Mathematical Understanding Ability of Students through *Contextual Teaching Learning* at the Merchant Marine School

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Abstract

The purpose of this study is to analyze the ability of students' mathematical understanding through Contextual Teaching Learning. The subjects consisted of each of the two students of the Aceh Merchant Marine School DPIII, namely the high, medium, and low categories selected based on the results of the initial tests which refer to indicators of mathematical understanding. The instruments used were tests of mathematical comprehension abilities and interview guidelines. The data obtained were analyzed qualitatively and described descriptively qualitatively. The results showed that subjects with high and moderate abilities had excellent mathematical comprehension skills, and subjects with low ability had good mathematical understanding skills. Based on the results of these studies it can be concluded that the ability of mathematical understanding and motivation of students get satisfactory results through the Contextual teaching and Learning approach.

Keywords: Contextual Teaching Learning; Mathematical Understanding.

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1. Introduction

One of the important mathematical abilities for students is the ability of mathematical understanding [13]. According to the 2015 *National Council of Teachers of Mathematics* (NCTM), mathematical understanding is very important because understanding concepts will facilitate students in learning mathematics. Every learning is emphasized in mastering the concept so that students have a good basic provision to achieve other basic abilities such as reasoning, communication, connection and problem solving. The 2013 curriculum also states that mathematical understanding is the most basic knowledge for learning advanced material. The fact show that the ability of students' mathematical understanding still has not achieved maximum results. The results of the Authors [9] state that students have not yet achieved completeness of value for mathematical understanding abilities. The Authors [5] also found that the ability to solve problems was still not optimal. The results of the researchers' observations that observed in the seafarer training students III (DPIII) at the Malahayati Aceh Besar Merchant Marine School (BP2IP) namely a lack of mathematical understanding. DPIII students are studying mathematics as an introduction to technical material which is further at the college level. One of the basic material taught is the comparison needed to lead to understanding the next technical material. The following problems are the material of proportion with indicators presenting the concept that "a vessel has two screens as shown. The height of a large and small screen has a ratio of 3: 2 and its area has a ratio of 4: 5, if the height of the large screen is 12 m and the area of the screen is 40 m^2. How many meters are needed to cover the entire screen?" Here is one answer to the indicator presenting concepts in various forms of mathematical representation and selecting certain procedures.
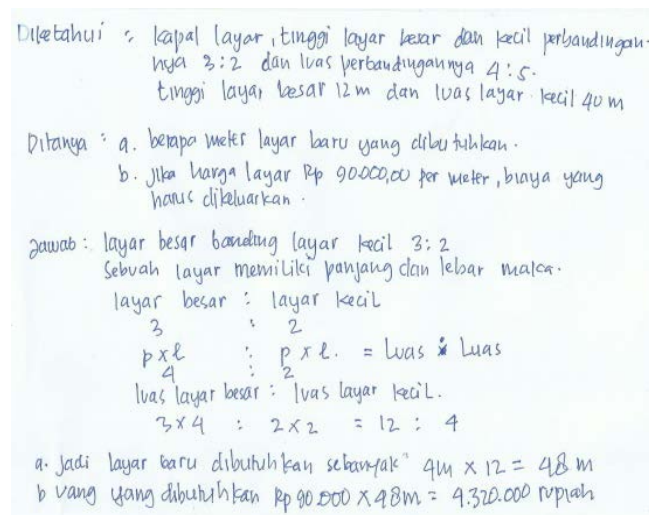

Figure 1: example of student answers to indicators presenting concepts

The answer in Figure 1 shows that students do not correctly classify objects, namely the ratio of height, screen

area, and comparison of screen area. students are not able to apply the concept or problem solving algorithms (if you know the height of the two screens, you will get the area of both screens). Students do not understand that the proportions made must be long, high and area, and broad. Students answer in general and do not pay attention that what they are doing is combining length and height comparisons and do not understand the calculation of costs that must be spent to replace the new screen. So it can be concluded that these students have not reached the indicators presenting concepts in various forms of mathematical representation and choosing certain procedures. Factors that affect the learning process are motivation [4]. Motivation needs to be both a motor and an encouragement that can trigger a sense of enthusiasm and also be able to change human or individual behavior to lead to better things for themselves [12]. This is in accordance with the results of Authors [2,6] stating that there is an influence between motivation and learning achievement Motivational indicators are the desire to succeed; there is encouragement and need for learning; the future hopes and aspirations; appreciation in learning; interesting activities in learning; the existence of a conducive learning environment [14]. Teachers need to recognize problems, both those relating to learning material, learning models, learning media, motivation and student abilities [4]. So based on these problems, teachers need to implement learning that provides opportunities for students to be directly involved during learning, actively interacting and communicating with fellow students and with teachers and using media during the learning process. One of the learning approaches applied is the contextual teaching and learning approach. The CTL approach is a learning approach that links the interrelationships between concepts and applies these concepts in everyday life. In accordance with the results of Authors [3,11] concluding CTL learning in improving students' mathematical understanding and motivation abilities. The connection between CTL and the ability of mathematical understanding, namely CTL emphasizes the process of engaging students to find material, so that it has to do with the ability to associate various concepts in mathematics or outside; CTL encourages students to be able to find the relationship of the material being studied with real life situations, so that they can develop necessary requirements and / or requirements enough for a concept; CTL encourages students to be able to apply material in real life, meaning in accordance with their ability to use using and choosing certain procedures. Based on this connection, contextual teaching learning can be applied to describe well mathematical understanding and motivation to learn mathematics, because it is in accordance with the conditions of the school and students of the Malahayati Merchant Marine School (BP2IP). Students at BP2IP majoring in technical department have different characteristics from other schools including those students majoring in technical have material that is directly applied to the practice of everyday life. Therefore research conducts research to describe mathematical understanding and student motivation. This research is important so that mathematics teachers can apply the CTL model to improve teaching strategies so that students' mathematical understanding of the concept increased. The mathematical understanding of students that has been achieved will be a provision for advanced material. Based on the importance of students' mathematical understanding, the limitation of this research is how the ability to understand mathematical students of BP2IP through CTL. The researchers conducted research with the aim of describing the ability of mathematical understanding and motivation to learn mathematics by using the approach of contextual teaching and learning in the shipping school.

