CHAPERT I

INTRODUCTION

1.1. Background

Mathematics is one of the subjects learned in each grade starting from elementary school, middle, and college. Due to this, math has an important role in daily life, furthermore, *it* has a role in various scientific knowledge and technology, along with other areas such as industry, assurance, economy, agriculture, social, and technical. Cornelius (Abdurahman, 2012:204) said there are five reasons why we should learn mathematics because math is: (1) A medium of clear and logic thinking; (2) A medium to solve daily life problems; (3) A medium to recognize relations and generalization of experience; (4) A medium to develop creativity; and (5) A medium to increase awareness toward cultural development. Based on some of these reasons, it is one of the factors that causes the importance of learning mathematics to be learned and mathematics has an important role in everyday life.

NCTM formulates the objectives of learning mathematics, namely: 1) develop mathematical communication abilities, 2) develop mathematical reasoning abilities, 3) develop mathematical problem-solving abilities, 4) develop mathematical connection abilities, 5) develop mathematical representation abilities. Meanwhile, the objectives of learning mathematics according to the 2013 curriculum emphasize the pedagogic dimension in meaningful learning, which is carried out in observing, asking, trying, reasoning, presenting, and creating activities. To achieve optimal learning objectives, learning is needed that can encourage mastery of prerequisite abilities, management of learning by reasoning and optimization of learning media.

The importance of learning mathematics is expected that students can take control the learning, especially regarding the students' mathematical problem-solving abilities. This is in accordance with one of the objectives of learning mathematics that has been described above, namely students develop mathematical problem-solving abilities which consist of the ability to understand problems, design

mathematical models, complete models and interpret solutions obtained by students based on the problems given. Sumiati and Asra (2013:89) suggest: "Ability to solve problems support a lot of someone creativities, i.e ability to create new ideas, either it is inherent, or modification from various pre-existing ideas." Therefore, problem-solving ability is one of the important things to be developed in learning mathematics and is the basic ability needed by students in the process of learning mathematics.

The importance of students' mathematical problem-solving abilities is emphasized in the NCTM which states that problem solving is a part of learning mathematics, so that problem-solving abilities and learning cannot be separated. The importance of having problem-solving abilities is reflected in Hendriana and Soemarmo's explanation that mathematical problem-solving is the most important part in learning mathematics, even the steps involved in problem-solving are a core part of mathematics (Agustami, et al. 2021). Supported by Branca suggests that problem-solving abilities are very important for every student because (a) problem-solving is a general objective of teaching mathematics, (b) problem-solving which includes methods, procedures and strategies is the core and main process in the mathematics curriculum., and (c) problem-solving is a basic ability in learning mathematics. In addition, Rusefendi says that problem-solving skills are very important in mathematics, not only for those who will study mathematics in the future, but also for those who will apply it in other fields of study and in everyday life. Based on the explanation above, it can be concluded that problem solving ability is very important to be improved, especially in learning mathematics.

Although problem-solving ability is an important thing, in fact level of students' mathematical problem-solving ability is still relatively low. Hayat (Zahro and Haerudin, 2022) stated that in Indonesia the low level of students' mathematical problem-solving abilities was indicated by the results of tests conducted by two international studies, including the Program for International Student Assessment (PISA) in 2018 and Trends in International Mathematics and Science Study (TIMSS) in 2015. Based on the results of the PISA study, it was found that **Indonesia has a level of student mathematical problem-solving ability which is**

always ranked in the bottom 10 and it is proven that in 2018 Indonesia was ranked 74th out of 79th countries. Meanwhile, TIMSS placed Indonesia at 44th out of 49th countries in 2015 with an average score of 397 for mathematics achievement while the average standard value used by TIMSS was 500 (Megantara, et.al., 2017). These rankings indicate that the level of mathematical problem-solving ability of students in Indonesia is still low and below international standards.

