

**THE DIFFERENTIATE BETWEEN THE RESULT OF MATHEMATICS  
USING METACOGNITIVE APPROACH AND MECHANISTIC APPROACH  
IN SET (HIMPUNAN)**

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**Abstract**

Generally, students do not active in this learning teaching mathematics in the class. The less of effectiveness will influence and satisfy toward the result of mathematics. Because of that, we find other approach that can make students become an active learner. For example: using metacognitive approach. The teaching learning using metacognitive approach is embed the awareness to students how to build, monitor, and control about what they have known, what they needed to do it, and how to do it. The aim is to know whether or not the differentiate between the result of mathematic for students who using metacognitive and mechanistic approach. The kind of research is quasi experiment. This research will hold at SMP Negeri 2 Pabelan grade VII C which called experiment class. It will do using metacognitive approach and then grade VII B which called control class. It will do using mechanistic approach. The result of this research shows that metacognitive approach is better than mechanistic approach. The teaching learning using metacognitive approach is better because this approach is embedding the awareness of students in the teaching learning mathematic in the class. It shows that students more aware to learn in the class, they also more concentration and listen the teacher's explanation, and they also find their new problem and how to solve their problem in teaching learning mathematic.

Keywords: metacognition, metacognitive approach

**Introduction**

Mathematic is a course that has taught in elementary school until university. The fact shows that mathematic is one of the difficult course and also frightened. Darhim in Maulana (2008) states that mathematic is one of course that is out favor students.

Sometimes, in communicating of concept, giving example and exercise in the teaching learning process is in traditional and conventional way, because it is just depend on the text book. It will affect students become passive in a class and students also become a receiver (Atma, 2010). Supinah et al (2008) says that in the teaching learning process teacher as a subject and student as an object. Next, Balitbang Puskur (2007) states that teaching learning of mathematic' teacher has to teaching learning process, it just based on the text book with the varieties approach.

Atma (2010) explains that teachers have to choose and use approach, strategy, method, and technique in teaching learning process of mathematic. It will make students active in learning teaching process in physic and social. The emphasis teacher in learning teaching process has to balance between doing and thinking. Teachers have to develop about awareness of students in doing teaching learning activities. It means that students do not have any skills but they have to understand why activities have to do and what the implementation.

Romli (2010) states that teaching learning process have to give a chance for students to design and construct knowledge. The knowledge cannot move instantly from teachers' think to

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students' think, because students have to become an active to construct knowledge based on their own cognitive maturity.

The teaching learning process has to make students recognize about their own ability, whether deficient and excess (Hamdani, 2011). Students have to identify what they have to solve the problem when they learn. Here, students have awareness to understand the teaching learning process. The teaching learning process has to give a chance for students to build the mathematic concept and develop mathematic skills, like build the new mathematic concept, solve problems in many kinds of concept, apply the strategies, and reflect the mathematic' problem in teaching learning process (Risnanosanti (2008)), and Mustamin (2011).

Creating the teaching learning process that emphasize in students activity, it makes students become more active and also give them a chance in the process of thinking that using appropriate approach. Schoenfeld in Atma (2010) states that one of approach in teaching learning process to instruct the thinking process and how to think a good one in solve the mathematic' problem is using metacognitive approach.

Suzana in Maulana (2008) defines that teaching learning process is metacognitive approach which implant the awareness how to design monitoring and controlling about what they have to know and need. It uses for doing and how to do it. The teaching learning process that using metacognitive approach have emphasize in teaching learning process to help students and guide them whether they have found the difficulties when they are learning.

Nindiasari in Maulana (2008) explains that teaching learning process that using metacognitive approach is important to develop the students ability in learn about strategy and cognitive. The example of cognitive strategy is asking to their selves and controlling their awareness.

The teaching learning process that using metacognitive approach can be used to solve problems in many kinds example of mathematic. It is understand the problem, plan the strategy, solve that use or apply the strategy and evaluate the result. The applying of teaching learning process that using metacognitive approach have to do problems in a good study toward exercises that have given from teacher or problems toward the teaching learning process. (Lidinillah, 2007).

