The Effectiveness of Metacognitive-Based Learning Model

IOP Conf. Series: Journal of Physics: Conf. Series **1028** (2018) 012084 doi:10.1088/1742-6596/1028/1/012084

The Effectiveness of Metacognitive-Based Learning Model

Mas'ud B[1], Marwati Abd. Malik[1], Badaruddin[2]

[1]Mathematics Education Department, Muhammadiyah University of Parepare
[2]English Education Department, Muhammadiyah University of Parepare

masud_umpar@yahoo.com

Abstract: The study reports about the effectiveness of metacognitive-based learning model in learning mathematics covering learning completeness, students' learning activities, teacher's learning management skill, and students' response. Metacognitve-based learning model is model applied in learning mathematics optimizing the student's metacognitive skill, including five phase; (1) orientation, (2) presentation and information, (3) simulation, (4) guided training, and (5) self-training. The population of this study was taken from all of the Eleventh Year Students of SMA Negeri 4 Parepare in 2016/2017. Both samples of experimental and control class consist of 24 students for each. The data were analyzed by descriptive and inferential statistics. The result of this study shows that the results of the analysis shows that the results of learning mathematics of students who are taught by applying the model of learning model of metacognitive skills-based learning is better than the result of learning mathematics students who taught without applying a model of metacognitive skills-based learning on mathematical material.

1. Introduction

An important component of mathematics learning that must be mastered and constantly improved is the problem-solving ability. As stated in Permendiknas no. 22 of 2006 on content standards, that one of the goals of learning mathematics is that learners have the ability to solve problems The ability to solve mathematical problems is needed by society, and the heart of mathematics is problem solving [1,2,3].

Data from Trends in International Mathematics and Sciences Study (2011), Indonesian students ranked 38 out of 45 countries in the field of mathematics. While the data of the Program for International Student Assessment (2015), Indonesian students are ranked 54 out of 72 countries in the field of mathematics (OECD, 2016). This shows that the problem solving ability of Indonesian students mathematics is still in low category. In addition, the ability to solve mathematical problems is needed by society, and the heart of mathematics is problem solving [1]-[5].

The ability to solve mathematical problems is influenced by many factors, including the use of less precise learning model with the material to be taught. One of the learning models that can be applied is a metacognitive skill-based learning model. The metacognitive skills-based learning model is a structured learning model that is similar to the mathematical problem solving structure. The metacognitive-based learning model has five phases: (1) orientation, (2) presentation and information on metacognitive skills, (3) simulation of metacognitive skill implementation, (4) guided training, (5) self-training.

In general, when the application of metacognitive skills-based learning in learning both, then the tendency of math problem solving skills is also high, and vice versa. The results of indicate a positive relationship between metacognitive skills and the ability to solve mathematical problems of learners [4], [5] and [6]. Learners who have good metacognitive skills will show good learning achievement as well as learners who have low metacognitive skills [7], [8].

The effectiveness of learning is a useful result obtained after the implementation of teaching and learning process, effectiveness can be viewed as an achievement of desired or targeted goals [[9].. Effectiveness indicators includes (1) learning completeness, (2) students' learning activities, (3) teacher ability in managing learning, (4) students' response to learning [10]. So the effectiveness referred to in this research is the success of learning can be seen from 4 indicators above. It is said to be effective, if it meets the three criteria of the indicator, the learning mastery must be fulfilled.

2. Methods

This study evaluates the effectiveness of a metacognitive-based learning Model in improving the student's achievement in learning mathematics. This study was a quantitative research using true-experimental design. The variables of this study were learning result and the application of metacognitive-based learning model in mathematics learning. The design of this study is randomized control group design:

R	***E***	T_1	Q_1
R	***K***	T_2	Q_2

Figure 1. Randomized Control Group Design

Where:
R : random (random selection of control and experimental classes)
T_1 : treatment for experimental class
T_2 : treatment for control class
Q_1 : learning result for experimental class
Q_2 : learning result for control class
E : experimental class
K : control class

This studied was carried out in SMA Negeri 4 Parepare located in Parepare, South Selatan Province, Indonesia. The population of this study was the eleventh year students in academic year 2016/2017 which consists of four classes. The sample of this study were the XI $Science_2$ students as experimental class and XI $Science_4$ students as control class, both samples were determined by cluster random sampling. The instruments of this study were paper-based test, observation sheet, and Questionnaire of student responses. The data of this study were analyzed by descriptive statistics (students' learning completeness, students' activities, and students' response) and inferential statistics (test of population normality using Kolmogrov-Smirnov Normality Test and Shapiro-Wilk Test, and test homogeneity of population variance using Levenes's Test for Equality of variance.

3. Results

The result of descriptive analysis for both experimental and control class is shown in Table 1 below.

Table 1. Description of Mathematics Learning Result for Experimental and Control Class

Experimental Class		**Control Class**	
Statistics	**Statistics Value**	**Statistics**	**Statistics Value**
Sample Size	24	Sample Size	24
Maximum Score	100	Maximum Score	100
Average Score	83.67	Average Score	77.58
Standard Dev.	7.66	Standard Dev.	9.69
Variance	58.67	Variance	74.67

Students' mathematics Learning Result was grouped into five categories as in Table 2.

