

CHAPTER I INTRODUCTION

1.1. Background

Learning Mathematics in college has a very important role in developing thinking skills, problem solving and independent students. The development of metacognition in university is also one of important effort that should be done. It is related to one of higher education's objectives that is transform and develop students' ability, include to design what will do, do what planned, monitor and evaluate what is doing and what has been done, so that they will be critics, creative, innovative, confident, and responsible (*Peraturan Pemerintah no.17 year 2010 about *Pengelolaan dan Penyelenggaraan Pendidikan**).

Briefly, Louca (2003) states metacognition refers to all process about cognition, such as sensing something about one's own thinking, thinking about one's thinking and responding to one's own thinking by monitoring and regulating it.

Metacognition is often described as multidimensional and has been used as a general term about higher level of cognitive skills. A common definition is "thinking about thinking". Metacognition is one's ability to know what he knows and what he does not know. It is also the ability to use one's own prior knowledge to plan a strategy for producing information, to take necessary steps in problem solving and to reflect on the quality of one's thinking about a particular concern. The concept of metacognition was first defined in the seventies by Flavell (1979). Flavell, who is considered to be the "father of the field" and thereafter a considerable amount of empirical and theoretical research dealing with metacognition can be registered. It seems that metacognition is a result of research on cognitive development, memory and reading. Many mathematics educators have shown great interest in this area as they realize that purely cognitive analysis of mathematical performance are inadequate for studying problem solving.

According to Schoenfeld (1992), metacognition has the potential to improve the meaningfulness in learning and creating a “culture of mathematics” in the class that best foster metacognition. Schoenfeld believe that “cultural world of mathematics” would lead one to think about mathematics as an integral part of everyday life, improve students’ skills in making or doing linkages between mathematical concepts in different contexts, and build understanding in the environment through problem solving mathematical either alone or together. In connection with that, one component of the learning process is a very important mathematical problem solving. According to Schoenfeld, a mathematics education expert, there is one particular mathematical point of view regarding the role that problems have in the lives of those who do Mathematics. This unifying theme is that the work of mathematicians is solving problems.

Problem solving in Mathematics is the process to find the solution to a problem when the method is not known to a problem-solver. Then the problem-solver has to use strategic skills to select the appropriate techniques for a solution. The problem is often not completely understood until the problem-solver has tried and failed to arrive at a solution using different strategies. It is a series of going forward and backward among the stages.

Metacognition can be built when students carry solving (problem solving). During the process of problem solving, awareness of students’ cognition can be grown as provide guidance so that students ask themselves whether understand what is being learned or thought. Students are guided to be aware of what is known and what is unknown and how to solve it, making planning problem-solving approach, make the stages of the solution, giving the reasons why doing so, monitor the process of solving problems and progress toward the goal when implementing the plan, and evaluate what has been done.

Scaffolding is defined as providing assistance to a student on an as-needed basis, fading the assistance as the competence of the student increases. In innovative learning arrangements students need scaffolds to support their metacognitive activities to improve the regulation of their cognitive activities, which in improving their achievement (Molenaar, 2011).

Scaffolding is the assistance given to the students to learn and solve problems. Such assistance may include guiding questions, hints (hint), encouragement, warning in the form of intervention, provide examples and non-examples, as well as other measures that conditioned the students can learn independently. Problem solving itself includes high-level thinking skills such as visualization, association, abstraction comprehension, manipulation, reasoning, analysis, synthesis, generalization, that from every point requires an organizing and coordinating. Therefore, metacognition learners have an important role in solving the problem. Especially in regulating and controlling the cognitive activity in solving mathematical problems. Thus learning and thinking that performed by students in solving mathematical problems become more effective. Thus, based on the explanation above, it can be said that metacognition has a significant role in designing (planning), monitoring (monitoring) and evaluate (evaluation) processes of a person's cognitive learning and thinking, thus learning and thinking are done by someone into more effective and efficient (Fauzi, 2011). In this study, scaffolding was directed at supporting the metacognitive activities of triads.