The study that have done by Maulana (2008) gets the result that teaching learning process that using metacognitive approach give the good result of mathematic in teaching learning process. The other research that have done Arifah (2012) says that teaching learning process that using metacognitive approach is more effective in the result of teaching learning mathematic process. The other research have done by Fashikun (2008) states that teaching learning process that using metacognitive approach influence toward the result of teaching learning mathematic process.

Based on the result of observation and interview by the researcher in SMP Negeri 2 Pabelan on November 13<sup>th</sup> 2013 and December 2<sup>nd</sup> 2013, the researcher got the information that they used conventional in teaching learning mathematic process. Teacher as a learning centre, teacher taught by using mechanistic approach and gave exercises to the students. Here, students felt bored and did not enthusiastic to join in teaching learning process. It supported by students turned around to speak with their friends. Students became passive joined in teaching learning process, gave opinion, and answered the questions. In the teaching learning process, we knew that teacher just transferred their knowledge to students without gave a chance to students to exploitation in the course with their friends together. For example, discussion and found the conclusion of the materials. The observation result was the average of their final test semester 1 2013/2014 was 60.4 of 168 students. Because of that, the researcher interest to do a study entitled: *The differentiate between the result of mathematics using metacognitive approach and mechanistic approach in Set (Himpunan)*

## **The problem**

Based on the background above, it concludes the problem that: whether or not the differentiate between the result of mathematic for students who using metacognitive and mechanistic approach in set

### **Hypothesis**

The hypothesis in this study is the differentiate between the result of mathematic for students who using metacognitive and mechanistic approach in set

### **Review of Literature**

#### 1. Metacognitive

##### a. Definition of metacognitive

The characteristic of metacognitive comes from metacognition. That word refers to metamemory, metacomponential, skill and process. Kluwe and Weinert in Eka (2013) says that metacognitive comes from Greek is “meta” and “cognition”. Meta means after or more, then cognition means skill that relate with process of thinking. Metacognitive means second-order cognition which has the meaning of think of think, knowledge of knowledge or reflect about actions. Others, it also means as the next step based on the cognitive process (Solso, 2007).

Metacognitive defines by John Flavell, a physiology from Stanford University in 1976. Favell in Wen (2012) defines metacognitive as someone knowledge with process and cognitive product by themselves or everything that relate with the process and product. Metacognitive relates to active monitor, guide the consequence and also organize the monitor process and how to guide it. The aim of cognitive is to develop the process and support some of concrete aim.

Metacognitive get debating in the definition. It is will affect that metacognitive does not same in many kind of research of psychology and also does not apply in a psychology. Besides that, the definition of metacognitive is giving the emphasis of awareness in the process of thinking (Eka, 2012).

Wellman in Eka (2012) explains that metacognitive is a cognition which they have to think two steps more and more that used control of cognitive activities. Because of that, metacognitive is also process of someone thinking or someone with their own cognition. It balance with Wellman, Kuhn in Heru (2011) defines metacognitive as an awareness and management in the process and cognitive product which had someone or people usually says “think about think”. Two of metacognitive definition support by Huitt in Romli (2010) states that metacognitive is about someone knowledge about the cognitive system, someone thinking and the essential skill in learn to learn.

Next, Brown in Mustamin (2011) defines metacognitive is an awareness toward the individual cognition. The method is to manage the process of individual cognition toward how to manage, plan and guide the cognitive activities. It also explains by Scheneider in Heru (2011) defines that metacognitive as a knowledge or cognition activities. The concept covers of individual knowledge where the background as an individual who has ability about the basic of the difference cognitive and knowledge. It also about the strategies to face many kinds of difference task, so individual does not think about the object and attitude, but also about cognition itself.

Based on many kinds of definition above, it concludes that metacognitive is someone knowledge about the process of their thinking and ability to control their cognitive activities while learning and thinking.

