

CHAPTER I

PRELIMINARY

1.1. Background of The Research

According to the Law of the Republic of Indonesia Number 20 of 2003, Article 3 concerning the National Education System, national education is for the development of skills and the formation of a valuable national personality and civilization in the context of forming a healthy state, we can see that the students aim to become citizens of noble character, sane, knowledgeable, capable, creative, independent, democratic, and responsible, who believe and fear God Almighty.

According to the Law of the Republic of Indonesia, Number 20 of 2003 Article 37 paragraph 1 concerning the National Education System, the primary and secondary education curriculum must contain a. religious education; b. civic education; c. language; d. mathematics; e. natural science; f. social science; g. art and culture; h. physical education and sports; i. skills/vocational; and j. local content.

Mathematics is one of the fields of study that must be included in the primary and secondary education curriculum. This is because mathematics has an essential role in education and in dealing with the problems of everyday life.

According to Susilo (2012:22), mathematics is more than just a collection of numbers, symbols, and mathematical formulas that have nothing to do with the real world. Instead, mathematics has grown and taken root in the real world. Susilo also stated that mathematics is the queen and servant of science. In short, as the queen of mathematics, she seems to be on the throne of all sciences because mathematics develops independently of other sciences. A Science that uses mathematics for research and development.

Cockroft acknowledged the critical role of mathematics in (Shadiq, 2014: 3), namely "*It would be very difficult-perhaps impossible-to live a normal life in very many parts of the world in the twentieth century without making use of the mathematics of some kind*" with, In other words, it would be very difficult or

impossible for a person to live in this part of the earth in the 20th century without the slightest use of mathematics.

Students' mathematical abilities should be high with a significant role in mathematics. However, according to the results of the International Student Assessment Program (PISA) survey released in 2018 (Budiyanta: 2020), it was announced in March 2019 it captured some of the problems of the Indonesian education system. Indonesia students have a low score in mathematical problem solving and is ranked 74th out of 79 countries. PISA is a worldwide educational system evaluation survey that measures the grades of junior high school students.

This assessment is conducted every three years and divided into three main areas: literacy, mathematics, and science. The 2018 results measured the skills of 600,000 15-year-olds in 79 countries. Indonesia is in a low category, with an average score of 379, an average score of 396, and ranked 7th to 62nd in 2015. From a curriculum perspective, problem-solving skills are one of the goals of mathematics lessons in schools. This means that you will train your thinking and reasoning processes, develop problem-solving skills, communicate information, and develop ideas verbally. Written, illustrated, graphic, map, diagram, etc. (Depdiknas, 2006: 6)

According to Minarni (2020), students who have problem-solving abilities can get many benefits, namely: will have motivation, curiosity (curiosity), inspiration, and creativity; the ability to read and make good sentences, as well as numeracy skills, can develop, making it possible to find original, new, distinctive, diverse answers; develop the ability to select and apply problem-solving strategies; develop analytical and evaluation skills.

The National Council of Teachers of Mathematics (NCTM) also taught The importance of problem-solving in learning. According to NCTM (2000), the mathematical thinking process in mathematics includes five primary standard skills: problem-solving skills, thinking skills, connectivity, communication skills, and presentation skills.

Furthermore, solving mathematical problems involves other mathematical process skills, and thus mathematical representation skills and other skills are also honed.

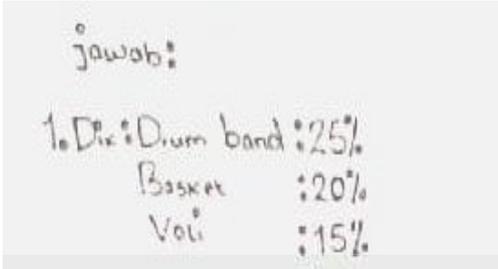
However, according to observations in several studies and journals, and facts in the field, students' mathematical problem-solving abilities are still low, so they need to be improved. The good news is that this ability can be enhanced with an innovative, creative learning approach based on a student center.

