Integration of Reciprocal Teaching-ICT Model To Improve Students' Mathematics Critical Thinking Ability

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Abstract : This research examines the effectiveness on how mathematics teachers have begun to integrate information and communication technology (ICT) with reciprocal teaching model to improve students' mathematics critical thinking ability into seventh junior high school classroom practice. This study was experimental research with a quasi-experimental design. The samples of the study are 36 students for classroom experiments and 36 students for classroom control. The instruments employed in this study were pre-test and post-test. All the instruments are made in essays forms. The data were analyzed by using descriptive statistics. Based on the research findings, it was gotten that (1) the development of teaching instructional multimedia of the seven grade students of junior high school; (2) the improvement of students' mathematics critical thinking ability in experimental class; (3) the aspect of attractiveness shows that the developed instructional multimedia was very interesting; and (4) reciprocal learning has good impact on students' mathematics critical thinking ability.

Keywords: Reciprocal Teaching, mathematics critical thinking ability, ICT.

1. Introduction

Mathematics learning in junior high school especially in suburb Jakarta is still using conventional method. In teaching practice, the teacher only rely on the classical lecture method which most of the students are usually sitting and listening to the lecture. Moreover, the learning resources are limited to the text book and media are rarely used for improving learning quality. According to Syaiful Rohim (2014) that learning methods like this does not fulfill the principles of effective learning and empowering the student's potential. Based on the statements above, mathematics learning in junior high school needs both of the resources and learning practices to be changed in order to integrate ICT to improve the quality of learning.

Education has three objectives, namely cognitive, affective and psychomotor. Cognitive domain is the most important student psychological realm which is simultaneously controlling the source of affective and psychomotor. Jean Piaget underlying on the set of cognitive strategies called metacognitive theory that the skills possessed by students in organizing and controlling the thinking process. Metacognitive includes four types of skills, one of which is of critical thinking skills, individual skill in using his thinking process to analyze the argument and give an interpretation based on the perception that the correct and rational, analytical assumptions and bias argument, and logical interpretation (Sutikno, 2013). With critical thinking will produce right thinking, structured and intelligent in analyzing a problem.

Critical thinking is an important thing to be developed. There are several considerations to develop critical thinking, critical thinking is a mode of thinking about things, substance or matter whatever, where the thinker improve the quality of his thinking by skillfully handling structures inherent in thinking and implementing the standards on intellectual him. Carson (2007) said that the dichotomy implies that thinking and knowledge are mutually exclusive, when in fact critical thinking and problem solving require a great deal of specific content knowledge. Critical thinking is the way how a person uses his brain to think logically, structured and thorough in solving a problem.

Using fun with teaching ca assist students learn effectively in various models of learning. Learning with fun learning model that will encourage students to be more enthusiasm in learning, and teachers also will be easier to teach. Therefore every learning model will be a comparison of the

results achieved by the students to measure how big the influence of the learning model used by teachers in teaching. Mathematics is one of the subjects that are considered difficult by most students, but it depends on how teachers can invite students to love math and make the math was easy for them that is by using learning models that are tailored to the material. Learning as a set of measures designed to support the learning process of students, taking into account the internal events that took place in the self-learners. Every source of learning in this world will produce useful knowledge for all those who study it (Sutikno, 2013).

2. Literature

2.1 Students' Mathematics Critical Thinking Ability

Critical thinking is the ability to think in an organized manner reasoning and evaluate the quality of a reason systematically and make decision confidently. Think critically consider and evaluate the information that ultimately enable students to make decisions actively. Critical thinking can be said to be a form of mental activity or human mind activity.

Critical thinking is an important thing to be developed in education in modern times. There are several considerations to develop critical thinking. This is because someone who develop a critical thinking is going to make it ready to face any circumstances to achieve the ideas of right and correct decision.

Krulick and Rudnick (1987) suggest that including critical thinking in mathematics test is thinking, questioning, connecting, and evaluating every aspect of a situation or a mathematical problem. That which include critical thinking in mathematics is thought that test, questioning, connect, and evaluate all aspects that exist in any situation in a problem (Fachrurazi, 2011). Critical thinking mathematical indicators used in this study are as follows:

a. Thinking Test (test) that provides precise results and in accordance with the procedures, find ideas in solving problems.
b. Questioning is finding the root of the problem appropriately, explaining a problem by presenting arguments there.
c. Connecting is that explain the differences / similarities of a problem, linking two objects that have some of the same properties.
d. Evaluation is considering the results and determine the value of the conclusions of the solution to the problems that have been obtained.

