Enhancing Students' Critical Thinking Skills Through Eliciting Model In Euclidean Geometry

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Abstract : This study aims to improve mathematics-education students' critical thinking skills at Medan State University through eliciting learning activities in Euclidean Geometry. This study is a classroom-action research which consists of four stages, such as planning, implementation, observation and reflection. The subject of this study is the third-semester students of mathematics education program. This study was conducted within two cycles in which four meetings were embedded in each cycle. The first cycle indicates that the students' critical thinking was still low (about 48,9%). However, there was an improvement of the students' critical thinking ability around 18,8% in the second cycle. This means that the result of this study shows that the implementation of eliciting learning activities can improve the students' critical thinking skills.

Keywords: Students' critical thinking, Eliciting Activities Model, Euclidean Geometry

1. INTRODUCTION

Thinking is a mental activity to help someone solve problems, to make decisions and to justify curiosity. Thinking skills consist of two main components, namely lower-order thinking and higher-order thinking skills. Lower-order thinking skills only apply limited ability for mechanistic routine activities, such as memorizing and repeating the previous information. Meanwhile, the higher-order thinking skills make the students able to interpret, to analyze or even to manipulate the previous information. Higher order thinking is used when someone acquires and keeps new information and latterly use or rearrange them for solving problems based on real situations. Thinking is a dynamic process through three stages, such as (a) understanding through the formation process of describing the same characteristics, abstracts and set aside, discard and considers essential characteristics, (b) the opinion establishment where it is formulated verbally in the form of acceptance, rejection, and agreement, assumptive opinion, that reveal the possibilities of a nature and, (c) establishment of a decision or conclusion as a result of the work sense (Sagala, 2003). Krulik and Rudnick (1999) suggested that thinking skills consist of four levels, namely: recall thinking, basic thinking, critical thinking and creative thinking.

Hamilton et al (2008) declared that the model-eliciting Activities (MEAs) is a learning model that is based on students' real life situations, requires students to work in small groups to solve problems and presents a mathematical model as the final solution. Meanwhile, according to Permana (2000), MEAs is a model of learning to understand, to explain and to communicate the concepts contained to grain problems through modeling process starts from the presentation of the mathematics learning. Problem activities were designed to produce learning activity which is resulted in a solution that can be used in solving problems. The expectation is to use this model of MEAs students are able to produce mathematical models in order to solve the problem and can be used for similar problems. Thinking skills must be developed one through learning activities

2. THEORETICAL FRAMEWORK

2.1. Critical thinking

According to Moore and Parker (1988), critical thinking is important, because someone is lacking careful determination and deliberating whether to accept, to reject or to postpone a decision on a statement. While Ennis (1996) stated that critical thinking is a process that aims to make decisions that make sense about what people believe or what to do. In the daily life, critical thinking skills is important, it affects the decision making of the statement that one faces. When one considers a statement that he already has certain information that is relevant to the assertions in general and describes where to get more information if needed.

According to Bonnie and Potts (2003), it can be briefly concluded that some of the "hallmark" of learning critical thinking include: (1) improving the interaction among students, (2) asking open-ended, (3) providing adequate time for students to give reflection on questions or problems that are given, and (4) teaching for transfer (Teaching to be able to use newly acquired skills to other situations and against their own experience that the students have).

Indicators in critical thinking by Wade (in gestalt, 2009) identified eight characteristics of critical thinking, which includes:

1. Activities to formulate problems
2. Problem limitations
3. Testing data
4. Analyzing various opinions and biases
5. Avoiding high emotional considerations

6. Considering various interpretations, and
7. Ambiguity

Someone who has the critical thinking skills can be identified from the behavior. Angelo (cited in Arif, 2007) Identify four systematic behaviors in critical thinking. The four behaviors can be explained as follows:

a. Analyzing skills

Analyze skills outline a structure into its component parts in order to determine the structure of the organization. In the skills to understand the ultimate goal was a global concept by breaking or detailing the generality into the smaller and detailed sections.

