International Journal of Trends in Mathematics Education Research
Vol. 2, No. 3, June 2019, pp. 124-127
Available online at http://ijtmer.com

E-ISSN : 2621-8488

RESEARCH ARTICLE

Comparison of Metacognition Awareness of Mathematics and Mathematics Education Students Based on the Ability of Mathematics

La Misu[1*], I Ketut Budayasa[2], Agung Lukito[3], Rosdiana[4]

[1,4]Universitas Halu Oleo, Indonesia
[2]Universitas Negeri Surabaya, Indonesia
[3]Universitas Negeri Surabaya, Indonesia
*Corresponding author email: [1] lamisuhamid@yahoo.co.id; [2] ketutbudayasa@unesa.ac.id; [3] agunglukito@unesa.ac.id; [4] rosdianadawi@gmail.com

How to Cite: Misu, L., Budayasa, I.,K., Lukito, A & Rosdiana (2019). Comparison of Metacognition Awareness of Mathematics and Mathematics Education Students Based on the Ability of Mathematics. *International Journal of Trends in Mathematics Education Research, 2*(3), 124-127.

ARTICLE HISTORY

Received: 6 February 2019
Revised: 10 March 2019
Accepted: 26 April 2019

KEYWORDS

Metacognition Awareness;
Ability of Mathematics;
Mathematics Education Students;
Mathematics Students;

ABSTRACT

Awareness of metacognition is one of mental process that occurs when a person knows what he thinks, including the knowledge and awareness to do something or realize the reason that. The purpose of this study is (1) to describe how the metacognition awareness of mathematics student and mathematics education student based on mathematical ability, and (2) to know the difference metacognitive awareness between of mathematics students with math education students based on mathematical ability. This research subject are the Department of Mathematics and Mathematics Education students of Halu Oleo University Kendari, Indonesia. This research is ex post facto by the data analysis using descriptive and inferential approach. Descriptive approach used to describe the level of metacognitive awareness of mathematics students and mathematics education students based on his mathematical abilities, whereas inferential approach used to see the difference in metacognition awareness of mathematics students and mathematics education students based math skills. The results of this study are: (1) the level of students metacognition awareness of Mathematics Department, generally located on level strategic use and level reflective use, while the level of students metacognition awareness of Education Mathematics Department, generally located on level aware use; (2) there is a significant difference between the awareness metacognition of math students with mathematics education student based on his mathematical abilities, and awareness metacognition of math student better than mathematics education students.

1. INTRODUCTION.

Overview of the curriculum between the Department of Mathematics and Mathematics Education there is an essential difference between the two. The difference lies in the passing standard on each of the two majors. In general, graduate of the Department of Mathematics Education is producing scholar's prospective middle school mathematics teacher, while graduates of the Department of Mathematics is generating prospective undergraduate mathematicians. Similarly, the interest of students while selecting mathematics or mathematics education since the first half was different, although the current math learning achievement in relatively the same high school. As for mathematics education student interest is wanted to be a scholar of mathematics teacher candidates according to the standard graduation in Mathematics Education Curriculum Department, while the interests of students want to graduate candidates Mathematics mathematician accordance with the standards of graduation in the Department of Mathematics Curriculum.

Based on the differences in student interest in the election of the Department of Mathematics and Mathematics Education Department allows the difference in metacognitive awareness of students from both departments, mainly in understanding mathematical concepts. It can be seen from the difference in yield improvement of current students learn mathematics High School until the first half in mathematics or mathematics education majors. When viewed from the average value of the national exam (NE) High School mathematics, mathematics education for students better than students of mathematics, which is the average NE mathematics education student is 63.58 and average NE mathematics students is 59.0. While the average achievement of students (AS) first half, better math student of math education students, which is the average AS math student 3.17 and the average IP math education students 3:07.

