THE USE OF COGNITIVE CONFLICT STRATEGY TO REDUCE STUDENT MISCONCEPTIONS ON THE SUBJECT MATTER OF RECTILINEAR MOTION

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Abstract— This study aimed to describe the student's misconceptions before teached with cognitive conflict strategy and to determine the changes of concept student's understanding at class X SMAN 1 Watopute on the subject matter of rectilinear motion after learning by cognitive conflict strategy. The method used was a case study. The population in this study were all students of class X SMAN 1 Watopute who was registered in the odd semester 2015/2016 academic year. The sample in this research is student at class X_3 of SMAN 1 Watopute as many as 23 students were taken by using purposive sampling method. Data obtained from the documentation and diagnostic tests understanding of the concept in the form of a multiple choice test with open grounds. In this study, the results are as follows:1) the percentage of the number of students toward understanding of the concept of rectilinear motion before learning that is: the category to understand the concept of 4.6%, amounting to 38.8% misconceptions category and the category did not understand the concept of 56.5%; 2) the percentage of students' understanding of the concept of rectilinear motion after learning is: the category to understand the concept of 48.9%, 19.7% misconceptions category and the category did not understand the concept of 31.4%. It can be concluded that there is a decrease misconceptions after learning with cognitive conflict strategy on the subject matter of rectilinear motion.

Key Words*: Cognitive Conflict Strategy, Misconceptions, Concept of Rectilinear Motion*

I. INTRODUCTION

The concept of learning physics is a very basic stuff. Misconceptions that have happened to the students will interfere with the effectiveness of learning and interfere with students' thinking in accepting the subsequent knowledge. Basically students entering the class was full of preconceptions about what to teach teachers. Teachers are not aware of and concerned about the preconceptions and the students themselves are not aware of it. From this expression suggests that before a teacher teaching a new concept, the teacher must know that in the brains of students have no concept of the despite the fact different. Generally learning physics subjects perceived difficult by learners because they most learners have not been able to connect between the material being studied with the knowledge he had. Physics closely related to the concept and the surrounding environment, so that learners can apply directly. Learning physics just memorize equations

without regard to the concept is also causing problems in learning difficulties. Of memorization equation, students have not been able to understand the physical meaning of the equation right, so meaningful learning has not been able to obtain.

Based on observations in class XI SMA Negeri 1 Watopute, by giving a diagnostic test to detect misconceptions students on the material rectilinear motion obtained information that 15 students from the third grade XI obtained the information that there are 13 students' misconceptions on the concept of distance and displacement, and there 15 students who have misconceptions on the concept of free fall motion . Furthermore, the results of interviews with some students of class XI SMA Negeri 1 Watopute obtained information that many of those who still think "if two objects moving in time and the same acceleration, the two bodies will have the same mileage as well." They forget that the initial velocity need to be accounted for factors that make different distances. In the distance formula $s_t = v_o.t + \frac{1}{2}a.t^2$ it appears that the initial velocity (v_o) also determine the distance to an object. Two objects moving at different initial velocity, although the time (t) and acceleration (a) are same, will take different distances.

Understanding the concept that less and their misconceptions on students can be overcome with some strategy changes the concept of the learning process which is a strategy based on cognitive conflict, a strategy based on the development of students' ideas and methods that can help change the concept (Bridging Analogy, computer simulations, interviews diagnosis, group discussions, concept maps, problem solving, experimental or field experience, the question constantly in the classroom) (Suparno, 2013: 99-115). According to the theory of constructivism, Piaget states that when someone builds a science, it is to establish a balance higher knowledge necessary adaptation (assimilation and accommodation), ie contacts or cognitive conflict that is effective between the schemes / old concept with a new reality (Woolfolk in Trianto, 2007) , Specifically Van den Berg in Maulana (2009) stated that the strategy of cognitive conflict in learning physics effective enough to overcome misconceptions in students in order to establish the balance of higher knowledge.

Cognitive conflict strategy is a learning strategy that exposes students to a situation which is contrary to the concept and then the students are directed on experiments or demonstrations to prove the concept. Cognitive conflict strategy is a strategy modifier

conceptual (conceptual change strategy) which can destabilize the misconceptions students to get a true scientific concept. Thus cognitive conflict strategy is a learning strategy that accommodates difference, be open and provide the stimulus more effective in helping students improve their understanding of the concept and building science. Thus the rationale that prompted researchers to identify and analyze the causes misconceptions before teaching students with cognitive conflict strategies and to identify and analyze the changes in students' understanding of the concept after learning provision with cognitive conflict strategy in a matter of rectilinear motion.