Before conducting the study, by observing some Mathematics lecturers in class, researcher found some of them actually have used metacognitive approach, in their teaching to develop students' abilities in understanding the material and improving the learning outcomes. It can be seen that by using presentation, giving worksheet, discussion, and many else, many lecturers often provide the opportunity for undergraduate students to develop their mathematical abilities, to explore, try, adapt, and change the resolution procedures, including verifying solutions which correspond to the new situation obtained because metacognitive approach is a sequential process that is used to control cognitive activities and ensure that the cognitive objectives have been achieved. Therefore, even though the lecturers have been applied the metacognitive approach, in particular in order to encourage the undergraduate students to understand the metacognition processes that need to be developed, the metacognitive skill of Mathematics students at State University of Medan have not known yet.

Inspired by the suggestion of Kiki Dewi Rahmawati in journal *Artikel Ilmiah Mahasiswa* to take the higher level of subject research about analysis metacognition and the research by Alvanda Candrasari in Journal of Chemical Education that found metacognitive skill with learning outcomes have strong correlation in his research so the researcher in this study has interests to do the research about analysis metacognition for students in university.

In the class that will be chosen as subject, the lecturer as treatment applicator, has applied this metacognitive approach dominantly in this semester compared with the past. It can be known by interviewing that lecturer, he always gives some worksheet which the questions has been matched with metacognitive indicators with or without scaffolding questions. Because of this metacognitive approach has been applied, the researcher can suppose that the students' learning outcomes will be increased in that class. Based on that, the researcher would like to know how much metacognitive skill and learning outcomes are related.

The researcher is also found that the interesting of research about metacognition in Mathematics Department at State University for S-1 students is still low. This can be known from repository Unimed as retrieved at <http://digilib.unimed.ac.id> that amount of skripsi about metacognition, especially in Mathematics Department is not much. The researcher in this study just found 3 skripsi about metacognition and all of that are about metacognitive approach. Then, the researcher has an interest to do research about the metacognition in higher education, especially in Mathematics Department at State University of Medan.

Based on background above, researcher interested in conducting research entitled **“Analysis of The Second Semester Mathematics Students' Metacognitive Skill in Solving Mathematics Problems at State University of Medan”**.

1.2. Problem Identification

Based on the background presented above, can be identified the issue is:

1. The metacognitive skill of Mathematics students have not known yet.
2. The lack of attention in the research about metacognition in Mathematics Department at State University of Medan.

1.3. Problem Limitation

In order for specific discussion, this study is needed to be limited. This study is focused on the second semester Mathematics students' metacognitive skill in solving Mathematics problems that taken from recent F3 examination of Calculus II about application of integral in finding area at State University of Medan.

1.4. Problem Formulation

Based on background and problem identification above, can be formulated the problems of this research are:

1. How is the second semester Mathematics students' metacognitive skill in solving Mathematics problems at State University of Medan?
2. How is the students' metacognitive (scaffolding) questions if given Mathematics problems?
3. How is the relationship of metacognitive skill with students' learning outcomes?

1.5. Research Objective

The objective of this research is:

1. To know the second semester Mathematics students' metacognitive skill in solving Mathematics problems at State University of Medan.
2. To know the students' metacognitive (scaffolding) questions if given Mathematics problems.
3. To know the relationship of metacognitive skill with students' learning outcomes.

1.6. Research Benefit

The benefit of this research is:

1. As the development of the theory of metacognition.
2. As a basis for improving the quality of learning in higher education, in particular in order to encourage the undergraduate students to understand the metacognition processes that need to be developed.
3. The Mathematics students' metacognitive skill is expected to be known and it is used to learning reference for lecturers and all further research soon.

1.7. Operational Definition

In order to avoid misconception about important terms contained in this research, the operational definitions will be noted as:

1. Metacognitive skill is people's extraordinary ability to evaluate and control their cognitive processes.
2. Scaffolding is the assistance given to the students to learn and solve problems.
3. Metacognitive approach is a sequential process that is used to control cognitive activities and ensure that the cognitive objectives have been achieved.
4. Mathematics problem is a problem that is amenable to being represented, analyzed, and possibly solved with the methods of Mathematics.
5. Problem solving is the process to find the solution to a problem when the method is not known to a problem-solver.