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# THE EFFECT OF CONTEXTUAL TEACHING AND LEARNING (CTL) AND CONVENTIONAL METHOD *ON* MATHEMATICS THINGKING ABILITY OF ISLAMIC SENIOR HIGH SCHOOL STUDENTS 1 *IN MEDAN*

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**ABSTRACT**

The aim of this study was to knowthe different of mathematics thingking ability students' who taugh by using Contextual Teaching and Learningwith Conventional Method on the Geometry material. This research used quasy experimental research. The population are students of class X at (Islamic Senior High School) MAN 1 Medan, consistof 8 classes, whereas the sampled were taken from 2 classes. Grade X Science -6 as Conventional method and Grade X Science -8 as CTL Method. The instrument used pre-tests and post- test to determine students' learning achievement. The results indicate that there are different of mathematics thingking ability. Students whowere taught by Contextual Teaching and Learning Model got higher thingking ability than that of Conventional Model on the Geometry material.

**Keywords**: Contextual Teaching and Learning (CTL) Model, Mathematics Thingking Ability.

## INTRODUCTION:

Mathematics, since human civilization began, plays a vital role in our daily lives. Various symbols, formulas, theorems, postulate, statutes, and the concept is used to assist calculations, measurements, writing, and so on. So do not be surprised if human civilization is changing rapidly because it is supported by the participation of mathematics that always follow the changes and the times.

In the process of learning mathematics is also a process of thought, because someone said to think if someone was doing mental activities, and people who learn mathematics have to do mental activities. In thinking, someone preparing the relationships between parts of the information that has been recorded in his thoughts as notions. From these notions formed the opinion that in the end it can be deduced. And it turns out a person's ability to think is affected by the level of intelligence. Thus the apparent link between intelligence to the process of learning mathematics.

In Indonesia, the paradigm of learning mathematics in schools is still dominated by the paradigm of conventional learning, ie where the student is positioned as an object, the student is considered not know or do not know anything, the student is considered as the empty glass to be filled with water to spill. While teachers to position itself as a person who has knowledge, as the only source of knowledge. Teacher lecturing, patronizing, and the supreme authority lies in teachers.

Based on observations / preliminary study that researchers do in MAN 1 Medan, many students stating that mathematics is difficult, too many formulas, problem-solving that sounds a bit complicated, abstract, and its application is also not visible in everyday life. Patterns of learning from teachers who more often monotonous or lectures and rarely bring props and invites students mengkontekskan matter of mathematics in everyday life, thus causing less active students in the classroom.

Researchers also observed the students' learning activities in class that many students have not been able to solve mathematical problems in everyday life in accordance with good mathematical reasoning. Less structured in presenting the results of the answers, do math according to the example given but have not been able to mamaknai what is in writing / working on, and there are still students who have not been able also to give a reason to draw conclusions from mathematical problems posed, particularly in the teaching materials Geometry ,

Issues of mathematical reasoning skills students facing by MAN 1 Students also occur in other schools in Indonesia. In fact, by learning mathematics students are expected to develop the ability to think, reason, communicate ideas, develop the activity of creative thinking, and problem solving. It shows that mathematics has benefits in developing the students' ability so it needs to be studied.

Mathematical reasoning skills is an humans thinking ability to connect the facts to a conclusion in the form of knowledge through a series of logical and systematic thinking process. This mathematical reasoning skills need to be developed to students that math is taught in schools becomes more meaningful and students can also construct knowledge based on their learning experience at school and in their daily activities.

Siswadi (2014:65) states that there is a relationship between the process of thinking with mathematics, ie when Mathematics serve as a tool to improve the ability of thinking that grew and developed through a process of reasoning and logical thinking. One material that is taught in Math is Geometry. Geometry occupies a special position in the curriculum of secondary school mathematics. From the psychological point of view, the geometry is an abstraction presentation of visual and spatial experience such as areas, patterns, measurement and mapping. Meanwhile, from the standpoint of mathematics, geometry presents approaches to solve problems, such as images, diagrams, coordinate system, vectors and transformation. Geometry is also a vehicle for studying the structure of Mathematics.

In the Regulation of the Minister of National Education in 2006, explained that the purpose of math instruction in schools is that the students have the following capabilities:

1. Understand the concepts of mathematics, describes the relationship between concepts and apply concepts or algorithms in a flexible, accurate, efficient and precise in troubleshooting.
2. Using the reasoning in the patterns and nature, perform mathematical manipulations and make generalizations, compile evidence, or explain mathematical ideas and statements.
3. Solve problems that include the ability to understand the problem, devised a mathematical model, solve the model and interpret the obtained solution.
4. Communicate ideas with symbols, tables, diagrams, or other media to clarify the situation or problem.
5. Have respect for the usefulness of mathematics in life, which has curiosity, concern and interest in studying mathematics, as well as a tenacious attitude and confidence in solving problems.

