Implementation of Creative Problem Solving Model to Improve The High School Student's Metacognitive

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Abstract. This Research is quasi-experimented study with 3x2 factorial and nonequivalent control-group design. The population in this study were all 10th grade students at one of the Senior High School in Ciamis. Furthermore, two sample groups randomly selected (experimental class and control class) with a purposive sampling technique. Each sample group divided into high, medium, and low level based on students' mathematical prior knowledge. The experimental class used Creative Problem Solving models but the control class used conventional models. The instrument used in this study were the metacognitive ability test. The differences of metacognitive ability improvement based on students' mathematical prior knowledge and applied learning model was tested by two ways ANOVA at significance level 0.05, after prerequisites testing are met. Based on this research, it is known that (1) Students' metacognitive ability improvement that has been acquired the Creative Problem Solving model is significantly better than students who acquired conventional learning; (2) There are significantly differences in metacognitive abilities improvement among students who obtain the Creative Problem Solving model with students who received conventional learning in terms of students' mathematical prior knowledge level, high, medium, and low. Metacognitive abilities improvement of Experimented students who have a high and a medium mathematical prior knowledge level, are significantly better than the improvement of Control students' metacognitive abilities that have a high and a medium mathematical prior knowledge level. However, the increase in metacognitive abilities of students who have lower mathematical prior knowledge level in the experimental class and the control class did not differ significantly**.**

1. Introduction

Metacognitive skills in general is a person's consciousness to be knowledge about the process and results of thinking (cognition) and the ability to control and evaluate their own cognitive processes. Metacognitive skills have an important role in learning (Flavel in [1]. It is this ability which is key to the success of students. In solving the problem (Schoenfeld; Gourgey in [2]), which means that students who have the ability metacognitive low will lead to failure in solving problems , while students who have good metacognitive skills will enhance their problem-solving ability [3].

Another advantage of the metacognitive ability is its role in the success of student learning and is closely related to intelligence (Borkowski, et al. In [1]). These capabilities include common knowledge

that can be used for various tasks which enables the use of strategies, the level of effectiveness of the strategy, and self-knowledge (Wildfire, 2013 [4]). Students who display the metacognitive skills, in solving mathematical tasks have better learning outcomes than students who do not show the metacognitive ability (Kramarski and Mizirachi in [5]). Students who have good metacognitive abilities, can find a cognitive style that suits his character (Brown; Rahman and Philips in [6])

When a student uses metacognitive skills, in the learning process going on an activity that involves a reflective process to what the students themselves. Students are trained to explain what was on his mind, will be able to explain it in detail, is also capable of assessing reasoning and problem-solving strategies, and be able to correct the misconception that understands (Web, et al. In [5]). Thus, the increase in metacognitive skills can train students to proficiently communicate, solve problems, control yourself, set the environment, as well as adept at selecting and implementing strategies to improve cognitive abilities.

The study habits led students are able to analyze the learning needs, formulating learning goals, and design a learning program. In addition, students are also able to select and implement strategies, monitor and evaluate whether the strategy has been implemented correctly, check the results, and reflect and get feedback [7] (Siswono 2004 [8]) describe the creative process, known as "Creative Problem solving (CPS) "in three main steps, namely to understand the problems, generate ideas and plan of action. Understanding of issues covering the steps to find purpose, find the data or facts and find problems as the target of questions.

2. Research Method

2.1 Design

This research is a quasi-experimental or quasi-experiment conducted using two research groups, the experimental group (using model Creative Problem Solving) and the control group (using conventional model, a model which is commonly carried out in the schools using the curriculum in 2013) .As consideration of the use of this study design is used because the sample group has been formed previously, meaning that the researchers did not classify the sample into groups randomly as it may interfere with the effectiveness of learning.

Therefore, the researchers used a purposive sampling techniques, the samples are used according to the purpose of research, is also a modest sample, in the sense that the researchers did not classify a random sample, but researchers only scrambles class groups only (Ruseffendi, 2005).

