in 2003 ranked 38th out of 40 countries, in 2006 ranked 50th out of 57 countries, in 2009 ranked 47th, in 2012 ranked 61st out of 65 countries and 64th out of 65 countries, in 2015 ranked 69th out of 76 countries, in 2018 Indonesia was ranked 73rd out of 79 countries and included the bottom 10 countries, in 2022 Indonesia was ranked 70th out of 81 countries (Yusmar & Fadilah, 2023). Then from the results of the Trend of International Mathematics and Science Study (TIMSS), in 2003 Indonesia was ranked 35th out of 46 countries with an average score of 411 while the international average score was 467, in 2007 it was ranked 36th out of 49 countries with an average score of 397 with an international average score of 500, in 2011 it was ranked 38th out of 42 countries with an average score of 386 out of 500, in 2015 Indonesia was ranked 44th out of 49 countries with an average score of 397 out of 500, while in 2019 Indonesia did not participate (Ariyanto et al., 2023).

The low quality of education is influenced by the main problems in everyday life, namely the low competence possessed by students and supported by learning conditions that are still conventional and lack of deep meaning of how to learn. This has an impact on the lack of students who like math lessons, due to difficulties in solving problems, solving problems, and converting problems into mathematical models (Zulaiha et al., 2023). In addition, the learning process in schools focuses more on the right answer rather than students' creative endeavors, reasoning, and experimentation to explore new potentials. Another problem that causes students' low ability to learn and solve mathematics problems is the traditional teacher-centered learning process that makes students passive (Zulkifli Lubis, 2023). The use of the lecture method is less interesting for students because the teacher is more dominant and more active than students in the learning process. As a result, students do not have an attitude of responsibility and actively participate in learning mathematics. This is in line with the opinion of Zaif, Sunardi, & Diah (in Nengsih et al., 2019) that current mathematics learning is monotonous where the teacher's role is limited to explaining material, giving examples, giving assignments, checking

answers quickly, and discussing them, while the student's thinking process which should be the core of learning is neglected. So that students' understanding of mathematical concepts is not good and results in low student learning outcomes, especially in solving problems related to mathematical problem solving ability.

According to the National Council of Teachers of Mathematics (in Archi Maulyda, 2020 : 14), in developing mathematical knowledge, mathematical ability standards are needed to provide high quality mathematical experiences to all students. The standards of mathematical ability that must be possessed by students are representation ability, problem solving ability, reasoning and proof ability, connection ability, and communication ability. One of the mathematical abilities that students must have is problem solving ability. Problem solving ability refers to the ability of students to understand and develop mathematical concepts through solving mathematical problems that can encourage the optimization of student abilities (Prima Riyani & Muhamad Sofian Hadi, 2023). The importance of problem solving ability according to Beigie (in Surya et al., 2017) is that students can improve their understanding of mathematical concepts by paying attention to carefully selected problems by applying mathematics to real situations. In learning, especially mathematics learning, students' problem solving ability needs to be developed because through this process, students can learn to understand problems deeply, think logically, analyze, choose appropriate strategies to solve problems, perform calculations, and evaluate solutions that have been found. Problem solving ability can be obtained by students through the experience of solving problems, giving problem solving test exercises, and implementing activities that can be reached in problem solving, including remembering, explaining, applying, analyzing, and evaluating (Sagita et al., 2023).

Students with low problem solving ability can face several consequences, such as: difficulty in understanding mathematical concepts involving problem solving which results in low student achievement, lack of confidence and loss of motivation to learn due to continuous failure, dependence on other people's help in solving problems rather than solving themselves, and limitations in solving complex problems in real life (Jatmiko, 2018). While students who have good problem solving ability are able to make positive contributions in learning and daily life, such

as: 1) have strong analytical ability to solve, identify, and describe the solution steps clearly, 2) are more creative in finding solutions to problems by thinking outside the box, unique approaches, and efficient solutions, 3) have good critical analysis ability of problems, 4) have a high level of perseverance and work independently in solving problems, 5) are able to communicate mathematically well in conveying problem solutions, and 6) are able to work together with groups in solving problems (Nasution & Mujib, 2022). Students are declared to have mathematical problem solving ability in learning mathematics when the student achieves certain criteria, namely problem solving indicators. According to Polya (in Anugraheni, 2019) there are four indicators of mathematical problem solving ability, namely: 1) understand the problem, 2) make a plan in solving the problem, 3) solve the problem according to the procedure, 4) looking back. Therefore, mathematical problem solving ability need to be possessed by students to encourage their thinking process in solving the problems at hand.