The problems in this research are: (1) How is the description of student's misconceptions at class X SMAN 1 Watopute before learning with cognitive conflict strategies in a matter of rectilinear motion? (2) How does the change of concept students' understanding after learning by cognitive conflict strategy in a matter of rectilinear motion? The purpose of this study was to answer the problem formulation is to describe the student's misconceptions before teached with cognitive conflict strategy and to determine the changes of concept student's understanding at class X SMAN 1 Watopute on the subject matter of rectilinear motion after learning by cognitive conflict strategy. The results of this study are expected to provide good benefits for students, teachers, schools and other researchers. For students, this study can provide understanding and dispel misconceptions about the concept of rectilinear motion. For teachers in this study can be used as input and contribute ideas to overcome the difficulties of learning physics. For schools, the results of this study can be used as input in an effort to increase learning outcomes physics. As for other researchers, this study can be used as inputs and resources on relevant research

II. RESEARCH METHOD

This study uses a qualitative method with case studies. Cases in this study is the lack of understanding of students at SMA Negeri 1 Watopute on the concept of rectilinear motion. The focus of the research conducted to identify and search misconceptions students by using multiple-choice tests open reasoned before and after learning through cognitive conflict strategy.

The population in this study were all students of class X SMAN 1 Watopute who was registered in the odd semester 2015/2016 academic year were distributed in 6 classes. The sampling technique in this study using purposive sampling that is

nonprobability sampling. In this study physics learning outcomes student of each class in the earlier material is the amount and the unit into consideration in the sampling. Classroom education outcomes in learning physics lowest proficiency level is taken as samples for examination. Of the six classes, and class X_3 has an average value of learning outcomes lows on the material quantities and units. So this class was selected as sample by the number of students as many as 23 people, consisting of 10 men and 13 women.

The procedure of this study can be seen in the following chart.

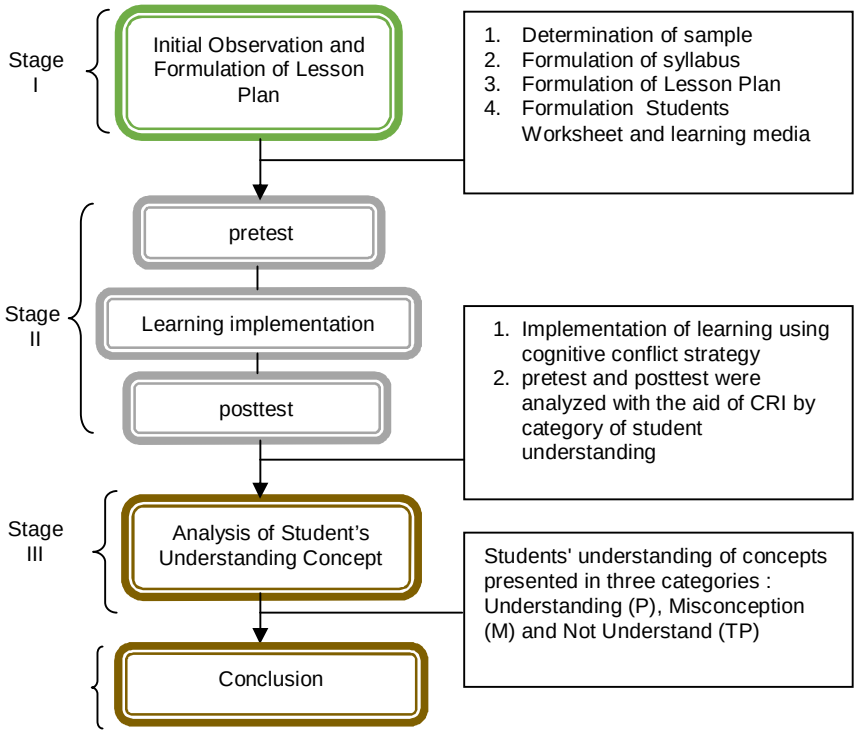

Figure 3.1 Chart Research Implementation Procedures

Data collection techniques in this research was conducted through documentation and test of concepts understanding. The documentation referred to in this study is documentation of the value of the study of physics students in the learning materials before, namely the magnitude and units, while tests the understanding of this concept in the form of a written test which is constructed in the form of an objective test model of test multiple choice with the open reasoning with the number of options as five totaling 20 items. This concept comprehension test consists of 14 multiple choice test items with open reasoning of the instruments that have been used by Ratama (2013) in his research entitled "*Misconceptions on Rectilinear Motion Remediation Approach Using Cognitive Conflict*", and has passed the validation process. While 6 items developed by the authors. 20 Furthermore, the item was validated again by a expert / lecturer of physical education,