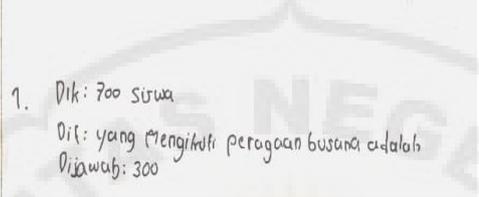
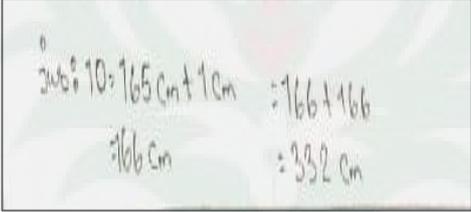
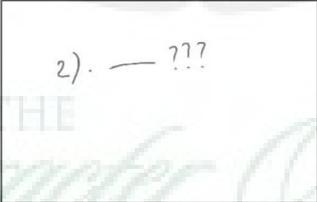
Students are said to have problem-solving skills if they can demonstrate a series of work in solving mathematical problems, which include stating the situation in their language; identifying data and selecting relevant information to solve problems; presenting problems mathematically in the form of algebra, graphs, and tables; use appropriate learning approaches and methods; develop problem-solving strategies, create and interpret mathematical models of a problem and be able to solve other non-routine problems (Minarni, 2013).

According to the study's description, the researchers conducted an initial test at SMP Negeri 1 Binjai to measure students' problem-solving ability. On Tuesday, November 30th, 2021, a test in class VIII-6 was conducted. The test consisted of two essay questions accompanied by statistics topic about mean, median, modus.

Here are some student responses to the first of initial test questions, as well as an analysis of the responses.

Table 1.1. Student Mistakes in Complementing Initial Test Questions

Indicator	Student's Responses	Identification Problem
Understanding the problem		Students are able to understand and write down what is known in the problem into mathematical language, but it is not

		correct/ not in full version
Planning problem solving		Students planning to solve this question by writing down all the information but it still not correct
Implementing a solution plan		Students try to solve the problem by adding the information that given in question, but it isn't correct.
Re-checking the solution		

According to the test results above, students received the greatest score of 45 and the lowest score of 0. The ability of students to solve mathematical problems is still relatively low, as can be observed. This value is still rated as "very low" in the table of criteria for students' mathematical problem-solving ability.

Graphic for percentage from the first observation as shown below:

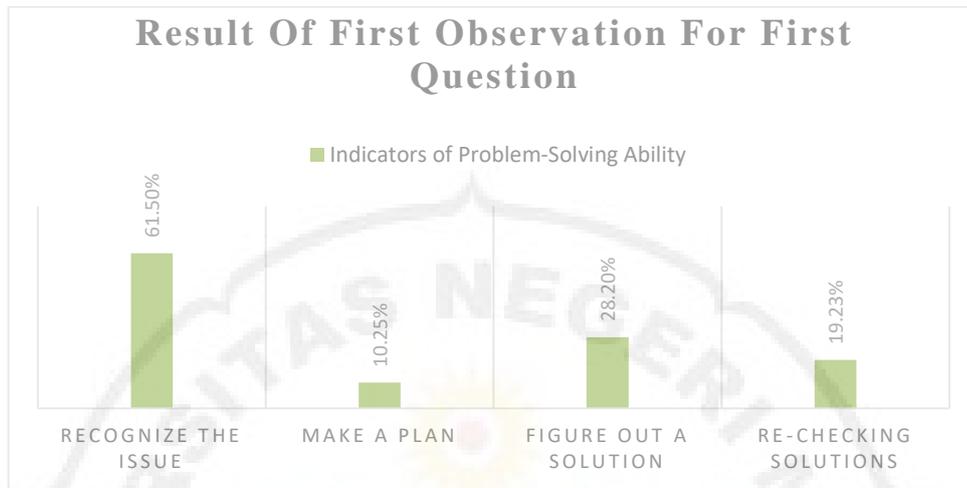


Figure 1.1. Result of First Observation for First Question

For the first question, based on the results of the original test offered to 13 students, the following criteria were developed to describe the level of problem-solving ability: On the indication of planning solutions, the average percentage of problem understanding was 61.5%, which is in the low group. 10.25% of the problems were rated as very very low, 28.2% of the problem-solving implementation indicators were classified as very low, and 19.23% of the re-checking indicators were classified as very low. The average value of problem-solving solving skills is 29% percent, which falls into the very low category.