To view the Creative Problem Solving model implementation to metacognitive skills of students, each sample group was divided into three categories based on the capability initially, the initial capability of high, medium and low, so in this study is used a factorial design 3 x 2 factorial design this can be seen in the following table.

Table 13 x 2 Factorial Design

Early Mathematical Ability	Learning	
	Experiment (E)	Control (C)
High Initial Capability (T)	TE	TK
Initial capabilities Medium (S)	SE	SK
Low Initial Capability (R)	RE	RK

The variables used in this study consisted of independent variables and the dependent variable. The independent variables in this study the model of learning (Creative Problem Solving and conventional) and the beginning of students' mathematical abilities (a category of high, medium and low), while the dependent variable that metacognitive abilities of students.

In addition to a factorial design, this study also research design "non equivalent control-group design", namely the experimental group and the control group were selected without the procedure of random, but random class, then both groups were given pre-test and post-test, but only the experimental group is given treatment (Creswell, 2010 [10]). The study design is illustrated as follows:

Experiment group	0	X	0
Control group	0		0

Figure 1. Design of Research

With O : Pre-test / Post-test students' metacognitive skills

X : Creative Problem Solving learning model

2.2 Population and Sample Research

The location of the research is SMAN 1Ciamis, with consideration is one of the schools that have implemented the curriculum of 2013. However, only class X MIA who are already using the curriculum in 2013, so that the population used in this study were all students of class X in Lesson 2014 / 2015 and research samples taken two classes X MIA.

2.3 Research Instruments

The research instrument used in this study consisted of metacognitive skills tests. The research instrument used, developed through several stages: 1) the stage of manufacture of the instrument; 2) the validation phase a team of experts; and 3) the test phase instruments (tests metacognitive skills).

2.4 Metacognitive Ability Test

Metacognitive ability test is made in the form of a description. The written test consists of a pre-test and post-test. These instruments are given to all students in the experimental class and control class, with the question of pre-test and post-test made equivalent (relatively similar). The purpose of the pre-test is to see the homogeneity of the initial capabilities of students. While the purpose of the post-test was to determine student learning outcomes after the implementation of Creative Problem Solving learning model. Furthermore, from the pre-test and post-test visits gain or increase in metacognitive skills of students.

3. Results and Discussion

Results

Overview average difference in terms of each level early mathematical ability of students in both classes can be seen in the following figure.

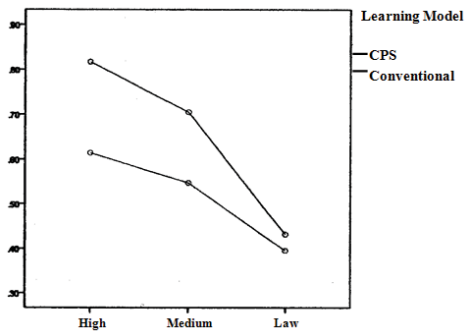

Figure 2. Graph N-Gain Metacognitive Ability in terms of early mathematical ability of students in the class CPS and Conventional

To see the effect of the interaction between the learning model and early mathematical ability of students to increase metacognitive skills, it can be seen that the value of the variable Model F * KAM (representing the interaction between the learning model and early mathematical ability of students) is 0849 with a value of significance is 0.434. The significance value greater than 0.05, so H0 is accepted. This means there is no effect of interaction between the learning model used by beginning students' mathematical abilities.

Discussion

Implementation of learning in this study held six meetings in the classroom. The time allotted at each meeting is 2 x 45 minutes. Observations in particular through student activity observation format are directly given to the experimental class, the class that implements the learning model Creative Problem Solving (CPS).