so that it becomes feasible for use as an instrument to describe misconceptions experienced by students on the concept of rectilinear motion. Mapping grain misconception diagnostic test students on the concept of rectilinear motion can be seen in Table 3.1.

Table 3.1 Mapping Item Test of Understanding Concept Rectilinear Motion

No.	Matter	Item Number	
		Previous researchers	Authors
1	Position, distance and displacement	4, 5, 8	1, 2
2	Speed, velocity, acceleration, and headway	3, 6, 7, 18	9, 10, 17
3	free fall Motion	11, 13, 15, 16, 19	20
4	vertical motion	12, 14	-

Data obtained from the results of diagnostic tests were analyzed with descriptive methods percentage, by analyzing each item matter to see whether there is a misconception on each concept studied.

III. RESULT AND DISCUSSION

A. The Result Of Data Analysis Research

1. Data Description Student Pretest Results

Description of the concepts students' understanding of 20 pretest items are also presented in Figure 4.1.

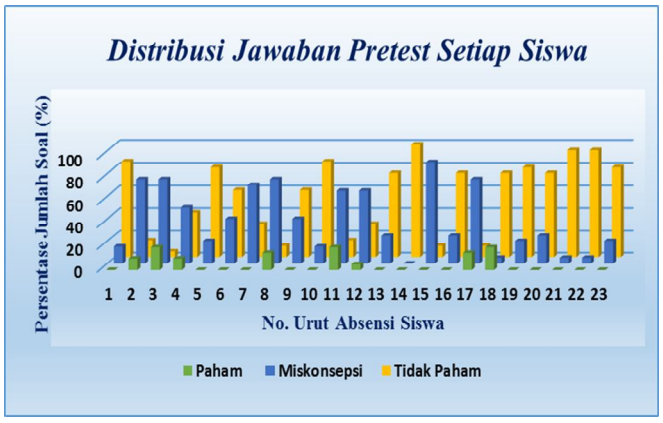

Figure 4.1 Percentage of Concept Understanding Each student in the pretest

2. Data Description Student Posttest Results

Description of the concepts students' understanding of 20 posttest items are also presented in Figure 4.2.

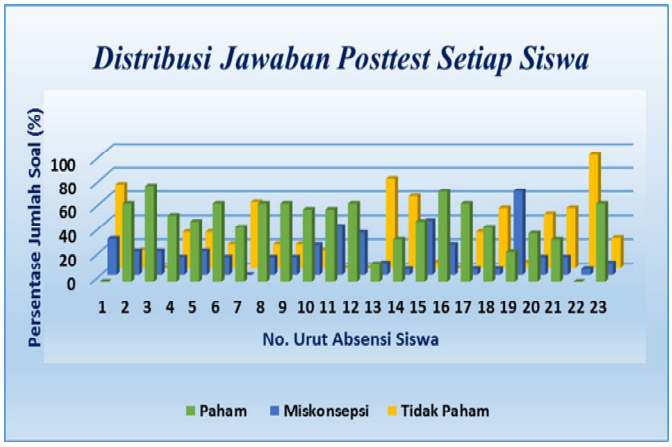

Figure 4.2 Percentage of Concept Understanding Each student in the posttest

3. The Changes Understanding Concept of Student's in Rectilinear Motion

Comparison between students' understanding of the concept of the four types of concepts in a straight motion of the material before and after learning with cognitive conflict strategy can be shown also in Figure 4.3 and Figure 4.4.