Learning will be more meaningful and interesting for the students if the teacher can present problems of contextual and realistic, that the problems are already known to be close to the daily lives of students. Contextual issues can be used as the starting point of learning mathematics in helping students develop their reasoning ability to learn mathematical concepts and can also be used as a source of mathematical applications. (Jauhari; 2011:42).

The purpose of this study are as follows: 1) To determine whether there are differences in mathematical reasoning skills students are taught using models Contextual Teaching and Learning with conventional models in teaching Geometry materials. 2) To find out how the process of solving problems using model Contextual Teaching and Learning with conventional models in teaching Geometry materials class.

## LITERATURE STUDY:

### The Nature of Ability:

The ability comes from the word that means being able to afford to do something. Accordingto Indonesian Dictionary, the meaning ability are: (1) proficiency; (2) strength: working with yourself.

The definition above shows that, that ability is a condition of a person who can do something with himself. Being able to empower all idea, feeling, and intention to make an invention (discovery) and the works that are useful for life. (Jhon B. Carroll :1993:3)

### The Nature of Reasoning:

Reasoning comes from the word that have meaning consideration of the good and bad, the power of thought or activity that allows a person to think logically. While the reasoning is a way of using reason or mental process in developing the minds of some fact or principle. (Sumantri; 2006:54)

According to Indonesian Dictionary, Reasoning is the way (about) using reason; (1) the thought or logical way of thinking (2) it develops or control something by reason and not by feelings or thoughts; (3) the mental process in developing the minds of some fact or principle.

### Mathematical Reasoning:

Math and reasoning process are two things that can not be separated. Math can be understood through reasoning, and reasoning can be trained through learning mathematics. Mathematical reasoning can also be identified with a logical mathematical intelligence which is part of one of the multiple intelligences (multiple intelligence), as this is part of a person's ability to process mathematical and scientific terms. In the learning process is concentrated on two kinds of reasoning, inductive and deductive reasoning. (Syafitri; 2013:34)

### Inductive Reasoning:

Inductive reasoning is an activity think to draw a conclusion or making a new statement of a general nature (general) based on some well known special statement. Learning begins with examples or cases and toward a concept. (Masykur; 2009:25).

### Deductive Reasoning:

Deductive Reasoning is a thinking activity that is obtained as a logical result of the truth earlier. Deductive verification process will involve theory and other mathematical formulas which have previously been substantiated. This reasoning can be called reasoning from the general to the particular.

### Students' Mathematical Reasoning Ability:

Mathematical reasoning skills is an ability to humans thinking to connect the facts to a conclusion in the form of knowledge through a series of logical and systematic thinking process.

In mathematical reasoning, students provide coverage of activity in mathematical reasoning as follows:

1. Presenting mathematical statements, either orally, in writing, drawings, and diagrams.
2. Asking the alleged (conjectures).
3. Perform mathematical manipulations.
4. Drawing conclusions, compile evidence, reasoning or evidence against some solutions.
5. Draw conclusions from a few statements.
6. Check reliability an argument.

In other words, reason is what distinguishes humans from other animals and creatures of God. Because his/her mind is the man responsible for his actions (Aaron, 1986).

Therefore it takes a conscious and strong willingness of each of these individuals to play an active role in education to foster human resource potential that can have the ability to think logically, analytical, systematic, critical, and creative, all of which involve a process of reasoning and the ability to cooperate in accordance with the content standards for primary and secondary education units math.

**Contextual teaching and learning:**

Johnson, (2002:179-180) said that the Contextual learning is a system that stimulates the brain to compose patterns that embody meaning. Contextual learning is a learning system that matches the brain that produce meaning by linking academic content to the context of students' everyday lives. Meanwhile, Howey R, Keneth define CTL as follows: "Contextual teaching is teaching that enables learning in the which student employ Reviews their academic understanding and abilities in a variety of in-and out of school contex to solve simulated or real world problems, both alone and with another. "

In Contextual Teaching and Learning (CTL) required an approach that is more empowering students with the expectations of students are able to construct knowledge in their minds, instead of memorizing facts. In addition, students learn through experience instead of memorizing, remembering knowledge is not a set of facts and concepts are readily accepted, but something has to be constructed by the students. (Zahorik in Nurhadi; 2002: 35).