But in reality, students' mathematical problem solving ability are still low, thus affecting the quality of learning and having an impact on students' academic achievement. The reason is due to the lack of classroom learning facilitation to develop students' problem solving ability that have not directed teachers to encourage students to develop students' mathematical problem solving ability (Rahma Putri, 2021). From the results of research (Putri et al., 2021) that students' mathematical problem solving ability at SMP Al Washliyah 4 Medan are still relatively low because most students experience problems when solving math problems and students tend to use formulas or quick ways that are commonly used rather than using procedural steps in solving math problems. This was also found based on the results of interviews in the initial observations carried out at SMP Negeri 10 Medan on November 29, 2023, obtained from an interview with Mrs. R. Sihaloho who is a grade VIII mathematics teacher that the learning model applied at SMP Negeri 10 Medan is still teacher-centered. Where the teacher explains the material then students take notes, solving problem, and low questioning/answering activities so that students become passive. She also stated that many students have difficulty working on problems related to mathematical problem solving ability, especially in the form of story problems. Students have difficulty solving story problems because solving

story problems requires several steps, so students need to understand the problem, carry out calculations, and good ability in drawing conclusions. This is in line with the opinion (Syahda et al., 2021) that story problems are considered difficult because students are unable to understand the material and identify the problems given in the story problems. Because one form of problems related to mathematical problem solving ability can be in the form of story problems, where story problems usually come from problems that exist in the student's environment. The difficulties experienced by students result in low student problem solving ability. They are more interested in solving problems that are similar to the example problems that have been done before.

To know more about students' problem solving ability, researchers gave an initial test to students. Based on the results of the initial test, the researcher found that students' mathematical problem solving ability were low. Students cannot solve problem solving problems related to everyday life. From 3 items given to 32 students, a description of the results of students' mathematical problem solving ability is obtained from the following table, namely:

**Table 1. 1 Description of Students' Level of Ability to Solve Problems in the Initial Test Based on Problem Solving Steps**

<b>Student Errors Based on Initial Ability Test Indicators</b>	<b>Number of Students</b>	<b>Percentage Number of Students</b>
Understanding The Problem	10 Students	31,25%
Devising A Plan	4 Students	12,5%
Carrying Out The Plan	3 Students	9,37%
Looking Back	0 Students	0
Number of students who completed	2 Students	6,25%

From these results we can know that students' mathematical problem solving ability still very low with 2 students (6,25%) who completed the initial test, so they need to be improved. From the results of the answers, students' errors or difficulties are obtained as follows:

No	Student Work Results	Error analysis
1	<p>2) Dik: panjang: <math>2x-3</math> lebar: <math>x+6</math></p> <p>b) keliling persegi panjang = <math>2(p+l)</math> c) <math>= 2(2x-3+x+6)</math> <math>= 2(3x+3)</math> <math>= 6x+6</math></p> <p>d) hasilnya adalah <math>6x+6</math></p>	<p>In the results of student answers, it can be seen that students are unable to understand the problem in terms of known and asked, because the student does not write down the known and asked completely and asked based on the problem.</p>
2	<p>2) a. diketahui: Panjang persegi = <math>(2x-3) m</math> <del>lebar</del> lebar : <math>(x+6) m</math> Sekeliling lahan : <math>2 m</math></p> <p>b. Rumus luas p. panjang = <math>2(p+l) / 2p+2l</math></p> <p>c. Rumus <math>= 2p \times 2l</math> <math>k = 2(2x-3) + 2(x+6)</math> <math>= 4x-6+2x+12</math> <math>= 4x+2x-6+12</math> <math>= 6x+6</math></p> <p>d. kesimpulan: Jadi luas taman ialah <math>6x+6</math></p>	<p>In the results of student answers, it can be seen that students have not been able to plan the steps to solve the problem to find the solution, because the student is not able to obtain length and width of the land if the perimeter is made 2 meters wide.</p>
3	<p>1. a. Diketahui: panjang sisi <math>(x+12) cm</math>, <math>(2x-2) cm</math>, dan <math>(3x-3) cm</math>. Dit: panjang sisi segitiga terpanjang? b. Rumus: keliling segitiga = jumlah semua sisi! c. <math>= (x+12) + (2x-2) + (3x-3)</math> <math>k = x+2x+3x+12-2-3</math> <math>= 6x+7</math> <math>31 = 6x+7</math> <math>x = 6+7-31</math> <math>x = 13-31</math> <math>x = -18</math></p>	<p>From the results students have not been able to solve the problem properly, where students are less careful in calculating the length of the longest side of the triangle, so that the answers obtained are wrong.</p>
4	<p><math>31 = x+2x+3x+12-2-3</math> <math>31 = 6x+7</math> <math>31-7 = 6x</math> <math>24 = 6x</math> <math>x = \frac{24}{6} = 4</math></p> <p><math>(4+12) + (2-2) + (12-3)</math> <math>= 16+6+9</math> Jadi sisi terpanjang adalah <u>16</u> dari <math>x+12</math></p>	<p>The results show that students have checked back and found the right result, but students do not write the conclusion of the final result and the correct opinion of the problem given.</p>

