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The Situations That Can Bring Reflective Thinking Process In Mathematics Learning

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Abstract

This paper focuses on situations that can bring reflective thinking process in mathematics learning. Reflective thinking can be identified from the phases of the reflective cycle of teaching, the phases of reflection, and metacognitive activities designed for learning. In order to stimulate reflective thinking process is good to consider the prior knowledge and intuition student owned. Relevant prior knowledge and intuition is useful in solving problems to create the situations that can bring reflective thinking process namely, the selection of action or alternative solutions, and decision-making regarding actions or solutions created or obtained.

Key Words: Reflective Cycle, Reflective Phase, Metacognitive Activity, Prior Knowledge, Intuition, Selecting Action, Decision Making

I. INTRODUCTION

One of the things that are important in learning is knows what you want to achieve through learning it. What is to be achieved is the goal of learning to be realized by the learners. Failure of the learning processes either because they do not know what is to be achieved from such learning. The learners do not have a clear direction in taking the learning process.

In the process of learning, what is to be achieved is packaged in the form of learning goals. This is a formal learning objective. In the process of learning a student is in addition to understanding the formal learning objectives need also to have or establish their own goals that imply motivation in mastering something of the learning process. Thus, students can control the process of understanding in learning through connection with the aim of learning itself that has been determined.

Besides setting their own goals in learning, understanding process tends to increase with smoothly learning "tools" as disclosed Muin (2010:22). These tools are the ability to think reflectively. A student can use reflective thinking skills in learning something. Reflective thinking is a thinking process that reflects the knowledge or information or new issues that are facing towards the knowledge or experience that has

been previously owned for its association with new information. The linkage was found were analyzed in order to obtain an understanding of new knowledge. In practice this learning process should continue in order to obtain a better understanding. Thus initial knowledge or experiences possessed before (prior knowledge) is necessary to bring reflection thereby building a new knowledge that more comprehensive.

In addition to initial knowledge, reflective thinking process can also be influenced by intuition. This intuition may emerge from the old knowledge that has been in a long-term memory. The Intuition identified as the allegations which may be either true or false. With the intuition one can begin to explore the information or knowledge that is still not well understood.

The relevant initial capabilities and intuition are important in the learning process, because they can stimulate the thinking process. Initial capabilities and intuition must be managed and controlled properly to be used to stimulate the thinking process. The process of managing and controlling the knowledge is a metacognition.

The reflective thinking skills are very important owned by anyone who wants to learn. Initial capability that already owned (prior knowledge) combined with the intuition that managed, applied and processed in learning, would provide more optimal results in mastering and achieving learning objectives. Thus the design of learning with metacognitive approach is quite logical to be able to develop reflective thinking skills.

II. DISCUSSION

Here is a study on how to develop student mathematical reflective thinking skills and metacognitive approach design as an alternative to be able to develop student mathematical reflective thinking skills.

Initial Knowledge and Intuition

Learning is a continual ongoing process. That is, learn to be reached gradually. The next stage of learning will be better done if the previous stages had completely mastered. This stage can be both of a stage of mental development (thinking) and also the stages based on the hierarchy of the concepts being studied. Therefore, prior knowledge as a result of the mastery of the previous stage is important in the learning process is being done.

Prior knowledge would be beneficial to manage the knowledge being studied. This initial knowledge is relative. The need for kind of prior knowledge type of substance depends on the material to be studied. Complete initial knowledge will provide a good input in managing the learning is being done. While the complete lack of prior knowledge will affect the speed of acquisition and the acquisition of the material studied. The results of Kopcha and Sullivan (2008) research showed that students with high prior knowledge to obtain better performance in the final test.

In addition to prior knowledge, thought processes should also manage the intuition as a stimulant in the process of achieving learning objectives. Schoenfeld (Muin, 2006:11) affirmed that conviction and intuition as one of the categories of metacognition in learning.

Reflective Thinking in Reflective Cycle

The learning process can be designed such that the achievement of learning objectives and the development of thinking processes can be obtained optimally. For the purpose of learning teachers can develop a supportive learning cycle. Rodger (2002:844) gives the phases of the cycle of reflective teaching. The phases are, presence phase, description phase, analysis phase, and experiments phase.

Jansen and Spitzer (2009) on research conducted on the prospective teachers, identify reflective thinking skills with two of four of phases of Rodger reflective cycle. The two phases are the phase description and interpretation. This interpretation phase in the Rodger phases of reflective is the analysis phase. Jansen and Spitzer (2009) identify the description phase to "describe the mind of students." Interpretation phase is identified with "interpreting the influences of their learning". The phase of "describe the student's mind" can be identified from the means of naming on how students think mathematically and how to distinguish students as individuals and groups. The phase of "Interpret the influence of the learning" is done by forming a conjecture or hypothesis which explains how learning process supports student thinking. Two reflective cycles in this instruction shows how reflective thinking can be analyzed.

Phan (2009:934) identify other phases of the reflective. He distinguishes the phases by, habitual action, understanding, reflection, and critical thinking. Phan (2009:935) examined the direct effects and the mediation of the four phases of

reflection on academic performance. Academic performances mediated by disorganization, persistence, and effort. From his research, he said that reflective thinking can predict academic performance. Research results show that there is a direct effect of the phase of understanding and reflection on the academic performance and there is the indirect effect of both on the academic performance through the mediation of persistence.