**The principles in Learning CTL:**

Contextual Teaching and Learning (CTL) as an approach to learning has seven principles. These principles underlie the implementation of the learning process by using CTL approach. Often, these principles are also referred to as a component in CTL. Seventh components are: (1) understand the problems associated with the components of constructivism and questioning, (2) associated with the planned completion of the inquiry, (3) resolve problems related to the inquiry and learnig community, (4) to re-examine associated with reflection.

**Conventional Model:**

Approach as the norm or that rely on methods that are commonly used in the learning activities in the classroom called conventional learning approaches.

The conventional approach is a learning process that known as teacher centered or more teachers dominate in learning activities. The learning method is done in the form of a lecture, assignments, and frequently asked questions. The conventional approach is an approach to learning that is widely carried out in Indonesian schools today, which uses a sequence of activities giving a description, examples, and exercises.Conventional method has the following characteristics: 1). Teaching centered on teaching materials, 2). Teaching centered on teachers, 3). Lecture method, 4). Occurs passive learning, 5). There are no groups of cooperative. (Sanjaya; 2006:25).

## RESEARCH METHODOLOGY:

This research used *quasy experiment* approach. Population was all Islamic Senior High School students (MAN 1) Medan. Sample was taken randomly from two classes of Grade X consisted 40 students each class. Control class was taught by conventional method while experimental class was taught by Contextual Teaching and Learning model. Instrument that was used is essay test arranged based on students' mathematical reasoning skills indicators. The data were collected by pretest and posttest then analyzed by t test.

## RESEARCH RESULT AND DISCUSSION:

Before the treatment is given, students must first be given a pre-test to determine the ability of the students as many as 7 initial questions. Assessment is done by using a scale of 35 and the score of each question is 5. Both control group and experiment group at the last meeting were given a post-test to determine student learning outcomes with the same question as pre-test. The results of pre-test and post-test of these groups can be seen as follow.

**Tabel 1: Results of pre-test and post-test at control class**

| No. | Statistics | Pre test | Post test |
|---|---|---|---|
| 1. | N | 40 | 40 |
| 2. | Items | 7 | 7 |
| 3. | Sum | 1734 | 3737 |
| 4. | Mean | 39.416 | 84.935 |
| 5. | Standard Deviations | 5.321 | 5.278 |
| 6. | Variance | 28.317 | 27.855 |
| 7. | Maximum | 51 | 97 |
| 8. | Minimum | 31 | 77 |

**Tabel 2: Results of pre-test and post-test at experiment class**

| No. | Statistics | Pre test | Post-test |
|---|---|---|---|
| 1. | N | 40 | 40 |
| 2. | Items | 7 | 7 |
| 3. | Sum | 1631 | 3386 |
| 4. | Mean | 43.985 | 89.098 |
| 5. | Standard Deviation | 6.108 | 6.010 |
| 6. | Variance | 37.304 | 36.119 |
| 7. | Maximum | 54 | 100 |
| 8. | Minimum | 34 | 77 |

Table one tell us about the distribution of the data from pre-test and post-test at control group. The number of students is 44. This table shows that mean is 39.416 for pre-test and 84.935 for post-test. Standard deviation is 5.321 for pre-test and 5.278 for post-test while variance is 28.317 for pre-test and 27.855 for post-test. The minimum score is 31 for pre-test and 77 for post-test while the maximum score is 51 for pre-test and 97 for post-test.

Table two tell us about the distribution of the data from pre-test and post-test at experiment group. The number of students is 38. This table shows that mean is 43.985 for pre-test and 89.098 for post-test. Standard deviation is 6.108 for pre-test and 6.010 for post-test while variance is 37.304 for pre-test and 36.119 for post-test. The minimum score is 34 for pre-test and 77 for post-test while the maximum score is 54 for pre-test and 100 for post-test. All these data were checked for normality and homogeneity.

To know the level of reasoning math ability of students can be seen from Table 3.