From the observation made by researcher, it was found that students' mathematical problem solving ability were still very low. This happens because there are still many students who often experience difficulties during the math learning process. Some of the factors include students who are less careful in calculations, students are unable to identify problems, and students' interest in learning mathematics is still lacking due to the teacher explaining material still using a simple, monotonous, less interactive lecture method. This is in line with the opinion (Doni Wungo et al., 2021) that the lack of interest and quality of student learning in mathematics causes their ability to solve mathematical problems to be low, so hindering the understanding in learning process.

Therefore, teachers need to apply a learning model that can improve students' mathematical problem solving ability. One of the learning models that can be applied to improve students' mathematical problem solving ability is the guided discovery learning model. According to Bruner (Dharma et al., 2022) learning with a guided discovery learning model can help students in finding problem solving and acquiring their own knowledge in depth, because students are actively involved during the learning process so that the knowledge gained can last long. The steps in guided discovery based on Syah's opinion (Adriani et al., affifah) are: 1) Stimulation (providing stimulation), 2) Problem statement (problem identification), 3) Data collection, 4) Data processing, 5) Verification (proofing), and 6) Generalization (concluding). Based on research by Dominikus, Djoko, and Yuniar (2021) on grade VIII students at SMP PGRI 6 Malang, there is an increase in problem solving ability through the Guided Discovery learning model. Furthermore, research by Emilianus, Ricardus, and Serafina (2023) on students of SMPK Immaculata Ruteng showed the effect of the Guided Discovery learning model on students' problem solving ability. Through discovery learning, students are helped to form effective ways of working together, sharing information and listening and using other people's ideas to find their own understanding. An effectively applied guided discovery learning model can help to improve students' mathematical problem solving ability.

Based on the description above, the researcher will conduct a research with the title "**Implementation of Guided Discovery Learning Model to Improve Mathematical Problem Solving Ability at SMP Negeri 10 Medan**".

## **1.2 Problem Identifications**

Based on the background description of the problem above, the problems in this research can be identified as follows:

1. Mathematics is considered a difficult, abstract, and unpleasant subject.
2. Many students have difficulties in solving and resolving story problems.
3. The low mathematical problem solving ability of students in grade VIII SMP Negeri 10 Medan.
4. Teachers still dominate in teaching in the classroom.
5. In learning mathematics, teachers have not fully implemented the Guided Discovery Learning model.

## **1.3 Problem Limitations**

Based on the identification of these problems, a broad scope of problems is obtained, so the researcher limits the problem to be more focused. The limitations of the problems in this research are:

1. Mathematical problem solving ability of students in grade VIII SMP Negeri 10 Medan.
2. The learning model that will be used in this research is Guided Discovery Learning in grade VIII SMP Negeri 10 Medan.

## **1.4 Problem Scope**

This research was conducted by focusing on the application of the Guided Discovery Learning model to improve the mathematical problem solving ability of students in grade VIII at SMP Negeri 10 Medan.

## **1.5 Problem Formulation**

Based on the scope of the problem, the formulation of the problem in the research can be stated as follows:



1. How is the improvement of mathematical problem solving ability of grade VIII students after applying the Guided Discovery Learning model at SMP Negeri 10 Medan?
2. How is the classical completeness of mathematical problem solving ability of grade VIII students through Guided Discovery Learning model at SMP Negeri 10 Medan?

### **1.6 Research Objectives**

Based on the problem formulation above, the objectives of this research are:

1. To describe the improvement of mathematical problem solving ability of grade VIII students after applying Guided Discovery Learning model at SMP Negeri 10 Medan.
2. To improve the mathematical problem solving ability of grade VIII students through Guided Discovery Learning model to achieve classical completion at SMP Negeri 10 Medan.

### **1.7 Research Benefits**

This research is expected to provide benefits, especially:

1. For students, applying the Guided Discovery Learning model is expected to provide convenience in learning mathematics, improve mathematical problem solving ability, and improve learning outcomes in mathematics.
2. For teachers, through the application of the Guided Discovery Learning model, it is hoped that it can be used as a reference in designing learning models to achieve optimal results.
3. For schools, it can be used to provide a variety of interesting learning models and improve the quality of education.
4. For researcher, through the research that has been done, researcher can gain direct experience in applying the Guided Discovery Learning model as a provision for researcher to become future educators in order to improve the quality of education.