However, based on the author's experience in teaching basic mathematics (calculus), generally students in solving math problems mostly only memorize derived formulas or memorize integration techniques. Seldom do students solve derivative and integral problems based on concepts. This can be seen from the results of student answers when solving the problem in front of the class then the students are confused in suggesting the initial idea of completion. Sometimes the initial idea already exists but the student

is confused to continue the next step. Sometimes students can also completely solve derivative or integral problems, but they have not been able to reveal the reasons for each step. In fact, in the learning process is always given derivative and integral concepts and examples of derivative and integral solutions based on derivative and integral concepts. This is according to the results of research Rahim & La Misu (2015) that generally a student of the Department of Mathematics Education of Halu Oleo University has not been able to explain and give the reasons for every step in solving the problem integral.

Therefore, in this study the author tried to distinguish metacognitive awareness of mathematics students and mathematics education students based on mathematical abilities. In other words, seeing students' awareness uses his thinking in providing formal reasons for all mathematical problems. In the opinion of Tacccasu (2008), that to improve metacognitive skills requires awareness that students must have at each step of their thinking. However, each student has different abilities in dealing with mathematical problems. Students will be aware of his thinking process and evaluate themselves against the results of the thinking, so that students will minimize errors in problem solving. Then Biryukov (2003), said that the concept of metacognition is suggestive of a person's thinking about thinking which includes knowledge of metacognitive (one's consciousness about what he knew), metacognitive skills (awareness someone about something he did) and experience metacognitive (one's awareness about the cognitive abilities of it's). Furthermore, Wilson & Clarke (2004), stating that metacognition is awareness of students will be the thinking, rechecking the thinking processes, and manage the process of thinking. In the learning process sometimes there is a misconception on the information obtained by the students, the information referred to by the lecturers do not like the information that is in the minds of students. Related to this, metacognition can monitor the stage of thinking that students can reflect on ways of thinking and the results of thinking. Metacognition has an important role in the learning process of mathematics especially understanding of the concept.

Consciousness metacognition students in question as proposed by Swartz & Perkins (1989) and NCREL (2007), that the level of awareness of one's thought processes include: Level 1: tacit use, is The individual does a kind of thinking, say decision making, without thinking about it, Level 2: aware use, is The individual does that kind of thinking conscious that and when he or she is doing, Level 3: strategic use, is the individual organizes his or her thinking by way of particular conscious strategies that enhance its efficacy, and Level 4: reflective use, is the individual reflect upon his or her thinking before and after, or even in the middle of, the process, pondering how to proceed and how to improve.

Based on the above, the purpose of this study is (1) to describe how the metacognition awareness of mathematics student and mathematics education student based on mathematical ability, and (2) to know the difference metacognitive awareness between of mathematics students with math education students based on mathematical ability. Thus, the research questions are (1) how is the description of metacognitive awareness of mathematics students and mathematics education based on mathematical abilities, and (2) is there a difference in metacognitive awareness between mathematics students and mathematics education based on mathematical abilities.

2. RESEARCH METHOD

This research subject is the student of Department of Mathematics and Mathematics Education of Halu Oleo University Kendari, Indonesia. Mathematics students there are 44 students consisting of 27 female and 17 male, while students of mathematics education there are 46 students made up of 34 female and 12 male. This research is ex post facto by the data analysis using descriptive and inferential approach. Descriptive approach used to describe the level of metacognitive awareness of mathematics and mathematics education students based on his mathematical abilities, whereas inferential approach used to see the difference in student metacognition awareness of mathematics and mathematics education based on mathematical ability.

Indicators for trace level or levels of metacognitive awareness of students, following the adaptation of Lauren (2009) as follows:

