

CHAPTER I INTRODUCTION

1.1 Background

Mathematics is a branch of science that has an important role in the development of science and technology, either as a tool in applications for other scientific fields as well as in the development of mathematics. Various applications of mathematics can be used to solve the daily life problems. As disclosed Cornelius (in Abdurrahman 2009:204) that:

Lima alasan perlunya belajar matematika karena matematika merupakan (1) sarana berpikir yang jelas dan logis, (2) sarana untuk memecahkan masalah kehidupan sehari-hari, (3) sarana mengenal pola-pola hubungan dan generalisasi pengalaman, (4) sarana untuk mengembangkan kreativitas, dan (5) sarana untuk meningkatkan kesadaran terhadap perkembangan budaya.

Mastery of mathematics by students become a necessity that can not be bargained in structuring reasoning and decision-making in an increasingly competitive era of competition at this time. Mathematics learning activities is expected to be able makes students ability to resolve the problems it faces, both in mathematics and outside of mathematics, and makes students developing their reasoning, so that students able to think critically, logically, systematically and finally expected that students able to be objective, honest and discipline.

Mathematics as a very important science should have been the lesson that favored by students that being learned mathematics. However, in reality the math including lessons that disliked a lot of students. Fears of students are not only caused by the students themselves, but rather the lack of ability of teachers in creating a situation that could bring students interested in mathematics. The main cause of the failure of a teacher in teaching in front of the class is superficiality of knowledge of teachers against whom students and how their learning ways. So every action learning that programmed even more mistakes than a policy taken. Due to fears of the students, the purpose of mathematical education is not achieved.

According to National (NCTM, 2000: 206) that learning mathematics with understanding is the main thing. Conceptual understanding and procedural is an inseparable part of mathematics problem solving. In NCTM (2000) also described there are five standards mathematical ability should be owned by students, namely: *problem solving, communication, connection, reasoning, and representation*. Based on the description, NCTM contains representations as one of the standards that must be owned by students so that mathematical representation of student really need to developed.

The mathematical representation ability is one of the general objectives of learning mathematics in school. This ability is particularly important for students and closely related to communication skills and problem-solving. To communicate something, someone needs a good representation in the form of pictures, graphs, charts, and other forms of representation. With representation, problems that initially seem difficult and complicated can be seen more easily and simply, so that the issues presented can be solved more easily. Goldin (2002: 208) state that:

Representasi adalah elemen yang sangat penting untuk teori belajar mengajar matematika, tidak hanya karena pemakaian system simbolis yang jugapenting dalam matematika dan kaya akan kalimat dan kata, beragam dan universal, tetapi juga untuk 2 alasan penting yaitu (1) matematika mempunyai peranan penting dalam mengkonseptualisasi dunianya; (2) matematika membuat homomorphis yang merupakan penurunan dari struktur hal-hal lain dari yang pokok.

Hudiono (2005:19) state that the representation ability can support students to understand mathematical concepts that learned and the relationship; to communicate mathematical ideas of students, to know more about the relationship (connection) between mathematical concepts; or apply mathematics in realistic mathematical problems through modeling. The role of representations is also described by NCTM (2000: 280)

Representation is central to the study of mathematics. Student can develop and deepen their understanding of mathematical concepts and relationships as they create, compare, and use various representations. Representations also help students communicate their thinking.

Representations should be treated as essential elements in supporting students' understanding of mathematical concepts and relationships; in communicating mathematical approaches, arguments, and understandings to one's self and to others; in recognizing connections among related mathematical concepts; and in applying mathematics to realistic problem situations through modeling. New forms of representation associated with electronic technology create a need for even greater instructional attention to representation. So, representations underpin *conceptual understanding, communications, connections, and problem solving*. All of these processes are assisted by an effective representation. Students should engage with each of these in all of their mathematics courses, so that effective presentations.

- Create and use representations to organize, record, and communicate mathematical ideas;
- Select, apply, and translate among mathematical representations to solve problems;
- Use representations to model and interpret physical, social, and mathematical phenomena

Based on explanation above can be concluded that representation is one of the important things in understanding mathematics. Mathematics can be understood if the students have good representation. So they are able to describe, interpret, express, symbolize or even modeling ideas, mathematical concepts and the coherence among them and contained in a configuration, construction or certain situations that appear in various forms in order to obtain clarity of meaning, show understanding or looking for a solution of the problems. But on last situation Mathematical representation ability of students is in school less attention since many students don't comprehend about their mathematical representation ability. Though mathematical representation ability is very important in learning mathematics since facilitating the students to represent problem in form of mathematical visual object which is more interesting.