b. Synthesizing skills

Synthesizing skills oppose to analyzing skills. Synthesizing skills are skills combine the parts into a new form or structure, synthesis statement demanding readers to combine all the information obtained from reading material to create new ideas that are not stated explicitly in the reading.

c. Identification and problem solving skills

These skills are the skills applicative concept to some new understanding. This skill requires the reader to understand the reading with critical so that after the reading is completed able to capture some basic mind reading, Destinations these skills so that readers are able to understand and apply the concepts into problems or new scope.

d. Summing skills

Skills conclude is the activity of the human mind by understanding / knowledge (truth) has, Based on these opinions can be understood that these skills requires the reader to be able to describe and understand the various aspects gradually in order to come to a new formula that is a conclusion.

2.2. Model Eliciting Activities

Models There are six principles of learning in instructional model MEAs that was pointed out by Dux et al. (2006), namely:

1. Reality

The principle which is so called meaningfulness. This principle says that the problems presented should be realistic and take place in everyday life of students. The next goal is to increase the interest of the students which is simulated in practical actions.

2. Model construction

This principle requires that the students created a mathematical model. The main characteristics of the MEAs is proposing design activities that stimulate creativity and higher level thinking

3. Self-Assesment

On this principle students are expected to test the feasibility of yhang tailored solutions to problems without the help of a teacher. Students are given the opportunity to prove the answer.

4. Documentation construction

Students must be able to document their thought process so as to find solutions to existing problems.

5. Effective Prototype

Students must be able to prove that the models they offer solutions to problems can be easily understood by others. This point serves to prove that creativity that students produce in designing a mathematical model can be generalized.

6. Construction of Shareability and Reusability

The resulting model should be generalized to similar problems. Students are said to be able to find a mathematical model that is appropriate if the model can be used for similar problems.

The learning activities were designed in this study based on the following considerations, such as:

1. The lecturer gives the course introduction
2. Lecturer classify students consisting of four students in each group
3. Lecturers give the student activity sheet in accordance with MEAs and student assignment sheet
4. Students read the problem and lecturers to make sure that each group understands what is being asked.
5. Students trying to solve the problems.
6. Students presented the mathematical model they found after the discussion and review of solutions in each group.

3. METHODOLOGY

3.1. Research Methodology

This research is a class act that is given to students of mathematics education is the third semester of the school year 2015-2016. The participants of this study were the students who received course materials Euclidean geometry. This study uses two cycles, in each cycle carried out repairs at the time of reflection. The basic concepts of action research consist of four components, namely the action planning, action and observation, and reflection. The fourth principal relationship is regarded as one cycle. (Kemmis and Mctaggat). This research will be carried out in three cycles. More specifically, the following cycle in action research described by Kurt Lewin.