It is strengthened by Rahman's research (2017) explains students are still less capable of solving questions, arranging mathematics models, model solutions, and interpreting the correct solution. It also supported with the research by Suriyani (2018) on SMP Negeri 1 Pulau Rakyat Asahan Regency grade VIII by 31 students, found students who study conventionally have a low level of solving abilities with 2 students in the high category, 13 students in the middle category, and 16 students on low category. Then the scientist observed 25 students in grade VII in SMP N 8 Percut Sei Tuan to discover facts about students' current mathematics problem-solving abilities. The scientist gave essay tests that related to mathematics problem-solving. The following mathematics problem-solving the scientist gave:

1) Apabila diketahui jarak kota A ke kota B adalah 105 km maka jarak pada peta yang berskala 1 : 1.500.00 adalah ... (dalam satuan cm)

Based on the result of the scientist preliminary problem-solving test for VII grade students of SMP N 8 Percut Sei Tuan 25 students who followed the test found an inability to understand the problems, plan a problem solving, solve problem solutions, and summarize. As for, the few mistakes that found from the research are:

Table 1.1. Observation Result

No.	Result of Students' work	Analysis Error
1.	1. Jarak sebenarnya : 105 km : .... cm : 105 × 100.000 : 10500.000 cm Skala : $\dfrac{\text{Jarak Pada Peta}}{\text{Jarak sebenarnya}}$ Skala : 1 : 1.500.000 $\dfrac{1}{1.500.000}$	• Students are incapable to understand the problem from the question that they did not write what they knew of the question.
2	jb: ① $\dfrac{105}{1 : 1.500.000}$ 105 $\dfrac{1}{500.000}$ = 105 × 500.000 = 500,200,0000 ← hasilnya	• Students are incapable of constructing the plan that they did not write the formula based on the question given.
3	(1). Skala = 1 : 1.500.000 Jarak sebenarnya : 105.000.00 cm Skala = $\dfrac{\text{Jarak sebenarnya}}{\text{Jarak peta}}$ = $\dfrac{105.000.000 \text{ cm}}{1 : 1.500.000}$ = $\dfrac{1}{525.000}$ Skala = 525.000	• Student incapable to accomplish the construction well.
4	$\dfrac{1}{1.500.000}$ Jarak Pada Peta $-10.500.000$ Jarak Pada Peta : $\dfrac{10.500.000 × 1}{1.500000}$: $\dfrac{10.500.000}{1.500.000}$: 10 cm	• Student incapable of finely concluding that the student did not re-evaluate the result of the solution.

Based on the following table, incapable students in understanding problems are 25 students (100%) whereas, in this part, students did not write what the questions known and asked. Incapable students in arranging solving plans are 13 students (52%) who did not write the formula or first step they must do. Incapable students in solving arranges problem are 15 students (60%) and incapable students in summarizing correctly are 15 students (60%) where on this part, students did not earn the right result and did not make a result they got. From the following result, it saw the percentage obtain above 50% students incapable of solving problems with proper steps along with problem-solving indicator i.e figuring problems, arranging solution, solving problems according to plan and re-evaluated. It shows that problem-solving abilities level on SMP Negeri 8 Percut Sei Tuan relatively low.

The researcher also conducted an interview with one of the seventh-grade mathematics teachers at SMP N 8 Percut Sei Tuan. Based on the results of the interview, it was found that the learning process that took place in the classroom was still using direct learning, meaning that learning was teacher centered. During the learning process in class the teacher explains the learning material then students will sit quietly and listen to what the teacher says. In addition, the teacher also provides examples of questions as a form of understanding of the material being taught. Then the teacher will ask students to work on similar questions with the example questions that have been given earlier. So that in this learning process, students are only used as objects who will only carry out activities according to the teacher's orders. Because of this, students' mathematical problem- solving abilities cannot be honed and developed so that the level of students' problem-solving abilities will keep it low.

This is supported by research Suriyani research (2018), low mathematics problem-solving abilities students have caused by the conventional learning where lessons still teacher-centered. This causes learning tends to be boring and students are not actively involved during the learning process. Students just sit and listen to what the teacher says and do the questions according to the formula given by the teacher. This causes students to only memorize the material that has been given without understanding the concept. In addition, in this learning process the teacher

does not relate the material to the student's experience so that the application of the material is difficult for students to accept. Based on the results of these observations, it was found that several factors were the cause of the low mathematical problem-solving ability, including the learning approach factor used in learning that did not help hone students' problem-solving abilities, then the student's study habits factor where students were accustomed to learning by rote and teacher-centered learning where the teacher taught by applying mathematical concepts, giving examples of working on problems, and asking students to work on problems similar to those that have been explained by the teacher.