The initial stage of learning, the teacher gives motivation to the students through questions and answers and give some examples of applications of trigonometry in everyday life. Then the teacher describes the steps that will be undertaken student learning and divide students into small groups of 5-6 people with early mathematical ability composition of high, medium and low. She reminded the material prerequisites by providing some questions, in order to make the perception of student understanding. Furthermore, teachers share teaching materials to each student in the group. In the process of learning, the teacher only act as facilitators, teachers guide students to identify problems in teaching materials and describes the need to resolve problems that are given, such as source books, ruler, bow, and the paper's puzzle. After all the students understand what he should do, the teacher asks the students to work on all the problems that are given by way of discussion and learning together with members of his group.

By the time students discuss with each group, teachers around and observe the discussion and providing assistance with scaffolding techniques when needed. Thus, the students really think to understand the problem, identify the characteristics of the given problem, thinking about what he should do, to believe that they really can solve the problems given.

The last fifteen minutes, the teacher asks the class representatives to convey the results of the discussion in front of the class, with the aim of equalizing the perception and understanding of a concept and the resolution of a problem. Teachers also asked the students to criticize his work, delivered the rebuttal, or ask students deliver solutions with different strategies. Thus, students are trained to share ideas, express opinions, delivered the rebuttal, and train students to communicate in front of the class.

Furthermore, teachers with students conclude the matter and reflect on what was learned. Reflection teachers do is to evaluate the learning that has been carried out and correct mistakes in their next meeting, while the reflection of the student aims to make the perception of what they have learned so that students can apply the concept to a wider problem. At the end of the activity, the teacher informs the material for the next meeting.

During the learning process, student’s activities is quite conducive and effective. The first meeting, several students had dared ask about understanding in solving the problems, it's just that the learning conditions are still stiff, especially at the time of presentation, students pay more attention without daring to ask. 2 x 45 minutes was still lacking, so that when the presentation, several questions last unassisted.

The second to the sixth meeting, some students began to actively ask and formulated the idea, began to increase student motivation, enthusiastic students in problem solving and his group began to increase. When solving the problems given, students help each other, teach, exchange opinions and cooperate with each other with group members as well as with other groups. Students also were active and enthusiastic in solving the problem, discuss, wondered answer, ask for clarification when discussing friend, give a different opinion, as well as answers to refute a friend by giving a reason. This is what adds to the learning

environment more conducive and vibrant, although there are some students who are often silent, embarrassed provide ideas, just write without comment or give opinions.

Based on the observations of researchers, at first the problems of students in solving problems such as less accurate in reading and understanding the problems, students can not describe or illustrate problems in the form of diagrams or sketches, and can not take advantage of what is known as the capital to solve the problem. However, at the next meeting, with scaffolding techniques, these problems can be overcome with good.

Heterogeneous grouping students by ability level makes students more low initial mathematical helped in solving the problem. Only, they look more silent without comment or simply write the results of group discussion without actively contribute ideas, they look more relying on friends in the group who had prior knowledge of mathematical level high and medium.

The opinion of most students about learning with CPS models is quite good. They argue that by learning discussion, faster job completion, and if it does not understand the problem, they can share ideas with their friends. However, some students found it very tiring learning model, they want more explanations beforehand as learning materials are commonly carried out in school rather than have to find out for yourself.

4. Conclusion

Based on data analysis and discussion of the results of research that has been described, obtained the following conclusions. Increasing metacognitive skills students acquire Creative Problem Solving learning model is significantly better than the increase in metacognitive skills of students who received conventional learning.There is a difference significant increase in metacognitive skills among students who obtain Creative Problem Solving learning model with students who received conventional learning in terms of early mathematical ability of students are high-level, medium, and low. Increasing metacognitive skills of students who have a high level of mathematical ability early and being in class CPS is significantly better than the increase in metacognitive skills of students who have a high level of mathematical ability early and being in a conventional classroom. However, the increase in metacognitive skills of students who have a low level of mathematical ability early in the CPS classes did not differ significantly with an increase in metacognitive skills of students who have a low level of mathematical ability early in the conventional classroom. Thus, Creative Problem Solving Learning model is successfully applied to students who have a high level of mathematical ability early and moderate. However, less suitable for students who have a low level of mathematical ability early.

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