From the initial test which has been conducted by researchers to students, it is known that the ability of students' mathematical representation is still low. It can be seen from the answers that they make. Some of them are notable to create a table of story problems correctly, notable to solve problems of the images presented, and less able to write the conclusion of the diagram presented. The following are some of the documentation of student test results.

Question 1

Given a following data

7, 9, 3, 6, 6, 8, 4, 5, 8, 7, 4, 5, 6, 9, 3

- Calculate the mean values
- Median and mode of data

Answer:

Jawaban

a. $7+9+3+6+6+8+4+5+8+7+4+5+6+9+3 = \frac{60}{10} = 6$

Rata Rata = $\frac{\text{Jumlah Nilai DATA}}{\text{Banyaknya DATA}}$

Rata = 6

3, 3, 4, 4, 5, 5, 6, 6, 6, 7, 7, 8, 8, 9, 9

Media = 6

modus = 6

Figure 1.1 Observation Result of Student's Answer Number 1

From the answers above, we can conclude that the students have not been able to represent the data into the form of mathematical expressions. They don't understand how to calculate the mean of data and also don't understand how to find mode and median.

Question 2

Sinchan body temperature for 10 days is shown by the following table.

Table 1.1The Question of Observation Question Number 2

Harike	1	2	3	4	5	6	7	8	9	10
Suhu ($^{\circ}$ C)	35	36	37	36	37.5	38	37	38	38.5	37

- Draw a line diagram of the above data
- How many days sinchan's body temperature is above normal(36.5° C)??

Answer :

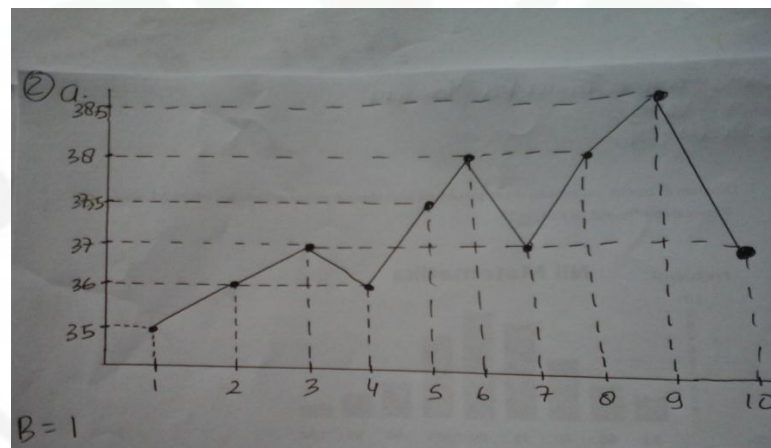


Figure 1.2 Observation Result of Student's Answer Number 2

From the answers above, we can conclude that the students have not been able to represent the data into the form of graph. Students are not able to enter the data correctly into the graph, data which he wrote different from the data in question and also don't understand how to put the data from tables that given, so the student feel so difficult to answer the question.

Question 3

The bar chart below shows the acquisition value math test grade VII-A. Minimal completeness criteria (KKM) = 75.

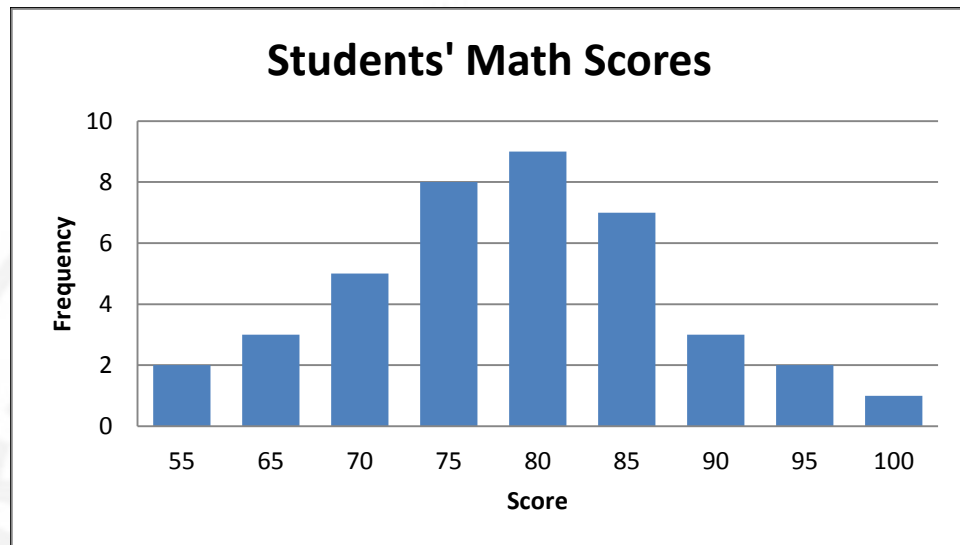


Figure 1.3The Question of Observation Question Number 3

- Calculate how much students that must follow the remedy
- Make a conclusion from the above bar chart math scores