Students' low mathematical problem-solving abilities can be improved with the help of teacher support for the application of appropriate learning approaches. One learning approach that can be used is Realistic Mathematical Education (RME). According to Wijaya (Bonuca dan Hasratuddin,2018) said: "Science will be meaningful for students in the context of the learning process or learning used a realistic problem. A realistic problem doesn't have to be a real-world problem and it can be found in a student's daily life. A problem name realistic if it can be imaginable or real in student's mind. Because of it, Realistic Mathematics Education (RME) can be used to practice students' problem-solving ability by connecting the daily life problems in the learning process.

Realistic Mathematics Education (RME) is one of the approaches ways where inside learning must start from a daily life problem. Those problems are used to bring up mathematics concepts. In this Realistic Mathematics Education (RME) model, teachers are just a facilitator and tutors during students' learning process. Teachers must give changes for students to give their opinion during learning. Fauzan et al (Widana, 2021: 450-462) presented RME learning principles as: "(1) activities basis, teachers must capable in encourage learners to be active physically and mentally; (2) reality basis, lessons start with raising real problem from students environment; (3) tiered problem solutions, students guided to do particular steps to solving problems; (4) dependence, shows connections between mathematics concepts to one another, unseparated; (5) social interaction, mathematics learning

activities capable to create a social relation between teacher and learners so the learning starts interactively, active and exciting."

Papadakis (Widana, 2021: 450-462) presented that the Realistic Mathematics Education (RME) learning method related to mathematics concepts, critical thinking abilities, creative thinking, and problem-solving. In line with this, the steps in the Realistic Mathematical Education approach are continuous with the steps in the problem-solving stage proposed by Polya. The steps for solving the problem proposed by G.Polya (1973) are as follows: Understanding the problem, Devising a plan, Carrying out the plan, Looking back. Meanwhile, the steps of the Realistic Mathematical Education approach described in Treffers and Goffre's Scientific Journal of Basic Education 26 are understanding realistic contextual problems, explaining realistic contextual problems, solving realistic contextual problems, comparing and discussing realistic contextual answers and concluding. (Novita , et al., 2020) These five steps of the Realistic Mathematical Education approach are in line with the steps of solving mathematical problems. Therefore, it is hoped that through this RME learning approach students can build their own knowledge through the problems given so that the problem-solving abilities of students can develop for the better.

In addition to learning models, learning media are also needed to support good mathematical problem-solving abilities and more effective learning. Learning media is a device that is used as an intermediary for delivering information that can stimulate students' thinking and can increase student interest. One of the learning media that can be used is PowerPoint (PPT). PowerPoint is a medium that the facilities are easy to use with slides to support effective and easy presentation devising. Easy applications allow teachers to use PowerPoint (PPT) for learning media.

According to Julia (Susanti, et al., 2021) PowerPoint learning media is one of the learning media that can be used to attract students' attention because the media combines all media elements, namely text, images, sound and even video so that it makes this media an interesting learning medium. According to Daryanto

(Hevitullah, 2016), the primacy from PowerPoint media is the ability in refining textures, colors, and pictures, with self-produced animation according to the user's creativity. Through this primacy, delivering educational material in the form of a slide can attract students to see, listen, and pay attention. Teachers also do not need to experience difficulties in delivering material, because it has been cultivated and served in the form of a slide according to the teacher's creativities.

The use of PowerPoint learning media can make students actively involved and attract students' attention to the material being studied and provide a student learning experience in understanding learning. However, the fact is that SMP Negeri 8 Percut Sei Tuan has not implemented the use of learning media during the learning process. Teachers only use books as a source/material to provide learning materials. In fact, with the PowerPoint learning media, the implementation of the learning process will be easier for students and teachers. Students will be active in the learning process, including in understanding the problems presented in PowerPoint, while the teacher will more easily convey learning materials to students. Therefore, a Realistic Mathematical Education learning model is needed with the help of learning media, namely PowerPoint in the learning process.