Table 2.Classification of Students' Mathematics Learning Result

		Experimental Class		Control Class	
Score	**Category**	**Frequency**	**(%)**	**Frequency**	**(%)**
0 – 54	Very Low	0	0	0	0
55 - 64	Low	0	0	4	17
65 - 79	Average	7	29.2	10	42
80 - 89	High	10	41.6	7	29
90 – 100	Very High	7	29.2	3	12
	Total	24	100	24	100

The categorization of the results of the students' mathematics learning analysis is presented in Table 3.

Tabel 3.Categorization of The Result of The Students' Mathematics Learning Analysis

		Experimental Class		Control Class	
Score	**Category**	**Frequency**	**(%)**	**Frequency**	**(%)**
0-74	Not complete	3	12.5	9	37.5
75-100	Complete	21	87.5	15	62.5

The activities of students taught by applying metacognitive skills-based learning models are better than those taught without implementing a metacognitive skill-based learning model. The result of data analysis on experimental class and control class by Kolmogorov-Smirnov test obtained sig value 0,200. Because of the sig value of 0.200> 0.05, the score of mathematics learning outcomes for both classes is from a normally distributed population.

a. Homogenity Test

The sig value for Levene's Test for Equality of variance is 0.231> 0.05. So it can be concluded that the data of mathematics learning outcomes for both groups came from a homogeneous population.

b. Hypotesis Test

T-value = 2.413 and t-table = 1.68. Because t-value > t-table,it was concluded that learning outcomes by applying metacognitive skill-based learning models were better than without applying a metacognitive skill-based learning model at a 5% significance level.

4. Discussion

There are 87.5% of students in the experimental class have completed the study. Control class 62.5% of students who have completed study. The average of student learning outcomes was taught by applying a metacognitive skill-based learning model of 83.67, while taught without applying a metacognitive skill-based learning model of 77.58. Student activity in experimental class is 44,57%, control class 38,2%.

The t-value = 2.413> t-table = 1.68. From the results of the analysis shows that the results of learning mathematics of students who are taught by applying the model of learning model of metacognitive skills-based learning is better than the result of learning mathematics students who taught without applying a model of metacognitive skills-based learning on mathematical material.

5. Conclusion

The metacognitive skill-based learning model is more effectively in enhancing the student's mathematics achievement. The activities of students taught by applying metacognitive skills-based

learning models are better than those taught without implementing a metacognitive skill-based learning model.

References

[1] Bell, Frederick H. 1978. *Teaching and Learning Mathematics: In Secondary Schools*. Second Printing. Dubuque, Iowa: Wm. C. Brown. Company.
[2] Branca, 1980. *Problem Solving as a Goal, Process, and Basic Skill*. *Problem Solving in School Mathematics*. Editor: Krulik, S. and Reys, R.E. Reston: National Council of Teachers of Mathematics.
[3] Shadiq, Fadjar. 2004. *Penalaran, Pemecahan Masalahdan Komunikasi Dalam PembelejaranMatematika*. Yogyakarta: P4TK Matematika.
[4] Arsyad N Rahman A and Ahmar A S, 2017 Developing a self-learning model based on open-ended questions to increase the students' creativity in calculus Glob. J. Eng. Educ. 19, 2 p. 143–147.
[5] Ahmar A S and Rahman A, 2017 Development of teaching material using an Android Glob. J. Eng. Educ. 19, 1.
[6] Eriawati. 2013. *Aplikasi Keterampilan Metakognitif dalam Pembelajaran Ekosistem di MAN Rukoh*. Journal Blotik, ISSN. 2337-9812, Vol. 1, No.1,Ed April 2013, Hal 1-66.
[7] Corebima, A.D. 2007. *Learning Strategies Having Bigger Potency To Empower Thinking Skill And Concept Gaining of Lower Academic Student. Proceeding of Redesigning Pedagogy Conference*, Nanyang, May 28-30-2007. European Journal of Education Studens. Vol. 2. Issue 5. 2016.
[8] Mas'ud, Arifin Ahmad and Gufran Darma Dirawan. 2015. *Math Problem Solving with Metacognitive Skills Involving Foreign Students Senior High School 3 Parepare.* Journal. Man In India, 95 (3) : 813-820 OECD. 2016.
[9] Coutinho, A.S. 2007. Educate~ Vol.7, Issue.1, 2007, pp. 39-47. (Online). *The Relationship Between Goals, Metacognition, And Academic Success.* Tersediapada: http:// www. educatejournal.org/.
[10] Livingston, J.A. 1997. *Metacognition: An Overview*; available: http:// www.qse.buffalo.edu/fas/schuell/cep564/metacog.htm, diakses, 5 Agustus 2014.
[11] Trianto. 2010. Mendesain Model Pembelajaran Inovatif-Progresif: Konsep, Landasan, dan Implementasinya pada Kurikulum Tingkat Satuan Pendidikan (KTSP). Jakarta: Kencana Prenada Media Group
[12] Suherman, Erman., dkk. 2001. *Strategi Pembelajaran Matematika Kontemporer.* Bandung: Jica.