

# Students' metacognitive skill in mathematics learning with cabri geometry II plus

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**Abstract.** Metacognitive skill is the awareness of one's thinking about the thinking process itself, whereas consciousness is the awareness of one's thinking about what to do. The subjects for this research were five students from class VII-1 SMP 1 Banda Aceh. Research data collection used the sheet metacognitive questions. Data were analyzed descriptively to interpret students' metacognitive skills in learning how to use Cabri Geometry II Plus software. The results showed that the metacognitive abilities of students increased from the first meeting to the fourth meeting.

**Key words:** Metacognitive, Cabri Geometry II Plus

## Introduction

Adegbija and Fakomogbon (2012) said most of lecturers and teachers in many colleges now only use the lecture teaching method. Use the lecture method as a teaching technique can lead to boredom for some learners, and lack of interest or concern to the subject matter being taught. Therefore when a teacher uses media in learning should be tailored to the learning objectives, the character of materials, availability, cost, and condition class.

Cabri Geometry II Plus is one of media, which can be used to help students to learn geometry. Cabri Geometry II Plus creates a variety of wake-up construction geometry, including two-dimensional wakes. Cabri Geometry II Plus advantages compared from similar software and previous versions is the interface that is easier to understand, use, and simpler. Cabri Geometry II Plus has a software interface similar to Microsoft's office issued, there is a structure that has a menu interface such as file, edit, options, window, and help others. On the toolbar, Cabri Geometry II Plus provides a tool to create and modify diagrams such as points, lines, circles, curves, midpoint, and so on. In addition, the Cabri Geometry II Plus has a set of pointers that can be selected as needed (Sopian and Widodo, 2007). Kurz, *et al* (2005) said that *software* in mathematics learning is possible way for teacher to encourage students to understand the basic mathematics to be more understanding, more visual, and more focus.

Sketching triangle and angle are suitable for learning by using Cabri Geometry II Plus software. Usually, many teachers help students to sketch/draw figures on a piece of paper or on a white board, so it takes a lot of effort and time. Although these skills are needed in mathematics, but for further understanding of the concepts that teachers and

students do not need to spend more energy and time to draw on the paper or board. By utilizing computer animation, teachers can use a variety of software in mathematics learning, especially in geometry to be more easily understood by the students and to foster students' metacognitive skill.

Computer as a tool, in this case the Cabri Geometry II Plus is able to make abstract mathematical concepts, which are more meaningful to the students because they are presented visually. When students use the computers in understanding mathematical concepts as interactive media, students not only explore and practice the concepts, but also increase their mathematical understanding. Activities for monitor yourself and see yourself that what he does can be controlled optimally, this activity known as metacognitive.

Bruning, et al (1995:99) explain that "*metacognition refers to knowledge people have about their own thought processes*". According to Burns, et al (1986) metacognitive include; find out what is already known/owned, knowing when to understand/comprehend the novelty of what had been read, knowing how that understanding can be achieved, and find out why something can and can not be understood.

Suzana (2004: B4-9) revealed that the metacognitive learning can enhance students' mathematical understanding. In the context of learning, students learn how to learn, learn skills and learning modalities owned, and know the best learning strategies for effective learning (Prayitno and Sugiharto, 2010). Susantini (2009) states that through metacognition students become self-sufficient student, cultivate an attitude of honest and dare to make mistakes and will significantly improve learning outcomes. Task of educators is to develop the students' metacognitive skill. In this research, besides Cabri Geometry II Plus we also use Macromedia Flash 8 due to it is equipped with action script so it makes a presentation or teaching device more varied and more interesting than the other presentation programs. In addition, students can repeat the process of sketching for many times to practise.

The research result of Johar and Meliyana (2010) showed that students' metacognitive skill during the process of learning through cooperative learning model has increased. Sugiarto (2012) concluded that student learning outcomes can be said to be qualified if the student is able to consciously control the cognitive processes and sustainable impact on improving metacognitive skills. The above studies do not use a software in learning process. Therefore, the issue in this study is how do the students' metacognitive skills improve by using Cabri Geometry II Plus?

## **Materials and Methods**

The subjects for this research were five of the 22 students from class VII-1 at SMP 1 Banda Aceh. Students were choosed according to teachers' recommendation. They come from low level, middle level, and high level of their prior achievement. In learning process, students work in group. There are 7 groups of 3 to 4 students. Each group has 2 to 3 laptops. Before learning process, teacher had installed Cabri Geometry II Plus and Macromedia Flash 8.

The process of lesson was teacher demonstrates the process of sketching triangles and angles manually (using rules, paper, and pencil), then students practice figures on their worksheet. Some of students demonstrated their performance on the board in front of the class. Next activity was teacher demonstrated Cabri Geometry II Plus and Macromedia Flash 8 to repeat the process of sketching to make students more understand. Then, teacher asked students to explore many thing about the process and ther result for deeply understanding about kinds of line inside of triangle, namely bisector line, perpendicular line, and symmetric line, also special angles  $30^{\circ}$ ,  $45^{\circ}$ , and  $90^{\circ}$ . There are four meetings for all topics, each meeting is 80 minutes.