Reflective Thinking Through Technology

The reflective thinking situation may also seem from a learning process that is designed with using information technology. The results of Zehavi & Mann (2006:84) research through the Computer Algebra System (CAS) and Dennis (2009:34) through the Learning Activity Management System (LAMS) shows the influence of the learning that is designed with technology (computer based) on the situation of reflective thinking.

Zehavi & Mann (2006:84-91) identified metacognitive as reflective thinking. The Aspects of reflective thinking that is appears is the selection of techniques, monitoring of the solution process, insight (in-depth thinking), and conceptualization. The term of reflective thinking is used to metacognitive level, which refers to the four categories that previously described, namely selection of technique, monitoring of the solution process, insight, and conceptualization that link between the concepts and meaning.

LAMS as cognitive tools can develop students' reflective thinking through a context. In the tutorial using the LAMS, students demonstrated a new understanding with, finding relationships, construct an explanation, and describe a new conclusion. Using LAMS as learning tools can increase the depth of understanding, higher-order thinking, and critical reflection (Dennis, 2009:34).

Reflective Thinking and Metacognitive Activities

Metacognitive activity is closely associated with reflective thinking. To bring one's reflective thinking, need to be designed the learning that present metacognitive activities. Metacognitive activities can identify student reflective thinking skills. Kaune (2006), from the analysis of video recordings of learning, found that there are three categories of metacognitive activities that emerged from the scene of the solving

equation problem that given to the students. These three categories are planning, monitoring of process, and reflection.

In planning, reflective thinking aspect that comes up is to choose the manner and solution strategies. In the monitoring of process, reflective thinking aspect that appears is controlling the solving process conducted. It can be done together in the class. On reflection, reflective thinking aspect that emerges is evaluating the results and deciding the answer. In this situation, can be developed thinking processes are carried out together in the classroom during the learning process (thinking classroom).

Reflective Thinking in Learning

Reflective thinking skills are crucial and very important that owned by someone, not only in relation to the learning process, but also relates to solving problems in everyday life. Reflective thinking skills is the ability that if held it will be used to understand, criticize, test, find alternative solutions, and evaluate the issues or problem being studied or faces (Muin, 2010). This capability is necessary triggered through a learning process that is actively designed. The Activity of which is comprised of physical activity and mental activity. This process is designed in order to student conscious of what he learned, conscious in the make experiences, and conscious of what they have obtained and be able to use it well.

In carrying out the activity of learning process, is quite important to know what he wants to achieve, how to do it, what it already owns, and what tools can be used to implement and achieve those goals. Learning is essentially an effort to bring people to develop themselves to become fully human; the man who is able to construct and to generate knowledge; the man who is able to survive in real life, and the man who want to progress and success. With reflective thinking skills, solving the problem can be done well. Sabandar (2009) identifies reflective thinking skills as critical thinking skills and creative thinking skills.

To be able to think reflectively need prior knowledge because reflective thinking emerged from the process of linking knowledge or concepts who want to know with the concepts already existed before. In this situation, needs owned an intuition before it really prove what can be intuition is, related to the issues being studied. That is because of it is not easy to determine the linkages between the concepts.

In the process of learning, reflective thinking can be raised in situation like the following:

- *Selection of Action or alternative solution*

    When someone is facing and feeling a problem, he tends to want to solve these problems. But not every problem encountered is easy to solve. Initial knowledge and intuition can play a role in guessing the solution what to do. He will choose an action or what alternative solution is appropriate and suitable to solve the problems faced. This situation will bring up the process of reflective thinking. The same thing with this situation is, the process of planning of metacognitive activity (Kaune, 2006), selection of techniques and insights (zehavi and Mann, 2006), the phase of habitual action and understanding (Phan, 2009), the phase description (Rodger, 2002; and Jansen & Spitzer, 2009), and creative thinking (Sabandar, 2009)

- *Decision Making about Action or Solution*

    Any problems encountered should be decided what kind of the solution. At this stage of the selection of action or alternative solutions, presented allegations of actions or alternative solutions. To decide the conclusion of the problem faced should have a certainly argument that supported with data. If an action or alternative solution is found then it needs to be considered and evaluated whether the action or alternative solutions are suitable with the problems faced, almost perfect, or even inappropriate. This will lead to do reflection on the actions or solutions are obtained. Decision-making related to these results is a situation that gave rise to the process of reflective thinking. This situation is relevant to the interpretation phase of Zehavi and Mann (2006), the aspects of monitoring and reflection of Kaune (2006), the phase of reflection and critical thinking from Phan (2009), the phase of interpretation of Jansen and Spitzer (2009), and critical thinking of Sabandar (2009).

Learning with Metacognitive Approach

Operationally learning with metacognitive approach is defined as the learning including the task and or questions that require the students self control and students explanation of the thinking process does. In the process, the learning is guided through questions about what he was thinking. This question can arise from his/her self (self

questioning), from teaching materials which was developed, and from questions of teachers. All of which were designed for demanding self-control and giving the students explanation of the thinking process does.

III. CONCLUSION AND SUGGESTION

Mathematical reflective thinking skills or the ability of reflective thinking in mathematics is the ability to think dynamically conducted through reflection on actions to be taken in choosing or determining alternative solutions, deciding which solution, and predicted a solution based on the knowledge or experience already obtained.

Reflective thinking skill is the skill that important to be owned and developed. Reflective thinking skill requires prior knowledge and intuition as a stimulant. Reflective thinking skill can emerge from the situation of selecting of action or alternative solution and, decision-making regarding actions taken or obtained alternative solution related to the problems solved.

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