Answer :

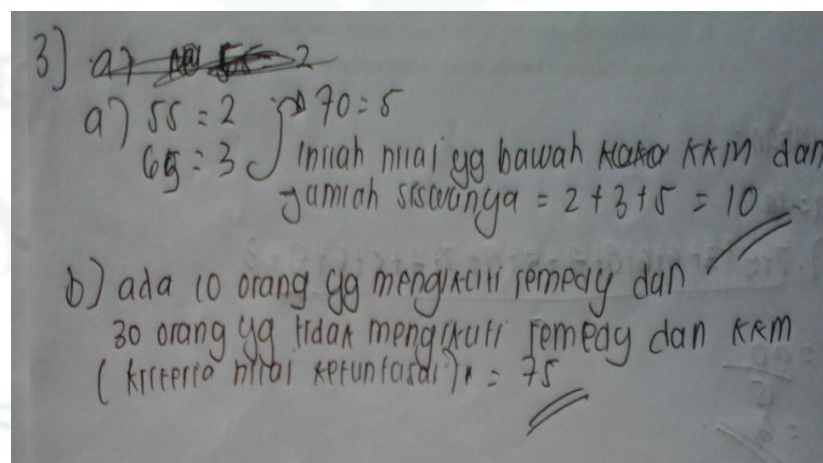


Figure 1.4 Observation Result of Student's Answer Number 3

From the answers above, we can conclude that the students have not been able to represent images into written text correctly because students are less able to appreciate the diagram based facts contained data. He just understand the graph based personal opinion.

Based on these problems, researchers can surmise that the students will have difficulty in the future to manage the problems so that it will also affect

Student's mastery and understanding in mathematics. Student's Mathematical Representation ability still low because the learning model used by mathematics teachers poor in developing student's ability. They still using conventional learning. It requires students to strive themselves in learning. It is not suitable to be applied to the student in this modern era. There are many factors can lead to low mathematics student learning achievements. Prasad (2008) said:

There are three dimensions – school environment, teacher-student relations and value orientation among teachers' influence the whole educational process in the classroom situation. School environment is an external factor and teacher-student relation is an internal factor. We know that values among teacher decide and control both the factors.

Students should be courageous to play an active role in learning, teachers must also be able to involve in technological sophistication in learning so that students feel more passion and learning are more interesting. So, Student's Mathematical Representation ability will be improving well when teachers use the right teaching methods. Therefore, while efforts should be made to improve the ability of the student representation is to increase the competence of teachers in selecting a learning model. Preferably learning model chosen is to increase student engagement in the learning process because until now there are still many students which complain even make mathematics as a frightening specter. So that they become lazy to further explore more math. This tends to make students less active that cause actions or behavior of the students are less skilled in communicating ideas or their ideas.

Relating with the above description it is necessary to think about ways and strategies to overcome the above problems. One model of learning which applied in learning mathematics is the Problem-based learning. Problem Based Learning is effective to improve students' mathematical representation based on multi-level and overall student achievement. According Tall (1995) in mathematical thinking, someone will be faced with an object (a problem in the form of numbers, symbols, statements, or other) in a learning environment, and it will have a perception of this object and perform an internal process to an action. This action in the form of a visuo-spatial representations (images or graphics, which will be the verbal-

deductive) through an object, or in the process of-concept with a conceptual link between them. Problem-based learning that begins with the real concept enables students to more easily understood better when working in groups as well as classical. Each student is required to undertake the completion of a variety of practice questions that had been prepared in the work sheet. PBL models can facilitate the conceptual change on students because of cognitive conflict through the exposed concrete problems.