1. Tacit use: (a) Indicators of planning, namely: the student cannot explain what is known, the student cannot explain what is being asked, and students are not able to explain clearly the problem, (b) Indicators of monitoring, namely: the students showed no awareness of anything monitored and students are not aware of a mistake on the concept and the results obtained, and (c) Indicators assessment, namely: students do not evaluate or if an evaluation would seem confused or uncertainty of results.
2. Aware use: (a) Indicators of planning, namely: students having difficulty and confusion at the thought of the concept (formula) and how to count to be used, the student only explain some of what was written, and students understand the problem because it can speak clearly, (b) Indicators monitoring, namely: the students were confused because it cannot continue with what will be done, the students aware of the misconception (formula) and how to calculate but cannot fix it, and (c) Indicators assessment, namely: students do not evaluate or if an evaluation would look confused or vagueness of the results obtained and the students do an evaluation but are not sure of the results obtained.
3. Strategic use: (a) Indicators of planning, namely: students understand the problem because it can speak clearly, students do not have trouble and confusion to find a formula and calculation, and the student can explain most of what he writes, (b) Indicators of monitoring, namely: students realize misconceptions and how to calculate and students are able to give reasons to support his thinking, and (c) Indicators assessment, namely: students do not evaluate or if an evaluation would seem confused or vagueness of the results obtained and the students do the evaluation, but less convinced by the results obtainable.
4. Reflective use: (a) Indicators of planning, namely: students know the methods used to solve the problem, students are able to explain the strategies used to solve the problem, the students understand the problem well because it can identify important information in the matter, and students can explain what is written on the answer sheet (b) Indicators of monitoring, namely: students are able to apply the same strategy on other issues and students aware of the misconception that do and can fix it, and (c) Indicators assessment, namely: students evaluate each step made and believe the results which is obtained.

3. RESULT AND ANALYSIS

The results of this study will discuss the level of student's metacognitive awareness of mathematics department, the level of

student's metacognitive awareness of mathematics education department, and differences in the level of student's metacognitive awareness departments of mathematics and mathematics education. In detail, it can be described as follows.

1. The Metacognition awareness level of the Department of Mathematics Students

The description of the level of metacognition awareness at the Mathematics Department of Halu Oleo University students can be seen in Table 1.

Table 1: The metacognition awareness level of the Department of Mathematics of Halu Oleo University students

Metacognition Awareness	Female students		Male students		Total student	
	Sum	%	Sum	%	Sum	%
Tacit use	2	7.41	1	5.88	3	6.82
Aware use	4	14.81	4	23.53	8	18.18
Strategic use	10	37.04	6	35.29	16	36.36
Reflective use	11	40.74	6	35.29	17	38.64
Total	27	100.00	17	100.00	44	100.00

Based on Table 1, it is seen that metacognition awareness at the Mathematics Department of Halu Oleo University students both male and female are generally at the level of strategic use and reflective use. A small portion is at the level of tacit use.

2. The Metacognition awareness level of the Department of Mathematics Educations Students

The description of the level of metacognition awareness at the Mathematics Education Department of Halu Oleo University students can be seen in Table 2.

Table 2: The Metacognition Awareness level of the Department of Mathematics Education of Halu Oleo University students

Metacognition Awareness	Female Students		Male students		Total students	
	Sum	%	Sum		Sum	%
Tacit use	5	14.71	2	16.67	7	6.82
Aware use	24	70.58	8	66.67	32	69.57
Strategic use	5	14.71	1	8.33	6	13.04
Reflective use	0	0	1	8.33	1	2.17
Total	27	100.00	12	100.00	46	100.00

Based on Table 2, it is seen that metacognition awareness at the Mathematics Education Department of Halu Oleo University students both male and female are generally at the level of aware use. Whereas the level of reflection used by male students is absent and female students are only a small part. Likewise, the level of tacit use for both male and female students is only a small part. This is according to the results of research La Misu (2017), that most student metacognition awareness levels of Mathematics Education Department of Halu Oleo University students are at level tacit use, and a small proportion at the level reflective use.

3. The Metacognition Awareness difference between students of mathematics and mathematics education

Summary of the t-test calculation to see the difference between metacognition awareness students' of mathematics and mathematics education of Halu Oleo University can be seen in Table 3.

Table 3: The results of the calculation of the t-test of metacognitive awareness of mathematics and the mathematics education students of the Halu Oleo University

Class	$\overline{X}$	N	Variance	t-count	t(0.05; db)	Explanation
Department of Mathematics	57.55	44	379.35	3.58	1.66	Reject H0, there is a significant difference
Department of Mathematics Education	45.29	46	152.64			

There is a significant difference in awareness of metacognition of mathematics students with mathematics education students. Because the average metacognition awareness of mathematics students is higher than in mathematics education students, then the awareness of metacognition of mathematics students is better than mathematics education students. This is supported by the results of descriptive analysis that students majoring in mathematics are at the level of strategic use and reflective use, while students of mathematics education are generally still at the level of aware use.