2. Methodology

The subjects in this study were DPIII students of the Malahayati Merchant Marine School (BP2IP) in Aceh

Besar. DPIV students are merchant marine schools that learn mathematics as a basic material. Taking research subjects through purposive sampling technique (data sources through consideration). DPIII students study proportions material as one of the important material. The ability of students' mathematical understanding of fraction material still does not meet the indicators of mathematical understanding based on initial observations. The researcher then divides the students' mathematical understanding abilities based on high, medium, and low levels obtained from the score during initial observation.

The level is set based on the assessment rubric (attachment), which is a high level if it reaches a score of 4 (excellent), a moderate level if it reaches a score of 3 (very good), and a low score of at least 2 (good). Based on the observation test the ability of mathematical understanding is taken by six subjects for each level that represents the answer of the essence of other students. These six subjects were given tests of mathematical comprehension abilities and questionnaires after CTL learning ended to describe the motivation of each subject. Data collection using mathematical understanding tests is used to find out how students' mathematical understanding abilities and interview guidelines are used to clarify written answer data. The data analyzed were the ability of mathematical understanding and motivation to learn mathematics students of the Malahayati Merchant Marine School in Aceh Besar. Data is analyzed qualitatively, namely by describing or describing data that has been collected as it is.

Data analysis was carried out namely data reduction, data presentation, and conclusion drawing in accordance with the problems analyzed. The data obtained requires triangulation to test the validity of the data. Triangulation in this study is a time triangulation that is comparing information or data with different times. The time triangulation carried out in this study were: 1) giving written tests using mathematical comprehension test instruments-1, 2) conducting exposure to written test results-1 data, 3) conducting interviews based on the results of the written test-1 obtained by students, 4) provide written tests using mathematical comprehension test instruments-2, 5) make exposure to written test results data-2, 6) conduct interviews based on the results of the written test-2 obtained by students, 6) do a comparison of test results and exposure to the results of the first interview and second.

If the comparison of the results of the written test and the exposure to the interview are consistent, the research data is valid. If not, then write-3 tests and interviews with equivalent test sheets are conducted, this step is done until the same written test and interview results are obtained.

3. Results

Data on students' mathematical comprehension abilities are taken based on the results of written tests, then given a score and classified according to indicators of mathematical understanding. scoring rubric that is scale 4 (excellent) if completing the given question perfectly (from 75% to 100%), scale 3 (very good) if completing the given question is less than perfect (from 50% to 74%), scale 2 (good) if completing the given question is not perfect (from 25% to 49%), and scale 1 (not good) if solving the given problem is less than 24%. The following are the results of the ability data of six subjects who were given tests of students' 1 and -2 mathematical comprehension abilities.

Table 1: data on mathematical understanding ability of test-1 results through *contextual teaching learning*

Indicator	High Subject		Medium Subject		Low Subject	
	TR	SD	MD	RZ	RS	TG
Restate the concept	Very good	Excellent	Very good	Very good	Very good	good
Developing necessary conditions and / or sufficient requirements	Very good	Very good	Very good	Excellent	Very good	good
Presenting concepts in the form of mathematical representation	Excellent	Very good	Very good	Very good	good	good
Classify objects	Very good	Very good	Very good	Excellent	Very good	good
Use certain procedures	Very good	Excellent	Very good	Very good	Very good	Very good
Apply the concept	Very good	Excellent	Very good	Very good	good	Very good

Based on Table.1, the data on the ability of mathematical understanding of the subjects obtained were the same, namely the high subjects were with excellent mathematical understanding abilities, subjects were with excellent mathematical comprehension skills, and low subjects were with sufficient mathematical understanding skills.