##### b. Classification of metacognitive

Flavel in Kadir (2009) explains that metacognitive consists of: 1) metacognitive knowledge and 2) metacognitive experience or regulation. Solso (2007) states that metacognitive knowledge refers to effort monitoring and reflect in someone’s thinking. It consists to factual knowledge, like knowledge about task, purpose, or me and strategy knowledge like how and when it will use specific procedure to solve problem.

Metacognitive regulation refers to someone's ability to use metacognitive knowledge to get the purpose.

Flavel, Baker & Brown, Gagne in Romli (2010) and Schraw & Dennison in Carlo (2009) divides metacognitive become two main aspect, they are knowledge of cognition and regulation of cognition. Knowledge about cognition consist of three categories, they are: 1) knowledge about people variable, 2) knowledge about task variable, and 3) knowledge about strategy variable. Knowledge about people variable refers to knowledge and belief with regard to cognitive and affective of someone. Next, knowledge about task variable refers to how the task will influence and limit when they have to do it. Then, knowledge about strategy variable refers to ability to use many kinds of ability to solve problem, which find the knowledge of declarative, knowledge of procedural, and knowledge of conditional. Regulation comes from cognitive consist of five categories, they are: 1) planning (plan, purpose and allocate the resources before learn), 2) information management strategies (the information used to do the process effectively, 3) monitoring (state in the strategy to learn), 4) debugging strategies (using of strategy to fix the understanding and action toward any mistakes), 5) evaluation of learning (analyze the performance and strategy that have been used after the process of teaching learning).

The different opinion comes from Desoete (2001) states that metcognitive consist of 1) metacognitive knowledge, 2) metacognitive task and 3) metacognitive belief. It supports by Desoete, Biryukov in Atma (2010) states that metacognitive concept is hypothesis of someone's thinking about their thinking of metacognitive knowledge. Metacognitive knowledge consists of declarative knowledge, procedural knowledge, and conditional knowledge. Declarative knowledge is knowledge about myself become learner and also knowledge about strategy, skill, and materials that needed to learn. Procedural knowledge is knowledge about how to use something that has known in declarative knowledge in learning activities. Conditional knowledge is knowledge about how to use procedural of skill, or strategy and maybe it is not useful anymore. It also about why the procedural do not use and in this condition is better than other procedural. Metacognitive knowledge is to use metacognitive strategy, sequence process to control the cognitive activities, and to make sure that the purpose of cognitive has fulfilled it.

Many kinds of definition by the experts above, but it concludes that metacognitive consists of metacognitive knowledge and metacognitive regulation.

## 2. The result of study

The result of study is one of terms that relate to teaching learning process. The result of study is ability, skill, and attitude of someone in to do anything. Ability, skill, and attitude can be fulfilled whether teaching learning process will happen (Arifin in Maisaroh 2010). Tardif in Hasmiah (2010) defines teaching learning becomes a value to describe the result of teaching learning process that have been reach students based on the criteria that have been stated. Besides that, Nana Sudjana (2009) defines the teaching learning process of students becomes a change of attitude in the result of teaching learning process. It covers cognitive, affective, and psychometric. Next, Dimiyati and Mudjiono in Atma (2010) states the result of study is interact of teaching and learning. Stand by teacher side, the result of study is when the materials have done. Stand by students' side, the result of study is when the teaching learning process has done from the top of learning process.

The classification of the result of study consists of three; they are cognitive ranah, affective ranah, and psychometric ranah. Cognitive ranah refers to the intellectual of the result of study. It consist of six aspects, knowledge, understanding, application, analysis, synthesis, and evaluation. Affective ranah refers to attitude and value of someone, while psychometric refers to ability and skill in the individual.

Simply, the result of study influences by two factors; they are internal and external. Internal is factors that influence the result of study from the students' learning. It consists of two aspects, physiology and psychology. External is factors that come from outside of

students that can influence the teaching learning process. External covers social and non-social environment.

3. Teaching learning process using metacognitive approach

Suzana in Maulana (2008) defines that teaching learning process using metacognitive approach as a teaching learning which build awareness how to plan, monitor, and also how to control what they have known, what they needed to do and how to do it. Teaching learning process using metacognitive process emphasize in the students teaching learning process to help and guide students when they find difficulties and also develop the concept while they are learning mathematic.