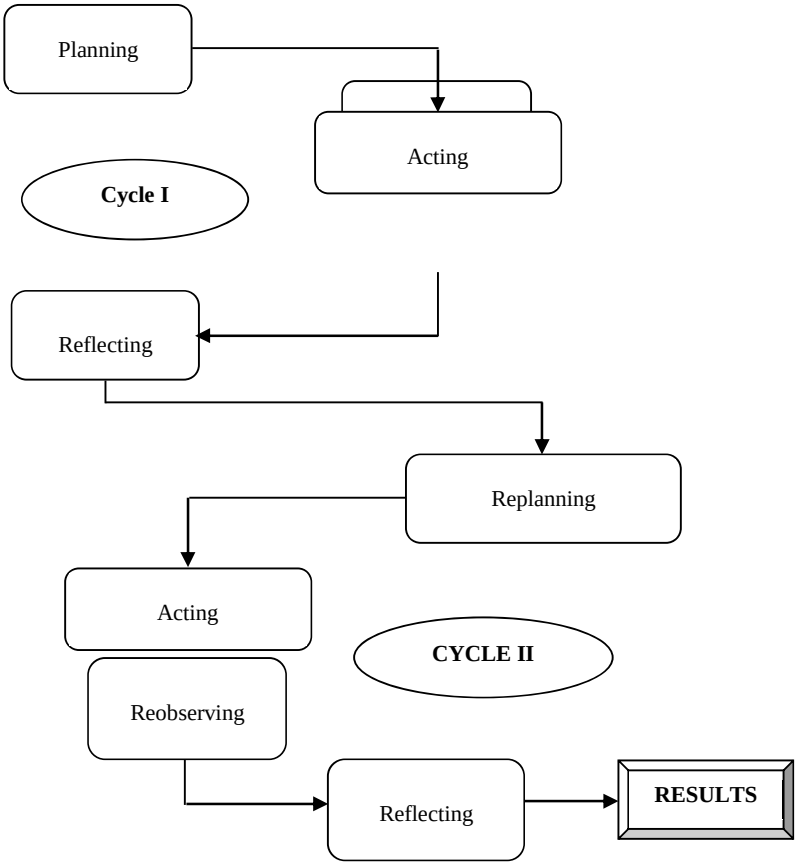

Figure 1: Diagram of Research Planning

The independent variables in this study are learning to model-eliciting Activities (MEAs), while the dependent variable is the ability to think critically mathematical and uncontrolled variables are early mathematical ability of students in groups (high, medium, and low). The instrument used to obtain the data in this study is to test the ability of critical thinking mathematically in the first cycle and the second cycle

4 Results

After doing research, 14 times for learning meetings and two meetings to conduct tests to measure student learning ability in every cycle, we obtained the following data seen in the table below.

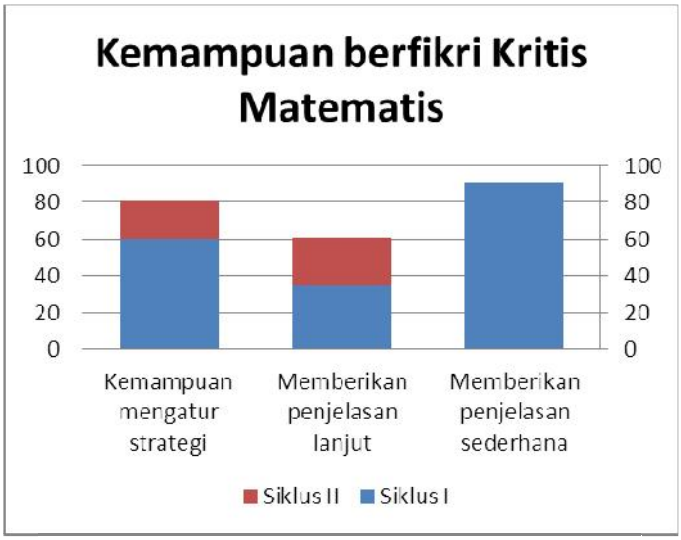

Figure 2: Diagram of Critical Thinking Skills

Figure 2 shows that the ability of critical thinking mathematical students from each cycle continues to be increased. In the first cycle, only 60% of the students have the ability to manage the strategy in solving the problems given the time to do a test after the lesson. After reflection on the learning that has taken place then the learning is done in the second cycle, from here seen an increase learning achievement in the form of a percentage increase in the ability to manage strategy in solving the problem as much as 20% from 60% to 80%. For the ability to provide further explanation in the first cycle is only about 40% of the students can do it according to the indicator. But on the second cycle, the learning outcomes increased about 15%, for an increase to 60%. For the ability to give a simple explanation there is no learning outcome, I cycle about 90% as well as in the second cycle.

At each cycle to do a reflection about the learning is done by looking at the record of learning, observation sheets faculty and student observation sheet and do observation to students by providing questions to describe what learning difficulties that students mostly encounter. Our finding is to give a simple explanation ability students tend to be more skilled because these results are used to doing in teaching students for which they did. Students feel for issues that do not require open-ended answer is not difficult, because it is only following the rules that are valid for this.

5 CONCLUSION

The conclusion from the results of this research is an increase of mathematics critical thinking skills of students who take courses Euclidean geometry. The increase occurred in two areas, namely the ability to manage strategies in problem solving and the ability to provide further explanation. The second ability is seen to rise at the time of the second cycle.

It is suggested for further research to examine the course with other aspects of critical thinking skills.

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