The process of lesson was teacher demonstrated the process of sketching triangles and angles manually (using rules, paper, and pencil), then students practice the figures on their worksheet. Macromedia Flash 8 helps students to repeat the process of sketching to make students more understand or more fluence. Some of the students demonstrated their performance on the board in front of the class. Next activity was teacher demonstrated Cabri Geometry II Plus. Then, teacher asked students to explore many thing about the process and the result was deeply understanding of the triangle's inside lines, namely bisector line, perpendicular line, and symmetric line, also special angles  $30^{\circ}$ ,  $45^{\circ}$ , and  $90^{\circ}$ . There are four meetings for all topics, each meeting is 80 minutes.

Research data collection was used the metacognitive questions sheet. Students answered the metacognitive question sheets at the end of each meeting. Data were analyzed descriptively to interpret students' metacognitive skill in learning to use software Cabri Geometry II Plus.

To assess students' metacognitive skills, in this study formulated the following questions:

- 1) Does *Macromedia Flash 8* help you more easily for sketching triangles and angles? Why?
- 2) Does *Cabri Geometry II Plus* help you more easily to understand the concept of various kinds of lines inside a triangle? Why?
- 3) Is the way of sketching triangle and angle manually similar to *software Cabri Geometry II Plus*? Why?"
- 4) If you do not understand how to skecth, what will you do?

The students' metacognitive skill was scored according to classification as follow.

- Score 1 : no answer
- Score 2 : students' answer is not suitable to the question
- Score 3 : students' answer is a little bit suitable to the question
- Score 4 : students' answer is almost suitable to the question

Score 5 : students' answer is suitable to the question

The Average score of students' Metacognitive Skill (AMS) for four questions classified as follow.

Table 1. The Criteria of the Average of students' Metacognitive Skill (AMS)

Score	Criteria
$1.00 \leq \text{AMS} < 1.50$	Worst/Tidak Baik
$1.50 \leq \text{AMS} < 2.50$	Bad/Kurang Baik
$2.50 \leq \text{AMS} < 3.50$	Good enough/Cukup Baik
$3.50 \leq \text{AMS} < 4.50$	Good/Baik
$4.50 \leq \text{AMS} \leq 5.00$	Excellent/Sangat Baik

The scores of students' metacognitive skill were in ordinal way, than that score transformed to interval way by using Method of Successive Interval (MSI).

## Results and Discussion

The Average Score of students' Metacognitive Skill (AMS) for the first to the fourth meeting are as table follow.

Table 2. The Average Score of Students' Metacognitive Skill (AMS) First to Fourth Meeting

No	Student	Meeting 1		Meeting 2		Meeting 3		Meeting 4	
		AMS	Criteria	AMS	Criteria	AMS	Criteria	AMS	Criteria
1	RA	2.41	Good enough	2.82	Good	3.37	Excellent	3.61	Excellent
2	WI	2.26	Good enough	3.12	Good	3.37	Excellent	3.86	Excellent
3	DH	3.47	Excellent	3.47	Excellent	3.86	Excellent	3.86	Excellent
4	DI	2.58	Good	3.12	Good	3.61	Excellent	3.61	Excellent
5	DF	2.58	Good	2.87	Good	3.37	Excellent	3.37	Excellent

Based on the table above, at the first meeting, only one student got excellent criteria. For the first question about 'Does *Macromedia Flash 8* help you more easily for sketching triangles and angles? Why?', Almost students answer 'yes, because we can repeat

the animation'. For the second answer, 'Can *Cabri Geometry II Plus* help you more easily to understand the concept of various kinds of line inside triangle? Why?', almost students answer 'yes, because we just click and get the result'. For the third question 'Is the way of sketching triangle and angle manually similar to the way of *software Cabri Geometry II Plus*? Why?', Almost students answer 'No, (without reason)'. One student gives reason 'Cabri is difficult because I should memorize the tools and choos the correct one'. For the fourth question, 'If you do not understand how to skecth, what will you do?', almost student said 'I asked my friend or teacher'. According to the students' answer, teacher asked students to practice more using Cabri and give various respons to their metacognition sheet.

At the second meeting, there were four students got good criteria and one of them got excellent criteria. We conclude that students' metacognitive skill is increased. According to students' answer about the first question; 'Does *Macromedia Flash 8* help you more easily for sketching triangles and angles? Why?'. Almost students answer 'yes, because information in textbook is more difficult than *Macromedia Flash*. For the second question, 'Does *Cabri Geometry II Plus* help you more easily to understanding the concept of kinds of line inside triangle? Why?', almost students answer 'yes, because we just click we get the result'. For the third question, 'Is the way to sketch triangle and angle manually is the same easy with *software Cabri Geometry II Plus*? Why?', students answer is different to the first meeting. Their answer is '*Cabri Geometry* is easier than manual because we get the not accurate position while sketch using compass. For the fourth question, 'If you do not understand how to skecth, what will you do?', almost students said 'I asked my friend or teacher'. According to students' answer, teacher asked students to practice more to use Cabri and to give various respons to their metacognitive sheet.