The main element of teaching learning process using metacognitive approach to practice in a small group to formulate and answer some cognitive questions that refers to their selves (Kramarski in Risnanosanti 2008). This question focus on comprehending the problem, build connections, use the appropriate strategy to do the questions, and reflect the process and finalization.

Based on Elawar in Maulana (2008) teaching learning process using metacognitive process which derives in three steps:

1. Preliminary discussion

First, teacher explains what the topic that they have to learn. Students have given materials and embed concept using question and answer while giving the material. Teacher monitors the students to minimum their fault. Students are guided to embed the awareness to ask to them while they are answer the question. At the end to understand concept, teacher hopes that students understand all of the materials and aware what they have to do, how to do it, and which part that they do not understand, what are questions appear, and how to solve it.

2. Self awareness

Students are given problem with the same topic and have to do it in individually. Teacher monitors class and guides in individually. Monitoring is to make students to control themselves toward their fault and giving instruction to students to aware on it. Teacher help students to monitor their thinking, it is not only give the correct answer while students do mistakes.

3. Conclusion

Conclusion that has done by students is a recapitulation what have done in the class. In this step students have to conclude by themselves and teacher guides to give some questions.

### **Research methods**

This research refers to quasi experiment research that has to do using two treatments. In the experiment class is teaching learning process using metacognitive approach and control class is using conventional. Designing this research is using pretest posttest control group design. The population in this research is all of students grade VII SMP Negeri 2 Pabelan, the sample is using students grade VII B and grade VII C. The taking of sample is using cluster sampling technique. Grade VII C is experiment class that giving teaching learning process using metacognitive approach and control class using do not.

This research is using two methods to collect data, test method and documentation method. Test method is using to collect data about the students' result of study, documentation method is to collect other data relates this research, the name of student and the total of students. The analysis data is descriptive and inferential. The descriptive analysis is using to measure the result of study that covers minimum score, maximum score, average, and standard deviation. The inferential analysis covers normality test, homogeneity test, and average test.

### **Result of research and Discussion**

Based on the data, in the first step based on the pretest both of class, it got the information that the average's ability of experiment class I 57.91 with maximum score is 85.00 and minimum score is 40.00. The average of control class is 59.60, maximum score is 80.00 and



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minimum score is 40.00. Based on the t-test, it got the significant score is 0.570 ( $> 0.05$ ) meant there is no difference between the result of study of experiment and control class.

The teaching learning in experiment class was using metacognitive approach, while control class was using conventional. The conventional teaching learning means the teaching learning is using approach that used by teacher in the previous meeting. On the other hand, it was not using metacognitive approach while teacher was teaching. The descriptive analysis of research was shown that the average of experiment class is 55.07, maximum score is 96.25 and minimum score is 22.50, while average of control class is 49.95, maximum score is 72.50 and minimum score is 25.00.

Based on the analysis of the result, it concluded that the average of the result of study in experiment class is higher than average of the result study in control class. Besides that, it shown from the result of preliminary data and the result of the research, it concluded that the result of both of study was decreasing although gave the different treatment. It was shown from the maximum score, minimum score, and average of the result of both of the class. In experiment class, the average of the result was decreasing from 57.91 to 55.07, maximum score was increasing from 85.00 to 96.25, and minimum score was decreasing from 40.00 to 22.50. In control class, although using the same approach by teacher in previous study is conventional, the average of the result of study was decreasing from 59.61 to 45.95, maximum score was decreasing from 80.00 to 72.50, and minimum score was decreasing from 40.00 to 25.00. It defined that the result of study was not influence by the teaching learning approach but also others factors. For example: teacher as a guide of teaching learning process, the instrument of teaching learning process, students' interest, students' ability, and students' environment. It supported by Syah (2010) states that besides teaching learning process, the result of study is also influence by internal and external factors from students. The internal factor comes from their selves, includes psychic, intelligent, attitude, interest, ability, and motivation. The external factor comes from outside of students, includes the social environment (teachers, staffs, communities, and family) and non-social environment (school's building, house, the things to study, the time that students' use)

The results of study both of the class will analysis using inferential uji t. The data uji t was shown the significant score is 0.036 ( $< 0.05$ ) meant  $H_0$  refused. It meant there was difference between the result of study of experiment and control class. The average of experiment class was 55.07 and control class was 45.95. It supported that the result of study of experiment class was higher than the result of study of control class. It concluded that there was the differentiate between the result of mathematic for students who using metacognitive and mechanistic approach in set.

