

## CHAPTER I INTRODUCTION

### 1.1. Background

Learning mathematics in college has a very important role in developing thinking skills, and problems solving. The development of metacognition in university is also one of important effort that should be done. It is related to one 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). In the observations that researchers do on 12 undergraduate students who admit university through the SBMPTN (Collective Admission Test for State University), 12 students SNMPTN (National Admission Test for State University) and 12 students from UMBPTN (Internal Admission Test for State University), during learning mathematics there are some problems that inhibit thinking skills, and the ability of students to solve the Calculus problems. Problem faced by students identified by researchers are students have difficulty in solving mathematical problems, the ability of mathematical problem solving and metacognition skill of students are still low.

In State University of Medan, Calculus is a course of MIPA Dasar that must be taken by all students in the faculty of mathematics and natural science, including the students in another major or in another word calculus as one of cross study from mathematics field that means is compulsory for all students S1 of all existing program.

Furthermore there is at least two reason why the calculus as a subject choosing in this study. Firstly, students was difficulty to understand the problem about calculus. Secondly, calculus inhibit study time or reduce GPA.

Researcher choose calculus because in reality shows that the calculus course II generally unpopular by students, even considered to inhibit study time or reduce the GPA, and calculus II was difficult to understand.

The first problems that students faced during learning mathematics is students have difficulty in solving mathematics problem. In solving mathematics

problem students only can do the problem by using routine procedures, as well as examples of problems that have been exposed by lecturer. Based on the observations that researchers do, when students faced the new problems, students are immediately confused, and do not understand how to solve the problem. When the researchers gave some tests, many students not fill the answer sheets.

The second problems identifying at the time of observation is the students problem solving ability is low. The low of problem solving ability can be caused by several factors, like factors of students not understand how to solve the problem and students not choose a good strategy in solve the problem. In order the mathematical problem solving ability of students is high, so students should able to choose a good problem solving strategy.

Mastery of good problem solving strategy based on the awareness of students in the thinking process. The awareness of students in thinking process is the awareness of what is known and how to implement it. Suherman, dkk. (2001: 95) also affirms that a success person in solving mathematical problem depends on the awareness of what is known and unknown.

Beside it, in interview that researcher conduct, the students not aware of what knowledge that can be used in mathematical problem solving. When researcher ask students about what knowledge the students use in solve the problem, they confuse and not know what knowledge that the students use.

The awareness of thinking process and solving problem is also called metacognition. According to Wellman in Nurgayah metacognition is a form of cognition, a second order thinking process which involves active control over cognitive process, or in another word state the awareness of what they know and unknown. Woodfolk (in Nuryanah) state that if the awareness realized, so students can begin to design the thinking process, monitoring and evaluating what they do, and what should they do.

Metacognition can built when students solving a problem. During the process of problem solving, awareness of students cognition can be grown as provide guidance students in understanding what they learn and what they think. Students are guided to be aware of what is known and unknown and how to solve

it, making the planning to solve the problem, monitoring the process to solve the problem and evaluating what has done.

In mathematical problem solving based on indicator of metacognition skill in the planning stages, students will write what is known, asked, making plan to solve the problem. Then on the monitoring stages, students will conduct the plan to solve the problem, and find the good strategy to solve the problem. Then, when the student has finished to solve the problem, students was doing evaluation with correct the advantage and disadvantage of their students answer, and students can find another strategy to solve the problem.

When metacognition awareness is realized then students will be able to design, monitoring, and evaluating what is learn. Students with metacogniton skill will be aware the advantage and limitation of their ability. This means that when students make mistakes, students are aware and will avoid the mistake and attempt to change the mistakes. In research by Dunning, dkk. (in Countiho 2007) states metacognition is predictors in academic achievement. Students with high/good metacognition skill will exhibit good academic performance as well as students will low matacognition skills. In another word, when the students metacognition skill is high so the learning outcomes of students is also high. Based on research 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 in journal of Chemical Education that found metacognition skill with learning outcomes have strong correlation.

In fact in daily activities, students always work with their metacognition. Awareness of the existence of this metacognition allows a person to be succed as a learners. Because students have ability to identify the thinking process in solving problem.

Beside of statement above, fact also show that the metacognition skills of 12 studnets SBMPTN, 12 students SNMPTN, 12 students UMBPTN in State University of Medan is still low. This is seen from the result of tests conducted by researchers on 16<sup>th</sup> and 17<sup>th</sup> February 2017 by giving 6 questions about calculus, 3 matter derivative and 3 material about integral to 36 undergraduate students. This

problem is design so that show indicator of student metacognition skills like planning, monitoring, and evaluating.