The results of this study indicate that the metacognition awareness of mathematics students always reflect every step made so that when they find a mismatch they immediately fix it. The process of refinement also requires rethinking about how decisions are made on the cognition process used. The thinking process used by students on the reflective use level leads more to the use of logical and analytical thinking. When a subject is given a problem, he can identify the type and structure of the problem which is then analyzed to produce a logical procedure used to solve the problem. This is in accordance with Vinner's (Subanji, [2007]) opinion that the analytic thinking process arises when students are given problems, then they identify the structure and type of problem, perform the analysis process to find the settlement procedure and then resolve the problem according to the type and structure. Then Ozoy, et al. (2009), said that students with high knowledge and metacognitive skills can directly guide their learning well. This is evident from the results of student learning mathematics with average achievement 3.17.

While students of mathematics education are still in the process of solving the problem by feeling confusion in determining how to get answers. Confusion shows that there is metacognition activity (metacognition experience) that leads to one indicator in aware use level. Students who occupy this level have different awareness in recognizing the problem, but they can give reasons why they do such thinking. For example a student is confused but can finish it but other students stop and not optimal in the process of finding results. To obtain optimal results requires interaction between metacognitive knowledge and metacognitive experience, meaning that not enough people only have metacognitive knowledge; it takes experience or metacognitive skills in solving a

problem. Uncontrolled metacognitive knowledge can lead to mistakes, as Marcell and Venman (2006) suggest that metacognitive knowledge of our learning may be false or true and this self-knowledge may be subject to change.

4. CONCLUSION

Based on the research and discussion above, it can be concluded that:

First, the level of students metacognition awareness of Mathematics Department, generally located on level strategic use and level reflective use, while the level of students metacognition awareness of Education Mathematics Department, generally located on level aware use; Second, there is a significant difference between the awareness metacognition of math students with mathematics education student based on his mathematical abilities, and awareness metacognition of math student better than mathematics education student.

REFERENCES

Biryukov, P. (2003). Metacognitive aspects of solving combinatorics problem Kaye College of Education. Direct access: http://www. cimt. org. uk/journal-/biryukov. pdf.

Laurens, T. (2010). Penjenjangan Metakognisi Siswa yang Valid dan Reliabilitas. Jurnal Pendidikan dan Pembelajaran (JPP), 17(2), 201-211.

Marchel,V & Veenman, J. (2006). Metacognition and learning: Conceptual and Methodological Considerations, Metacognition Learning 1(1) 3–14.

Misu L. & Masi L. (2017). Comparison of Metacognition Awareness of Male and Female Students Based on Mathematics Ability in Department of Mathematics Education of Halu Oleo University, International Journal of Education and Research, 5(6)

NCREL (2007). Metacognition, available: http://info@ncrel.org. Accessed March 9, 2007.

Özsoy, G., & Ataman, A. (2017). The effect of metacognitive strategy training on mathematical problem solving achievement. International Electronic Journal of Elementary Education, 1(2), 67-82.

Rahim, U. La Misu, (2015). The Resolution Integral Approach to Metacognition in Math Education Student of Halu Oleo University, International Journal of Education and Research, 2(8) 151-158.

Subanji (2007). The Process of Pseudo Conversational Thinking In Constructing Graphic Functions of Reverse Dynamic Events, Dissertation, Unesa Graduate, Surabaya, Unpublished.

Swartz, Robert J. & Perkins, D.N. (1989). Teaching thinking: Issues and Approaches. Revised Edition. The Practitioners' Guide to Teaching Thinking Series.

Tacccasu, Project (2008). Metacognition, (Online). Http://www.careers.hku.hk /taccasu/ref / metacogn.htm, Accessed on April 30, 2012.

Wilson, Jenny, and Clark, David (2004). Toward the Modeling of Mathematical Metacognition. Mathematics Education Research Journal, 16 (2) 25-48.