The teaching learning process using metacognitive approach made students became an active learner in teaching learning process. Before using metacognitive approach, the teaching learning process was controlling by teacher and students were only receive the lesson. Students wrote what their teacher wrote in the black board and became a passive learner in the class. Students were speaking with their friends and looked did not enthusiastic to follow the lesson although answer the questions have given. It supported when there was a question from students that "was there the discussion in group or not and have we do individually?" After got the answer that teaching learning process as like that, they looked cheerful and enthusiastic. In the teaching learning process, all of students had aware to concentrate and listen what teachers' said, students also became an active learner to answer the question, students' also focused to find the problem solving about the question and did not speak with their friends.

Applying the teaching learning process using metacognitive approach made students got more chance to explore the materials with their teacher and asked their friends to join on the discussion. By the discussion, students could exchange the opinion to do the question and made students more critics. Students are also braver to say their opinion in their mind.

The teaching learning using metacognitive approach has shown from the step that used students to answer the questions. Students wrote what they knew and what they did not know. While doing exercises, students looked some question that they have done in previous meeting,

they looked there was the similar or difference both of old or new question. Whether the questions had a similar with previous question, they would do with the same step, but whether was difference they would do with different step. After they did, students are more aware to check their answer, whether was correct or was not. When they doubted with their answer, they wanted to ask their friends or teacher about it. Here, they explained where they found it and they felt it was strange and not logically. At the end of teaching learning process, students would act as a good listener to conclude the conclusion. They could conclude the main of the materials that they had learned today.

The teaching learning using metacognitive approach is practicing students to embed the awareness how to plan, monitor, and control what they have known, what they needed, and how they to do it. The teaching learning process using metacognitive process will emphasize the students' activities and help or guide students whether they found the difficulties while learning mathematic. Students in teaching learning process, it is not only as a receiver the lesson, but they can find the main of the materials that their teacher's have given. Students learn to understand the problem, plan the strategy, use the appropriate strategy and score the result of study. The teaching learning process will make students able to control their awareness to think the questions. At the end, it will influence to the result of study. It supports by Arifah (2010) that teaching learning process using metacognitive approach toward the influence of teaching learning process.

Students in teaching learning process will derive into some of small group and force students to socialize. Here, students become an active learners, braver in giving opinion and answer the questions. The teaching learning process makes students to get more chance to explore the materials with their teacher or friends. They also understand the concept of materials and make the interesting atmosphere in the class. It will make students more enthusiastic in teaching learning process. It supports Maulana (2008) states that teaching learning process using metacognitive approach will make students become an active learner in the teaching learning process. It also gives more chance to students to understand the materials with their teacher or friends in group discussion. It will increase their self awareness in learning mathematic. Based on the explanation above, it concludes that there is the differentiate between the result of mathematic for students who using metacognitive and mechanistic approach in set.

### **Recommendation**

Based on the research, the researcher gives the opinions, they are:

1. Teachers have to apply the teaching learning using metacognitive approach to practice students to embed the awareness how to plan, monitor, and control what they have know, what they needed and how to do it. The teaching learning using metacognitive approach have a good position to control and control the cognitive process in students' thinking, so learning and thinking will be effective and efficiency. It will give the positive effect in teaching learning process.
2. Students have to try to develop their own awareness in teaching learning process to understand the problem, plan the strategy in problem solving and use or apply the strategy and score the result. So, students can solve the problem better.
3. Researcher want to apply the teaching learning using metacognitive approach, the researcher have to choose the different materials.

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