Here is an overview the result of the initial observation

Misunderstood the derivative.  
Students do not know the derivative of trigonometry

3. Tentukan turunan pertama fungsi  $f(x) = 5 \sin x \cos x$

$$d(x) = 5 \sin x \cos x$$

$$f'(x) = -5 \sin x \cos x$$

Figure 1.1 Students from SBMPTN

Misunderstood the derivative strategy

3. Tentukan turunan pertama fungsi  $f(x) = 5 \sin x \cos x$

$$f(x) = 5 \sin x \cos x$$

$$= -\sin x \cdot \frac{1}{5} \cos x - \sin x \cos x$$

$$= -\frac{1}{5} \sin x \cos x - \sin x \cos x$$

Figure 1.2 Students from SNMPTN

**Figure 1.1 and 1.2 are answer sheet of students in initial test**

Based on figure 1.1 and 1.2 shows that mistake in metacognition. From 2 answer above show that students use their planning skill, by writing what is known, but in two answer above students not writing what planning to solve the problem. In monitoring skill students not using their monitoring skill completely. In figure 1.1 and figure 1.2 above shows that students not choose the good strategy to solve the problem. Because the step in monitoring skill was wrong, so the evaluation skill is unknown.

Wrong formula in the problem solving

3. Tentukan turunan pertama fungsi  $f(x) = 5 \sin x \cos x$

$$u = 5 \sin x$$

$$u' = 5 \cos x$$

$$v = \cos x$$

$$v' = -5 \sin x$$

$$y = \frac{5 \cos x \cdot \cos x - (-5 \sin x) \sin x}{\cos^2 x}$$

$$= \frac{5 \cos^2 x + \sin^2 x}{\cos^2 x}$$

Figure 1.3 Students from UMBPTN

Wrong element in the problem solving

3. Tentukan turunan pertama fungsi  $f(x) = 5 \sin x \cos x$

$$f(x) = 5 \sin x \cos x$$

$$= 5(5 \cos x - \sin x)$$

$$= 25 \cos x - \sin x + C$$

Figure 1.4 Students from UMBPTN

**Figure 1.3 and also 1.4 are answer of student in Initial Test**

From figure 1.3 and 1.4 above shows that, in solve the problem students has using their planning skill, but in figure 1.4 student not make the planning of strategy to solve problem. In monitoring skill student UMBPTN in figure 1.3 students has choose the god strategy to solve the problem but in answer sheet above shows that students enter the wrong formula, so that the answer is wrong. In figure 1.4 students not use the monitoring skill completely, because the students not choose the right strategy to solve the problem, so that the answer also wrong. In evaluation skill figure 1.3 and figure 1.4 shows that students has make the answer but the answer was wrong. It indicates that students not using the evaluation skill completely.

From 6 questions provide by material derivative and integration in Calculus is still a lot of students who did not understand and difficulty to solving the problems. This percentage is 43.32% shows the lack of awareness of thinking activities and monitoring. In planning skill 48,3%, in monitoring skill 45,35% and in evaluating skill 36,3%. Based on the results, the researcher are interested in knowing metacognition skill students in solving mathematics problem Calculus II.

Based on the above problem the researchers interested to do research entitle: **“The Analysis of Mathematics Stdudents’ Metacognition Skill in Solving Mathematics Problem on Subject Calculus II at Second Semester State University of Medan”**.

## **1.2. Problem Identification**

Based on the background presented above, the problem identification of this research is:

1. Students have difficulty in solving mathematics problem.
2. The mathematical problem solving ability is still low.
3. Students are not aware of what knowledge that can be used in mathematical problem solving.
4. The metacognition skill of the student still low.

### **1.3. Problem limitation**

Based on the identification problem above, there is a wide scope of issues, so this research is

1. The second semester mathematics students metacognitive skill in solving mathematical problem that taken from problem of calculus II about the application of integral in finding area at State University of Medan.
2. The use of metacognition to know the mathematical problem solving.
3. The components of metacognition to identify the level of students metacognition.

### **1.4. Problem Formulation**

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

1. How is the relationship metacognitive skill of SBMPTN Students, SNMPTN Students and UMBPTN Students with student's learning outcomes?
2. How does the difference of metacognitive skill in solving mathematics problem of SNMPTN students, SBMPTN students and also UMBPTN students?
3. How is the level metacognition of SNMPTN students, SBMPTN students and UMBPTN students in mathematical problem solving?

### **1.5. Research Objectives**

The objectives of this research is:

1. To know the relationship metacognition skill with students' learning outcomes (result of F3 test).
2. To know the difference of metacognitive skill in solving mathematics problem of SNMPTN Students, SBMPTN students and also UMBPTN students.
3. To describe the level metacognition of SNMPTN students, SBMPTN students and UMBPTN students in mathematical problem solving.

## **1.6 Research Benefit**

The benefit of this research is :

1. For undergraduate student :  
To help student in solve mathematics problem using their metacognitive skill and instruments in this study can hone their ability in solving the problem.
2. For Lecturer, expand knowledge to help student in solving mathematics problem and to identifying the difficulties of the student's in solving the mathematics problem.
3. For researcher this study is a valuable experience in order to broaden the knowledge and able to be used as capital when entering the real world of education; and For another researcher, as reference to development of the theory of metacognition.

## **1.7 Operational Definition**

The operational definition of this research is:

1. Metacognition is awareness and management of one's own thought.
2. Metacognition skill is knowledge of their own's cognitive processes and the ability to use the process.
3. Problem solving is the effort of individuals or groups to find answer based on the understanding that has been held previously in order to meet the demands of a situation that was common.
4. Mathematics problem: understanding mathematics matters by practicing on each those pieces in systematic thought.