2.2 Reciprocal Teaching Model with ICT

Reciprocal Teaching was first described by Palincsar in her dissertation thesis in 1982 (Palincsar and Brown, 1984). The main purposes of Reciprocal Teaching is designed to improve reading comprehension. This teaching practice will be achieved by encouraging a group of students to work together to construct meaning and build understanding from a range of texts. Reciprocal teaching learning model is a model of learning that familiarize students using four independent comprehension. Reciprocal teaching is an activity where students talk with their teachers about the substance and meaning of texts they just read. Students are put in a position where they have to stay focused on what they read, so they are able to explain it to the class by using four strategies (they are listed below). While the teacher begins leading these discussions to show how it is done, they slowly reduce involvement so that students take the lead. They are then not only responsibility for reading the text but also for learning and teaching it.

As mentioned above, there are four main strategies used by students in reciprocal teaching: summarizing, questioning, clarifying and predicting. Students are instructed to go through each action after they read a segment of text. Below is a detailed look at each strategy. The reciprocal teaching strategy described by Palincsar and Brown, (1984), as follows :

a. Summarizing the essence and meaning of students and identifying the main idea of what they read;
b. Inquire means students ask themselves to make questions to ensure they understand their readings, thereby monitoring their understanding so that they are ready to start reading the material;
c. Clarify means students take steps to clarify parts of the text are confusing; and,

d. Predicting means that students anticipate what they might read next based on cues in the text and the ideas that have been presented.

3. Research Method

The research method used is a quasi-experimental design. In the quasi-experimental, the researchers are not allowed to take the subject randomly, however the researchers will be permitted to use the existing subjects who have been formed in the previous class. The main reasons that random group of individuals are not allowed is that it would disturb the Teaching and Learning Activities in schools. This research was conducted in two classes which has the same characteristics. The first class are called experimental class which is given special treatment, using the model of reciprocal learning and teaching – ICT model, while second class are called the control class which is taught by using conventional learning. Population in this study are all students of class VII which is approximately about 216 students of Junior High School 150 Jakarta in the second semester of academic year 2014/2015.

In control class teachers start the lesson by explaining the material of math and the problem of math which is related with their daily life, and the students act as a listener. In this class we called it as teacher oriented because the teaching and learning presented only by the teacher.

In experiment class we devided the class into small groups and the students are given question sheet by the teachers. The students have to read the text carefully and try to understand the text. And to help the students more understand about the problems which are given in the sheet, the teacher explain it by using attractive power point. After that the students make a summarize based on the problems which are given by the teachers. Then the students ask questions to the other group, facilitate by the teacher. Next teacher gives students' work sheet to the groups and they have to present the answers by using power point. The groups who present the power point in front of the class give a chance to the other group to ask questions and develop the problem based on the presentation. To answer the questions students have to examine the questions first and answer the questions by using the mathematical concept and to solve the problem accurately need to connect one concept of mathematical to the other mathematical concept, so the problem can be solved easily. When the students try to answer the questions they need to analyze it and this things are never done in conventional class.

4. Result

4.1 Students' Mathematics Critical Thinking Ability

The descriptive statistics research data shows that students' mathematics critical thinking ability in the experimental class which is taught by using Reciprocal–ICT model is presented in the following data:

Table 2: Descriptive of Students' Mathematics Critical Thinking Ability in Experimental Class

No	Indicators	Question Number	Total Score	the average score Of each number	Total Of each Indicator
1	Test Thinking	2	89	2.47	4.89
		3	87	2.42	
2	Questioning	4	81	2.25	4.72
		8	89	2.47	
3	Connecting	1	101	2.81	5.53
		5	98	2.72	
4	Evaluating	6	94	2.61	4.97
		7	85	2.36	
Total					20.11

The descriptive statistics research data shows that students' mathematics critical thinking ability in the control class which is taught using conventional model is presented in the following data:

Table 3: Descriptive of Students' Mathematics Critical Thinking Ability in Control Class

No	Indicators	Question Number	Total Score	the average score of each number	Total per Indikator
1	Test Thinking	2	65	1,81	3,61
		3	65	1,81	
2	Questioning	4	72	2,00	3,92
		8	69	1,92	
3	Connecting	1	83	2,31	4,08
		5	64	1,78	
4	Evaluating	6	77	2,14	3,72
		7	57	1,58	
Total					15,33

5. Conclusion

Based on above data we can say that the level of students' who are in experiment class by using reciprocal learning and the students who are in control class by using conventional learning are quite different because of several reasons. In experiment class students have a lot of chance to ask questions and develop the problems which are given, this things can make students think more critical. In this class both teacher and students are using attractive power point that can make the learning process more interesting. Thus, the researchers conclude that there was a significant influence on the model of reciprocal learning ICT-assisted teaching to students' critical thinking skills. Whereas the control class which are given the conventional learning make the students more passive and significantly are not shown the ability of ctitical thinking.

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