**Table 3: Calculation Result of Post-test Average Score Students' Mathematical Reasoning Ability**

| No. | Indicators | Average Scores ( $\bar{x}$ ) Post-test | |
|---|---|---|---|
| | | Control Class (Convensional) | Experimental Class ( CTL ) |
| 1. | Ability to present mathematical statement | 4.84 | 4.79 |
| 2. | Ability to propose asupmtion | 4.68 | 4.71 |
| 3. | Ability to prapare facts, giving reasoning for the conclusion | 4.61 | 4.50 |
| 4. | Finding Pattern, manner for making generalisation | 4.41 | 4.58 |
| 5. | Ability to manipulate Math | 4,23 | 4.37 |
| 6. | Ability to check reliability an Argument | 3,75 | 4.32 |
| 7. | Ability to take conclusion from statement | 3.20 | 3.89 |
| | **Total Aspects** | **29.73** | **31.16** |

Based on the table above, the post-test scores of each indicator appears the difference, ie all aspects of the control class 29.73, while the overall aspects of the experimental class 31.16. This shows that there are significant differences of mathematical reasoning abilities of students in each class after being treated Geometry learning in teaching materials. These data can be seen as figure below

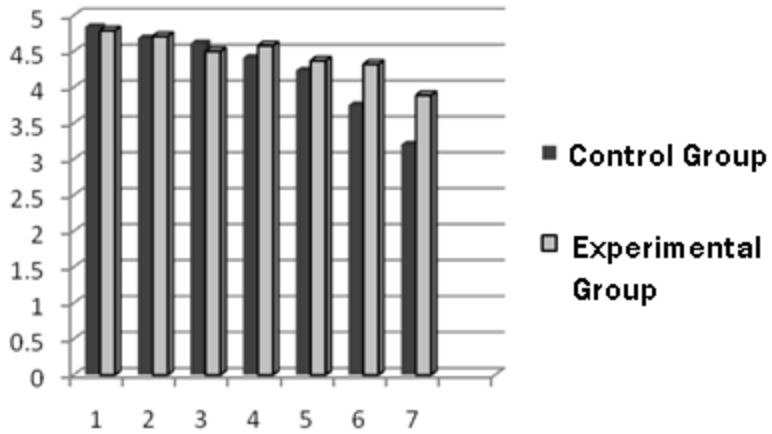


**Figure 1. Comparison between Control Group and Experimental Group**

The result showed that the level of mathematical reasoning abilities of students in the classroom teaching materials on Geometry. The scores at experiment class are higher than those of control class. It can be seen from the table that the higher the level of the indicator on students' mathematical reasoning, the higher the level of student ability in the process of reasoning in learning. And of course it is directly proportional to the level of difficulty of a given problem in post-test Geometry teaching materials in MAN 1 Medan.

Students' Mathematical Reasoning ability who got learning geometry model-based CTL is at a high level visualization, some of the students at the level of analysis visualization medium level, and the rest are in informal deductive level. It shows that the learning-based CTL involving different stages of learning that starts from Constructivism, inquiry, questioning, modeling, reflection, authentic assessment, Learning Community, guiding students construct knowledge in their minds, not memorizing theory and fact.

Besides, there are also situations that motivate students more actively understand the concepts being studied and can be expressed understanding of concepts orally and in writing using relevant vocabulary appropriate to the level of thinking. This certainly can help improve the level of thinking of students from one level to the next level. In line with that expressed by Elaine B. Johnson who said that the Contextual learning is a system that stimulates the brain to compose patterns that embody meaning, and this learning system is able to produce meaning by linking academic content to the context of students' everyday lives. While the level of mathematical reasoning ability of students who received conventional learning at the level of medium-level visualization, and even some students are still at the level of low-level visualization.

The result showed that the level of mathematical reasoning abilities of students in the classroom teaching Geometry materials on experiments class is higher than that of the control class. It can be seen from the table that the higher the level of the indicator on students' mathematical reasoning, the higher the level of student ability in the process of reasoning in learning. And of course it is directly proportional to the level of difficulty of a given problem in post test teaching materials Geometry in MAN 1 Medan.

Based on the students' answer sheet post-test measuremen, the level of students 'mathematical reasoning abilities that contains seven indicators, then we can see the diversity of students' answers to the following process:

**Item No.1:**

Problem No. 1 is about the easy level, which is calculate indicators-1 on the ability of presenting mathematical statement with the average post-test score of students taught by conventional learning model is 4.84, while students taught by CTL learning model is 4, 79.

Answer Process that discusses these indicators got a maximum score in the control class there are 37 students (84%), while the experimental class there are 31 students (81%). Students who score 4 in the control class there are 7 students (16%), while the experimental class there are 7 students (19%).

**Item No. 2:**

Problem No. 2 is about the easy level, which measures the ability level indicators "put forward allegations" with the average post-test score of students taught by conventional learning model is 4.68, while students who are taught by CTL learning model is 4.71.

Answer process that discussed these indicators got a maximum score of 5 in the control class there are 30 students (68%), while the experimental class there are 27 students (72%). Students who score 4 in the control class there are 14 students (32%), while the experimental class there are 11 students (28%). Here is presented an example of the process of the answer to question no. 2.