The findings show that there is a change in the students' misconceptions in understanding mathematical representation. Problem Based Learning can facilitate students' conceptual change because this model gives students opportunity to synthesize the concept. Problem-based learning can facilitate changes of student misconceptions about multi mathematical representation for problem-based learning poses a challenge for students to develop a strategy to prove his hypothesis. Once the strategy is used, the teacher role is to support students in synthesizing of new concepts through questions support (scaffolding).

The learning model that can be applied in learning mathematics is Inquiry-Based Learning. Inquiry-Based Learning is well suited to helping students become active learners because it situates learning in real-world problems and makes students responsible for their learning. It has the dual emphasis of helping learners develop strategies and construct knowledge. Allowing students to interact with materials, models, manipulate variables, explore phenomena, and attempt to apply principle affords them with opportunities to notice patterns, discover underlying causalities, and learn in ways that are seemingly more robust. Learning by using Problem Based Learning (PBL) and Inquiry Based Learning (IBL) gives greater opportunities for students to develop students' mathematical representation ability.

PBL and IBL learning model is expected to improve the ability of students' mathematical representation is low, especially in the statistics. Statistics not only learn the ability to find the truth and the absolute final answer, but also to obtain a conceptual understanding and application of learning in life. But, between both of models are definitely one better model applied to the topic statistics and can improve the ability of students' mathematical representation higher than

the other models. Based on the general description above, then the researcher has interested to do research entitled “**The Difference of Students' Mathematical Representation Ability By Using Problem Based Learning And Inquiry Based Learning on The Topic of Statistics in Grade VIII SMP Negeri 1 TanjungMorawa A.Y2016/2017.**”

1.2 Problem Identification

Based on the explanation in the background, the problem identification:

- a. Students of in SMP Negeri 1 TanjungMorawa still have difficulties in solving mathematical representation tests, especially on the topic of statistics.
- b. Students are not actively involved in the learning process.
- c. Teacher in SMP Negeri 1 Tanjung Morawa never using a variety of learning models (PBL or IBL) on the topic of statistics so that are not visible differences better model used in topic of statistics because the learning is still teacher centered.
- d. The learning process in the classroom rarely train and develop the skills of communication and interaction among students.

1.3 Problem Limitation

The problem limitation in this research are as follows:

1. The author sofocus with The Difference Of Student's Mathematical Representation Ability Taught By Using Problem based learning With Inquiry based learning For Grade VIII in SMP Negeri 1 TanjungMorawa.
2. Learning in this Research topic is Statistics.

1.4 Problem Formulation

Based on the problem limitation and background above, the problem is formulated: Whether Student's Mathematical Representation Ability taught by using Problem Based learning is higher than Inquiry Based Learning for Grade VIII SMP Negeri 1 TanjungMorawa?

1.5 Research Purpose

The purpose of this research: to know whether student's Mathematical Representation Ability taught by using Problem Based Learning is higher than Inquiry Based Learning for grade VIII SMP Negeri 1 Tanjung Morawa.

1.6 Benefit of Research

The benefits of this research are:

1. For students: Helping students of SMP Negeri 1 Tanjung Morawa for increasing their conceptual understanding in mathematics.
2. For teachers and prospective teachers: This study could be a reference in planning learning of statistics subject.
3. For school: Expect to be a source of information or contribute ideas for improvement of mathematics teaching, especially in school where the researcher conducted and the school in general.
4. For researcher: The result of research can be used as reference in developing the appropriate learning approach in learning process.

1.7 Operational definitions

In order to avoid the differences of clarity meaning about important terms contained in this research, the operational definitions will be noted as following :

1. Mathematical representation ability is students' ability to express mathematical ideas (problem, statement, definition, and so on) into form: (1) Picture, diagram, graph, or table; (2) Mathematical notation, numerical/algebra symbol; (3) Written texts/words the interpretation of their mind.
2. Problem-based learning that begins with the real concept enables students to more easily understood better when working in groups as well as classical. Each student is required to undertake the completion of a variety

of practice questions that had been prepared in the work sheet. PBL models can facilitate the conceptual change on students because of cognitive conflict through the exposed concrete problems. The findings show that there is a change in the students' misconceptions in understanding mathematical representation. Problem Based Learning can facilitate students' conceptual change because this model gives students opportunity to synthesize the concept. Problem-based learning can facilitate changes of student misconceptions about multi mathematical representation for problem-based learning poses a challenge for students to develop a strategy to prove his hypothesis.

3. Inquiry-based learning (IBL) is a pedagogy which best enables students to experience the processes of knowledge creation and the key attributes are learning stimulated by inquiry, a student-centred approach, a move to self-directed learning, and an active.