All metacognitive skill studetns at the third and the fourth meeting are excellent. In general, from the first to fourth meeting, we can conclude that the students' metocognitive skills can be practised. This result was suitable to the results of Johar and Meliyana (2010). Mulbar (2008) explains teaching metacognitive strategies to students can increase their achievement. To do that, students should practice to answer some metacognition questions, for instance what, why, and how, while they are reading and learning.

## **Conclusion**

Metacognitive skill is important in mathematics learning process. Teacher should facilitate their students to practice answering the metacognitive questions. There are some strategies to practice metacognitive skills. From the first to the fourth meeting, we can conclude that students' metocognitive skills were increased. Software is one of the media, which make students interested in learning mathematics and increase their meatcognitive skills.

## **References**

Adegbija, V & Fakomogbon, A. 2012. Instructional Media in Teaching and Learning: a Nigerian Perspective. *Global Media Journal African Edition 2012 Vol 6 (2)*. Retrieved on March 20, 2013 from <http://globalmedia.journals.ac.za/pub>

- Bruning, R. H., Schraw G. J, & Ronning, R. R. 1995. *Cognitive Psychology and Instruction*. USA: Prentice Hall
- Burns, et al. 1986. in [www.afakhriati.wordpress.com](http://www.afakhriati.wordpress.com). Retrieved on March 3, 2008
- Johar, R, Meliyana. 2010. Menilai Perkembangan Metakognitif Siswa dalam Belajar Matematika. *Prosiding Seminar Nasional Evaluasi Pendidikan dan Penelitian Matematika*. Banda Aceh: Fakultas Keguruan dan Ilmu Pendidikan, Universitas Syiah Kuala.
- Kurz, T. L., Middleton, J. A., & Yanik, H. B. 2005. A taxonomy of software for mathematics instruction. *Contemporary Issues in Technology and Teacher Education* 5(2). Retrieved on March 24, 2013 from <http://www.citejournal.org/vol5/iss2/mathematics/article1.cfm>
- Mulbar, Usman. 2008. *Metakognitif Siswa dalam Menyelesaikan Masalah*. Retrieved on January 27, 2013, from [ejournal.unesa.ac.id/article/2114/36/article.pdf](http://ejournal.unesa.ac.id/article/2114/36/article.pdf).
- Prayitno, A & Sugiharto, B. 2010. Mengoptimalkan Minat, Keaktifan Berkomunikasi, Keterampilan Metakognitif, dan Penguasaan Konsep dengan Classwide Peer Tutoring (Cwpt). *Seminar Nasional Pendidikan Biologi FKIP UNS 2010*. Retrieved on March 24, 2013 from [jurnal.fkip.uns.ac.id/index.php/prosbio/article/](http://jurnal.fkip.uns.ac.id/index.php/prosbio/article/)
- Semampouw, H. 2012. Strategi RQA dalam Perkuliahan Genetika Berbasis Metakognitif dan Retensi. *prosiding Seminar Nasional MIPA dan Pembelajaran 2012 Jilid I, Malang*, 423-433
- Sopian, A. dan Widodo, S. 2007. Pemanfaatan Cabri Geometri II Plus dalam Pembelajaran Mata Kuliah Konsep Dasar Matematika pada Pokok Bahasan Geometri. *Jurnal Pendidikan Ke-SD-an vol. 2. No. 8, UPI*. Retrieved on February 2, 2013 from <http://jurnal.upi.edu/md/view/92/pemanfaatan-cabri-geometri-ii-plus-dalampembelajaran-mata-kuliah-konsep-dasarmatematika-pada-pokok-bahasan-geometri.html>
- Susantini, E. 2009. The Development of Biology Material Resources By Metacognitive Strategy. *Jurnal Ilmu Pendidikan*. Jilid 16 No. 2 Juni 2009.
- Sugiarto, B. 2012. Korelasi Antara Keterampilan Metakognitif dengan Hasil Belajar Siswa di SMAN 1 Dawarblandong, Mojokerto. *Unesa Journal of Chemical Education* Vol.. 1, No. 2. pp. 78-83 September 2012 ISSN: 2252-9454
- Suzana, Y. 2004. Pembelajaran dengan Pendekatan Metakognitif untuk Meningkatkan Kemampuan Pemahaman Matematik Siswa SMU. *Prosiding Seminar Nasional Matematika* (pp B4: 1 – 10). Bandung: Fakultas Pendidikan Matematika dan Ilmu Pengetahuan Alam, Universitas Pendidikan Indonesia.