**Item No. 3:**

Problem No. 3 is about medium-level, which measures the ability level indicators "compiled evidence to a conclusion" to the average post-test score of students taught by conventional learning model is 4.61, while students who are taught by CTL learning model is 4 , 50.

Answer process that discussed the indicator that gets the maximum score of 5 in the control class there are 27 students (62%), while the experimental class there are 19 students (50%). Students who score 4 in the control class there are 17 students (38%), while the experimental class there are 19 students (50%).

**Item No. 4:**

Problem no.4 a matter of medium level, which measures indicators "Finding the level or nature of the symptom pattern mathematical generalization" with the average post-test score of students taught by conventional learning model is 4.41, while students who are taught by CTL learning model is 4.58.

Answer Process that talked about these indicators, which got the maximum score of 5 in the control class there are 20 students (45%), while the experimental class there are 22 students (58%). Students who score 4 in the control class there are 22 students (50%), while the experimental class there are 16 students (42%), and students who got score 3 in the control group there are 2 students (5%), while in the experimental class there is no score 3.

**Item no. 5:**
Problem No. 5, a matter of medium level indicators that measure the level of ability of "manipulating mathematics", with an average value of post-test students who are taught by the conventional learning model is 4.23, while students who are taught by CTL learning model is 4.37.
Answer process that discussed the indicator that gets the maximum score of 5 in the control class there are 12 students (27%), while the experimental class there are 17 students (45%). Students who score 4 in the control class there are 30 students (68%), while the experimental class there are 18 students (47%), and students who score 3 in the control group there were 2 students (5%), while the experimental class there are 3 students (8%).
**Item no. 6:**
Problem no.6 is a matter of difficult level, which measures the level indicator The ability of the "check the validity of an argument" with the average post-test score of students taught by conventional learning model is 3.75, while students who are taught by CTL learning model is 4, 32.
Answer Process that discussed the indicator that got the maximum score of 5 in the control class there are two students (5%), while the experimental class there are 15 students (39%). Students who score 4 in the control class there are 29 students (66%), while the experimental class there are 20 students (53%), and students who score 3 in the control class there are 13 students (30%), while the experimental class there are 3 students (8%).
**Item no. 7:**
Problem No. 7 is a difficult level, which measures the ability level indicators "draw conclusions from the statement" with the average post-test score of students taught by conventional learning model is 3.20, while students who are taught by CTL learning model is 3, 89.
Answer Process discussed the indicator that got the maximum score of 5 in the control class there are two students (5%), while the experimental class there are 7 students (19%). Students who score 4 in the control class there are 11 students (25%), while the experimental class there are 20 students (53%), students who received a score of 3 in the control class there are 25 students (57%), while the experimental class No 11 students (28%) and students who score 2 in the control class there are 6 students (13%).
The above results are relevant to the research that has been conducted by three researchers formerly listed on the relevant research section. Thus, this study has shown the same results that there are differences in mathematical reasoning ability of students taught by conventional models and CTL model.

## CONCLUSION:

Based on the analysis above, the researchers obtained the following conclusions:
1. The ability of mathematical reasoning class X MAN 1 Medan taught by CTL learning model in teaching Geometry materials obtained an average of 89.098, with 36.119 variance and standard deviation of 6.010 with the lowest value is 70 and the highest value is 100 by the number of essai tests are 7 items.
2. Ability of mathematical reasoning class X MAN 1 Medan taught by learning model on Conventional teaching Geometry materials gained an average of 84.935, with 27.855 variance and standard deviation of 5.278 with the lowest score is 77 and the highest score is 100 with the number of essai test are 7 items.
3. 3. There is a difference between mathematical reasoning skills students taught by CTL and conventional learning model in teaching materials Geometry. This is evidenced by the test results, where the $t_{observation}$ = 3.346 > t table = 1.990 at a significance level of 5%.
4. The answers process of students who get CTL learning model are more varied than those of Conventional method.

## SUGGESTION:

Based on the research results obtained, the researchers want to provide suggestions as follows:
a. The Principals of MAN 1 Medan, has to guide and motivate teachers to use appropriate learning models in the learning process.
b. Mathematics teachers, have to choose the most appropriate instructional strategies with subject matter being taught, so that it can support the learning process more active, effective and efficient.
c. Students should expand the collection of questions from the simplest to the most complex and varied. Look carefully at the lecture when the teacher is teaching. Determine how to learn the good and efficient, and the students should be able to play an active role in learning activities so that the learning process can run from two directions.

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