For the second question, graphic of the result is:

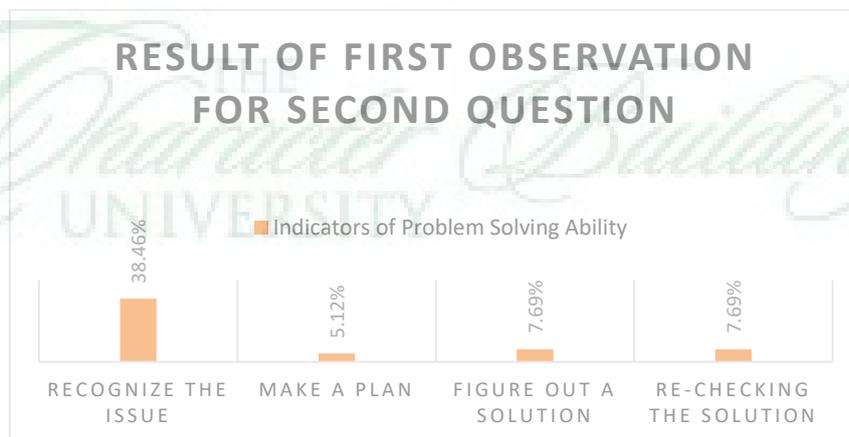


Figure 1.2. Result of First Question for Second Question

The average percentage of problem resolution for the second question, on the indication of planning solutions, was 38.46%, which is in the bottom group. 5,12% of the problems were evaluated as extremely low, 7,69% of the problem-solving implementation indicators were rated as extremely low, and 7,69% of the re-checking indicators were rated as extremely low. The average value of problem-solving abilities is 14.74 percent, which is considered very low.

According to Fuadi, Minarni, and Banjarnahor (2017), the causes of students' low ability to answer mathematical problems include, among other factors,:

1. Students are still having a hard time understanding the problem and extracting information from it.
2. Students are unfamiliar with problems that are not typical.
3. Students keep struggling with converting the problem into a mathematical model.
4. Students continue to struggle with problem-solving planning and execution, as well as double-checking their work for accuracy.

In an interview with a mathematics teacher at school, she indicated that lecturing is a common teaching approach that teachers utilize in the classroom, where students are passive recipients of knowledge rather than actively participating in learning. Despite the fact that traditional schooling is ineffective in honing pupils' mathematical abilities. Students have learning issues, according to Minarni, Napitupulu, and Husein (2016), because the expository technique still dominates learning in the classroom and students are rarely involved in solving math problems.

According to Kurniasih and Sani (2017: 109), "Creative and innovative learning processes stimulate children's curiosity through exciting activities that motivate them to think critically and make new decisions. In addition, learning management needs to be dynamic, meaning that children are treated as subjects of the learning process.

Based on DIKTI (2014), SCL (Student-Centered Learning) is a learning method that allows students to be the center of the learning process. Strict teaching

from the teacher will enable students to adjust to their abilities and, in the learning process, is a form of learning that provides opportunities for direct action. (DIKTI, 2014).

The Open-Ended approach is one of the developments that emerged from the problem-solving process. According to Sumartini (2016), it is necessary to be supported by appropriate learning methods to improve problem-solving skills. Problem-solving skills related to the real world can- be integrated to solve problems and competition in the real world.

The open-ended model of learning strategy as one of the strategies in learning mathematics allows students to develop their mindset according to their respective interests and abilities. Through open-ended learning, students can find something new in solving a problem, especially problems related to mathematics. So the open-ended learning model is very influential in improving problem-solving abilities because, in the open-ended learning model, students are required to develop various heterogeneous thought processes and their creativity to solve these problems, so it is expected to develop students' mathematical problem-solving abilities.

The open-ended approach is learning with a problem-solving approach, according to the learning strategy. An open-ended method can create interactive activities between students and mathematics learning so that students are motivated to solve problems using any strategy. With some of these strategies, the open-ended approach might provide an opportunity for students to gain knowledge or experience in finding problems, comprehending them, and addressing them (Murni, 2013).

Some of the benefits of open-ended problem solving include: providing an appropriate learning environment for students to develop and express their mathematical understanding, allowing for multiple correct solutions and allowing each student to respond to problems in their own way, involving each student in activities and lessons, students can use their mathematics knowledge and skills, comprehensive, with many different solutions, and students can choose their favorite strategies to solve problems (Capraro, 2007).

The probing prompting method is used to explore students' thinking skills. The probing prompting learning method is question-based. According to the meaning of the word, probing means investigation and examination. While prompting has the meaning of encouraging or guiding.

