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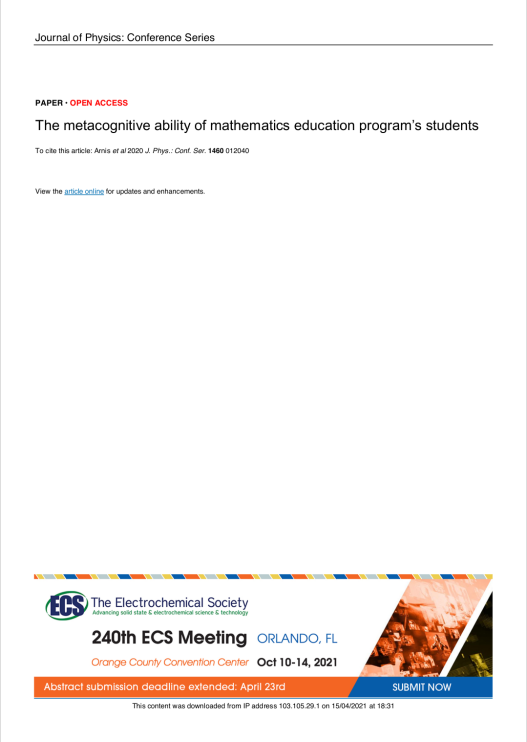

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The metacognitive ability of mathematics education program's students

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The metacognitive ability of mathematics education program's students

The metacognitive ability of mathematics education program's students

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Abstract. The quality of learning outcomes is influenced by the ability of students to control their cognitive processes continuously and develop into metacognitive. Through the metacognitive process, students are expected to be able to motivate, organize, develop themselves to determine their goals and try to achieve the goals to make their learning and thinking processes more effective and efficient. This study aimed to determine the students' metacognitive abilities of Mathematics Education Study Program in Tarbiyah and Teacher Training Faculty, UIN Ar-Raniry Banda Aceh. The type of research used a quantitative method. The population of the study were all student who took the subject of Field Geometry course in Mathematics Education Study Program, Tarbiyah and Teacher Training Faculty, UIN Ar-Raniry Banda Aceh. The sample was the students in one of the five classes taking the course. The instrument in this study was a problem-solving question. Data analysis was conducted descriptively using Analysis Score. The students have different metacognitive abilities in solving a mathematical problem-solving question. Three of the twenty-three students have high metacognitive abilities.

1. Introduction

Weinert and Kluwe [1] argued that the quality of learning outcomes viewed from the ability of students to control their cognitive processes continuously [2] and this cognitive process develops into metacognitive. Metacognitive is known as *'Thinking about thinking*' that relates to the ability (of students) to think themselves and the ability to use certain learning strategies appropriately. The concept of metacognitive is the idea of the thinking process about the mind of students. Metacognitive is the second-order cognition that is thinking about thinking, knowledge about knowledge, or reflection about actions [1]. In its development, the metacognitive ability is different from metacognitive knowledge [3]. Metacognitive abilities include the ability to plan, the ability to implement, the ability to monitor, and the ability to evaluate individual learning processes. These abilities are expected to help students to solve problems [4].

Previous research found that metacognitive abilities for student-level are still very low; the average score obtained by students is only 37.97 on a scale of 0-100. The research was conducted on 35 students who took a plant ecology course in the biology education program at the University of Muhammadiyah Palembang. However, this research is related to mathematics, not biology. This research hopes that there

will be changes in the results of this study. However, there were no significant results in the research the authors conducted.

Metacognitive ability in the learning process is the ability of students to control their learning process, starting from the planning stage and determining the right strategy according to the problem at hand. It also involves students' ability in the process of monitoring the learning progress and correcting if there are errors that occurred during the learning process. Finally, it also includes students' ability to analyse the effectiveness of the chosen strategy and can evaluate the learning outcomes. Metacognitive is a process of *'letting the student into the secret*' [5] where students can develop their knowledge and abilities, and decide what learning strategies will be used in the problem-solving process, and can find their knowledge that will be learned. Through the metacognitive process, students are expected to be able to motivate, organize, and develop themselves to determine goals and try to achieve their goals, so learning and thinking performed by the students can be more effective and efficient.

Metacognitive abilities in problem-solving by students of Teaching Mathematics Study Program at UIN Ar-Raniry Banda Aceh are still very low. This can be seen from the various obstacles faced by students in solving concepts, especially concepts in understanding mathematics. The author will examine this issue in this study. The research conducted by the author is expected to have a positive impact on the metacognitive changes of students at UIN Ar-Raniry.

The previous research conducted by [6] showed that students' metacognitive abilities were still low, with the mean score obtained only 37.97 from a scale of 0 to 100. The valid data about how metacognitive abilities at universities in Aceh are not yet available. Hence, this study aimed to examine how are the metacognitive abilities of the students in Mathematics Education Study Program, Tarbiyah and Teacher Training Faculty of *Universitas Islam Negeri* (UIN) Ar-Raniry Banda Aceh.

The research problem of this study was "how are students' metacognitive abilities in problem-solving of the mathematics education program of UIN Ar-Raniry Banda Aceh."

2. Method

The population in this study were students who took geometry courses in Mathematics Education Study Program, Tarbiyah and Teacher Training Faculty, *Universitas Islam Negeri* (UIN) Ar-Raniry Banda Aceh with the research sample of one of the five student classes taking geometry courses in the study program. The students were given a test with the mechanism of providing problem-solving questions, following [7] opinion that metacognitive abilities can help students to solve problems optimally.