Based on the facts about the learning process and learning outcomes above, the teacher must be able to design learning with the learning approach used by the teacher that is acceptable to the group of students' abilities. Every student has different learning abilities. The initial ability of students is the ability that has been possessed by students before participating in the learning process. This initial ability describes the readiness of students in accepting the learning that will be delivered by the teacher. The initial ability of students is important for teachers to know before starting learning, this is due to knowing: a) whether students have the knowledge that is a prerequisite for learning, b) to expand the material that has been understood by students. By knowing these two things, the teacher will be able to design learning well, so that there is a positive relationship between initial abilities and students' learning outcomes, so that students who have better initial abilities will understand learning material faster than students with low initial abilities in the learning process.

Based on the background of the problem above, to find out the effectiveness of Realistic Mathematical Education (RME) assisted learning media on students' mathematical problem-solving abilities, the research was carried out with the title: **"The effectiveness of RME approach with assisted by learning media on students' mathematical problems solving abilities at SMP Negeri 8 Percut Sei Tuan."**

1.2. Problem Identification

Based on analysis of the above background, some problems can be identified as follows:

- Students' mathematical problem-solving ability is still low.
- Learning mathematics at school is teacher-centered learning.
- Lack of teacher attention to students' mathematical problem-solving abilities
- The implementation of learning does not relate the material to the student's experience.
- Students tend to memorize without understanding the concept of the learning material.
- Lack of teacher attention to differences in students' initial mathematical abilities
- The use of learning media in the classroom has not been effectively implemented by the teacher

1.3. Problem Limitation

Based on the background of the problem above, there were some identifiable problems. To avoid overarching discussions, then the researchers limit the problem as follows:

- Students' mathematical problem-solving ability at SMP Negeri 8 Percut Sei Tuan is still low caused they could not understand and solve the problem given.

- Lack of teacher attention to differences in students' initial mathematical abilities
- The use of learning with the Realistic Mathematical Education (RME) approach with the aid of learning media has not been implemented in SMP Negeri 8 Percut.
- The use of learning media in SMP Negeri 8 Percut Sei Tuan has not been effectively implemented by the teacher.

1.4. Problem Formulation

Based on the problem limitation above, then the problem formulation is as follows:

- How is the effectiveness of the RME on mathematical problem-solving ability compared to ordinary learning at SMP Negeri 8 Percut Sei Tuan?
- Is there any interaction between mathematics learning with students' mathematical initial ability (high, medium, low) to students' problem-solving ability?

1.5. Research Objective

The objective of this research is:

- To analyze the effectiveness of the RME approach on mathematical problem-solving ability compared to ordinary learning at SMP Negeri 8 Percut Sei Tuan.
- To find out whether there is an interaction between mathematics learning with students' mathematical initial ability (high, medium, low) to students' problem-solving ability.

1.6. Benefits of Research

After carrying out this research, hope the result of the research could give benefit as follows:

- For the teacher, as resources especially mathematics teacher, to apply a **Realistic Mathematic Education (RME) approach with assisted by learning**

media in the mathematic learning to improve students' mathematical problem-solving ability.

- For students, can be a learning experience that can be applied in learning other subjects, to improve the mathematical problem-solving ability and provide satisfactory results.
- For the researcher, as information, additional insight, and experience as prospective teachers in the future.
- For the other researcher, the result of the research will add to the information and resources for future research.
- For Universitas Negeri Medan, the result of the research can be used for literature.

1.7. Operational Definition

1. The effectiveness of learning mathematics is the satisfaction of achieving a learning goal through a teaching and learning process that involves teachers and students so that with the achievement of learning effectiveness students will be able to develop their skills and abilities in the field of learning.

2. Realistic Mathematical Education (RME) approach is an approach in learning that uses realistic problems so that students will understand the problem first before solving it and plan and choose the right strategy to solve the problem.

3. Learning media is a device used as an intermediary for delivering information that can stimulate students' thinking and can increase student interest.

4. Problem solving ability is the ability of students to solve mathematical problems with the following steps understanding the problem, designing a settlement plan, implementing a completion plan, and reviewing the completion steps.