The probing-prompting technique is a learning technique in which the teacher presents a question that guides and explores student knowledge. The questions given by the teacher provide opportunities for students to think and can involve students in learning (Poerwadarminto: 2005). So that students avoid boredom. According to Miftakul Huda, the probing-prompting technique is a learning technique that guides and explores so that there is a thinking process that links each student's knowledge and experience with the new knowledge he is learning. In this learning model, the question-and-answer process is carried out by appointing students randomly so that each student inevitably has to participate actively. Students cannot avoid the learning process. At any time, they can be involved in the question-and-answer process. (Shomin: 2014).

Suherman (on Huda, 2013: 281) The definition of probing prompting is to present a series of questions that guide and explore students' ideas so that they can jump-start the thinking process that can link students' knowledge and experiences with the new knowledge being studied. Probing prompting is an effective non-conventional learning activity if used in abstracting negotiating texts.

Based on the above background, the researchers are interested in conducting research with the title "**The Application of Open-Ended Learning Approach with Probing Prompting Method to Improve Students' Mathematical Problem Solving Ability at Class VIII SMP Negeri 1 Binjai**".

1.2. Problems Identification

Based on the background described above, the problems in the research can be identified as follows:

1. The low mathematical problem-solving ability of students.
2. Learning methods in the school still using conventional methods
3. Students students are less interested during the learning process

4. Students keep struggling with the problems presented.
5. Students have demonstrated an incapacity to plan and solve challenges
6. The open-ended approach has never been used, even though it is recommended as a learning activity used in the classroom.
7. The probing prompting strategy is essential but has not been used to help improve students' mathematical problem-solving abilities.
8. The learning process becomes unattractive, rigid, and gloomy

1.3. Problem Limitation

There needs to be a problem limitation for this research to be more focused and aligned with the expected goals. The limits of the problem in this study are:

1. The Open-ended approach with the Probing prompting learning method is intended as an alternative for learning mathematics in problem-solving
2. This research was carried out in class VIII-5 and VIII-7 SMP Negeri 1 Binjai on statistical material
3. This research limited in measure students' ability to understand problems, develop strategies or plan solutions; solve problems according to the plan that has been made, and re-examine the answers according to the indicators of mathematical problem solving ability

1.4. Problem Formulation

Based on the background of the problem and the identification of the problem above, it can be formulating the problem is how the improvement of the problem-solving ability of students at class VIII SMP Negeri 1 Binjai after the open-ended approach with the probing prompting methods was implemented?

1.5. Purpose of The Research

Based on the formulation of the problem above, this study aims to see the improvements of students' mathematical problem-solving abilities in learning mathematics with statistics topics through an open-ended approach with the probing prompting method in class VIII SMP Negeri 1 Binjai.

1.6. The Benefit of The Research

This research is helpful in education directly or indirectly. The benefits of implementing this research are as follows..

1. Theoretical Benefits

The results of this study can expand knowledge; as a result, it can be used as a basis for learning Mathematics to improve students' problem-solving skills in statistical material. In addition, research outputs that can be used as material for further study by researchers & academics in the field of education

2. Practical Benefits

Practically, this research is expected to be used as a reference in teaching by teachers, especially in understanding students' mathematical problem-solving.

3. For Students

Allow pupils to maximize their comprehension and creative potential when addressing mathematical issues by providing chances for them to do so.

4. For Teachers

We can use the Open-Ended Approach to learning with the probing prompting method in Mathematics classes.

5. For Researcher

Researchers will master the fundamentals of teaching and build mathematical learning methodologies.

1.7. Operational Defenition

To avoid misconceptions in comprehending some of the primary terms in this study's title, limitations in understanding some of the essential terms contained in the title must be provided. As a result, the author clarifies the following concepts, among others::

1. Open-Ended Approach

The open-ended approach discussed in this study allows students to shape their mindsets based on their interests and talents.

2. Probing prompting Methods

Probing-prompting is a method of learning that involves delivering information about the things that underpin it. With the expertise and experience of pupils with what has just had been revealed, a thinking process develops. (Shomin: 2014)

3. Mathematics Problem-Solving Abilities

Students' capability to solve mathematical problems, and problems in other sciences and issues in everyday life, is described as the ability to integrate mathematical activities to solve mathematical problems, problems in other sciences, and issues in everyday life. (Soedjadi, 1994:36)