The test question used was problem-solving test question from the [8] which has been tested for validity and reliability, and the problem-solving test question is as follows:

> The area of an abcd square is 25 cm^2. Points E, F, and G are respectively the midpoints of AB, AD, and CD. The intersection between BD and FG is the point H, determine the area

Figure 1. Tests for metacognitive abilities

Data analysis was conducted descriptively using the Analysis Score [9]. A student will get a score of 7 if the student describes the answers in his/her sentences, the order of the answer is sequence and systematic, logical answers with correct grammar (language), added with reasons (analysis/ evaluation/ creation) and the answer is correct. A student will get a score of 6 if he/she describes the answer in his/her sentence, sequential and systematic answers, logical answers with less correct grammar (language), which is added with reasons (analysis/ evaluation/ creation) and the answers are correct. A student will get a score of 5 if the student describes the answers in his/her sentence, the answers are less coherent and systematic, less or illogic with incorrect grammar (language), equipped with reasons (analysis/ evaluation/ creation) and the answer is correct.

A student will get a score of 4 if he/she describes the answers, not in his/her sentence, sequential and systematic answers, logic with correct grammar (language), complemented by reasons (analysis/ evaluation/ creation) and the answer is correct. A student will get a score of 3 if he/she describes the answer, not in his/her sentence, the answer is less or not coherent and systematic, logic with incorrect grammar (language), less equipped with reasons (analysis/ evaluation/ creation) and the answer is correct. A student will get a score of 2 if the student describes the answer, not in his/her sentence, the order of the answer is less or not coherent and systematic, logic with incorrect grammar (language), less equipped with reasons (analysis/ evaluation/ creation) and the answer is incorrect. A student will score 1 if he/she describes the answer, not in his/her sentence; the order of the answer is less or not coherent and systematic;the answer is logic with less correct grammar (language); the answer is not equipped with reasons (analysis/ evaluation/ creation); and the answer is incorrect. And a student will get a score of 0 if students cannot answer at all.

3. Results and discussion

The data of one class were obtained based on the results of the test conducted on Wednesday, June 19, 2019, which took place in a multimedia lecture hall. The test consisted of the problem-solving questions.

The samples were given problem-solving test questions and analyzed based on *Score analysis*. This is the final score that conducted as a result, so the recapitulation of samples' scores was obtained as follows:

Table 1. The recapitulation of samples' scores.

Score	Total of the sample obtained the score	$P=\frac{F}{N}x100\%$
Score 7	3	13%
Score 6	3	13%
Score 5	2	9%
Score 4	6	26.1%
Score 3	4	17.4%
Score 2	4	17.4%
Score 1	1	4%
Score 0	-	-

The samples who were students who took the geometry course at Mathematics Education Study Program, Tarbiyah and teacher faculty, Universitas Islam Negeri (UIN) Ar-Raniry Banda Aceh answered math test questions with different levels of ability: (1) Three of twenty three students with the percentage of 13% of the sample obtained a score of 7 had been able to give answers in their own sentence and it is correct, sequential and systematic answers, logic with correct grammar (language), and equipped with reasons (analysis/ evaluation/ creation); (2) Three of twenty three students with a percentage of 13% of the sample obtained a score of 6 had been able to give answers in their own sentences and it is correct, sequential and systematic answers, which are equipped with reasons (analysis/ evaluation/ creation) but logically with less correct grammar (language); (3) Two of twenty three students with a percentage of 9% of the sample obtained a score of 5 had been able to give answers in their own sentences and it is correct and equipped with reasons (analysis/ evaluation/ creation) but the order of answer was less coherent and systematic and less or not logic with incorrect grammar (language); (4) Six of twenty three students with a percentage of 26.1% of the sample obtained a score of 4 could answer in the sequential and systematic answers, logic with correct grammar (language), which is equipped with reasons (analysis/ evaluation/ creation) and the answer is correct, but the answer is not in his/her own sentence; (5) Four of twenty three students with a percentage of 17.4% of the sample obtained a score of 3 could answer correctly but the answers were not in their own sentence, the order of answers was less or not coherent and systematic, logic with less correct grammar (language),

and less equipped with reasons (analysis/ evaluation/ creation); (6) Four of twenty three students with a percentage of 17.4% of the sample obtained a score of 2 were not able yet to give answers in their own sentence, the order of answers was less or not coherent and systematic, logic with less correct grammar (language), less equipped with reasons (analysis/ evaluation/ creation) and incorrect answers; and (7) One of twenty three students obtained a score of 1 was not able to give answers in their own sentence, the order of answers is less or not coherent and systematic, logic with incorrect grammar (language), that was not equipped with reasons (analysis/ evaluation/ creation) and the answer is incorrect.

Only three out of 23 students (13%) had high metacognitive abilities in solving mathematical problem solving, indicating that there is still a need to improve the quality of student learning outcomes. The quality of learning outcomes viewed by the ability of students to control their cognitive processes continuously [2]. Metacognitive skills can be enhanced through self-habituation to solve contextual mathematical problems [10]. Metacognitive abilities help students understand the questions [11], solve them and can improve academic achievement at various ages, cognitive abilities, and learning domains including reasoning and solving mathematical problems [12,13].

The previous research by UIN Palembang's student showed that the metacognitive abilities for the student grade were still very low. The average score of the students was only 37.97 on a scale of 0-100. The study was conducted on 35 students who had taken a course in plant ecology in the biology training program at the University of Muhammadiyah Palembang.

Goos & Gilbraith [14] argues that students who use their metacognitive strategies well when solving math problems based on problem-solving have a better ability to solve mathematical problems. The student uses metacognitive to arrange the steps of thinking in solving problem-solving problems.

4. Conclusion

All samples solve the mathematical problem-solving question with different levels of ability. Only three students had high metacognitive skills in solving a mathematical problem-solving question. These results indicate that there is still a need to improve the quality of student learning outcomes.

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