Table 2: data on mathematical understanding ability of test-2 results through *contextual teaching learning*

Indicator	High Subject		Medium Subject		Low Subject	
	TR	SD	MD	RZ	RS	TG
Restate the concept	Very good	Excellent	Very good	Very good	Very good	good
Developing necessary conditions and / or sufficient requirements	Very good	Excellent	Very good	Excellent	Very good	good
Presenting concepts in the form of mathematical representation	Excellent	Very good	Very good	Very good	good	good
Classify objects	Very good	Very good	Very good	Excellent	Very good	good
Use certain procedures	Very good	Excellent	Very good	Very good	Very good	Very good
Apply the concept	Very good	Excellent	Very good	Very good	good	Very good

Based on Table.2, the data on the ability of mathematical understanding of the subjects obtained were the same, namely the high subjects were with excellent mathematical understanding abilities, subjects were with excellent mathematical comprehension skills, and low subjects were with sufficient mathematical understanding skills.

4. Discussion

Learning is a process of behavior change that arises from experience [8]. The method of learning used by the subject can influence the results achieved by the subject. This research is an effort to improve the subject's mathematical understanding. The effect of the approach is very evident in the subject of RS and TG. They include low category subjects. The results of the research conducted on them showed that students' mathematical understanding through CTL was able to fulfill the indicators well.

TR and SD subjects, the use of the CTL approach also adds to their understanding abilities, although not much. CTL is an approach that paves the way for high category subjects who basically have the ability. Understanding is a fundamental aspect of learning so the learning model must include the main points of understanding [1]. Understanding can be achieved with the learning approach used, so that a learning approach is needed that is in accordance with the conditions of the subject so that the subject has understanding.

Medium subjects, MD and RZ, the application of the Contextual Teaching and Learning Approach (CTL) allows them to be directly involved in learning activities, actively interacting and communicating with their peers and teachers. So the subjects use their mental processes to discover the concepts they are learning for themselves, thus the learning process is centered on them. The Authors [10] states learning using the CTL approach is a learning strategy that emphasizes the process of involvement of the subject to find material concepts that are studied and relate them to real life situations so as to encourage the subject to be able to apply them in life.

During the learning process, the subject is also familiar with the stages of the CTL Approach that have an influence on improving mathematical understanding skills, these stages are (1) The teacher and subject ask and the teacher gives stimulation to the subject by asking: try to mention another example in daily life about comparison, (2) constructivism, which is to build subject knowledge from existing knowledge, respect their opinions and provide the subject with the right so that they can be creative about the knowledge that has been and will be built. The teacher gives the opportunity to the subject to determine that the sample questions given include what kind of comparison, which has the same or different units, 3) the inciri, TR, SD, MD, TZ, RS, and TG subjects making discoveries in the learning process of finding the types of comparisons they learned. This is done to provide opportunities for subjects to find interesting things in learning so that they are more understanding and longer to remember, this activity is in the form of subjects seeking additional information in their groups to find solutions, (4) learning communities, namely learning that takes place can taken from the surrounding environment, the RS and TG subjects provide examples beyond the comparative concept of shipping. This shows that they have mathematical understanding. (5) modeling that is by discussing the subject can conclude the concept of comparative value that has been made with a group of friends, (6) authentic assessment, namely to provide a matter of fact to find a solution (providing research instruments related to

comparative values).

The use of the CTL approach also greatly helps the subject to facilitate the learning process, clarify learning material, and facilitate interaction during the learning process. The findings are also in accordance with constructivism theory. In constructivism theory believe that knowledge should not only be given to the subject, but be constructed by the subject through active involvement during the learning process.

Constructivism theory also emphasizes the importance of the teaching atmosphere, prior subject knowledge, and active interaction between subjects through the help of learning media. During the learning process with the application of the CTL approach the subject is required to discover the concepts that are being studied and the subject is fully given the opportunity to be actively involved during the learning process, in the sense that the subject is given the freedom to interact with the teacher and fellow subjects (the inquiry stage). The results of the study concluded that the ability of mathematical understanding obtained by the subject through the CTL was good.

5. Conclusions

Based on the results of the research and discussion that have been put forward, it can be concluded that the ability of students' mathematical understanding through the Contextual Teaching and Learning (CTL) approach is varied. Subjects with high mathematical understanding by first understanding the intent and problem questions, then making representations of the problem in the form of mathematical models, so that the subject chooses the right strategy to solve the problem. Subjects with mathematical understanding by understanding in advance by writing down the intent and problem questions, then reiterating in the form of drawings, sketches and mathematical models. After that, the subject reread the information in the question to determine the appropriate way to solve the problem. Whereas subjects with low have mathematical understanding by first understanding the intent and problem questions, then making representations of the problem inappropriately, so that subjects have difficulty solving problems.

6. Recommendations

Preferably the Contextual Teaching and Learning (CTL) approach is used for mathematics learning with the material highly related to everyday life. Teachers need to apply CTL in mathematics learning so that they can improve students' mathematical comprehension of mathematical material and increase student motivation in learning, therefore mathematics teachers are expected to be able to apply varied learning models in mathematics learning.

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