Figure 4.3 Understanding Concept of Student's in Rectilinear Motion at pretest

Figure 4.4 Understanding Concept of Student's in Rectilinear Motion at Posttest

B. Discussion

From the analysis of the answers given pretest before teaching students with cognitive conflict there are some concepts rectilinear motion is still a lot of misconceptions and misunderstanding of the concept. Percentage of misconception and misunderstanding of the concept of high indicates that many students are stuck with them for harm in understanding this concept. Examples of some misconceptions rectilinear motion to the student before given learning with cognitive conflict strategy are as follows.

1. Position, Distance and Displacement

Objects said to be moving if move toward a point of reference. Distance is a scalar measure and is defined as the entire length of the path by the object. While displacement is a vector quantity, and is defined as the change in body position, equal to the shortest distance between the initial position to a final position of objects that are straight lines, with regard to the direction path for moving objects. From the answers to pretest students obtained information that: (a) the student has not been able to explain the role and position of the reference point on the concept of moving objects; (b) the student has not been able to distinguish between distance and displacement; (c) the student has not been able to put the use of distance and displacement in the concept of velocity and speed, as well as on the concept of acceleration and acceleration.

2. velocity, speed, acceleration, and headway

The term speed and velocity have almost the same meaning. Speed is a scalar quantity, while velocity is a vector quantity. An object is said to accelerate when it is in motion undergo a change of pace. Acceleration is defined as the rate of change of velocity and a vector quantity that the direction of the velocity vector changes. Direction of the acceleration can be unidirectional, opposite, even forming an angle to the speed. While the acceleration was a big change of pace and is a scalar measure.

There are some misconceptions students when faced with several cases related to the concept of speed, velocity, acceleration and pecepatan. From the answers to pretest students obtained information: (a) students of the same sense of speed and velocity; (b) students are not able to distinguish between headway and acceleration; (c) the concept of uniformly accelerated motion, students assume that the deceleration or acceleration is not constant; (d) students assume that the two objects have the same acceleration, must have the same velocity and the same distance anyway.

3. Free Fall Motion and Vertical Motion

If an object in free fall, and the air resistance can be ignored, then the time of falling objects on the earth, only determined by the height of the beginning as well as the acceleration of gravity at the venue. So if two objects of different mass is dropped at the same height, both will reach the ground at the same time, as long as moving both get a constant acceleration, the acceleration of gravity. From the answers to pretest students obtained information that: (a) the movement of free fall, the fall time an object is affected by the mass of the object, the greater the mass of the object, the faster the object will fall; (b) in a vertical motion, the students do not understand the acceleration of the object and the acceleration of gravity.

After conducting learning strategies cognitive conflict through anomaly data or examples of problems that are contrary to the original concept of students accompanied by demonstrations, discussions and experiments can provide enormous positive impact on the understanding of the concept changes rectilinear motion on students. This can happen because in learning with students' cognitive conflict strategies required to disclose their concept through demonstration activities in the classroom. In addition,

students discuss with their teachers and classmates to clarify the concept of right or misconceptions that exist at the demonstration. Furthermore, the concept of truth was confirmed through experiments conducted jointly by teachers and students. So that the memory of students to the concepts given also become sharper.

In this learning the concept of the position, distance and displacement as well as the movement of free fall is a rectilinear motion concept that is easily overcome misconceptions problem. While the concept of the relationship between velocity and speed and between acceleration and headway is a difficult concept to reduce the problem of misconceptions that exist on students. Difficulty in reducing students' misconceptions and misunderstandings can be caused by old scheme students who are difficult to change (in assimilation or accommodation) in a short time. Besides giving the concept is not accompanied by real experiment in learning also can be difficult to overcome misconceptions students.

Basically learning strategies nothing is perfect, so we have to be clever in choosing learning strategies to environmental conditions, students and other materials or concepts to be taught. For example, in this study there are some obstacles such as lack of time for classes, because the cognitive conflict strategy is likely to require a longer time. However, these problems can be solved by adjusting the subject to be discussed with the length of lesson hours to each meeting.

IV. CONCLUSIONS AND SUGGESTION

The results of this research showed that: 1) the percentage of the number of students toward understanding of the concept of rectilinear motion before learning that is: the category to understand the concept of 4.6%, amounting to 38.8% misconceptions category and the category did not understand the concept of 56.5%; 2) the percentage of students' understanding of the concept of rectilinear motion after learning is: the category to understand the concept of 48.9%, 19.7% misconceptions category and the category did not understand the concept of 31.4%. It can be concluded that there is a decrease misconceptions after learning with cognitive conflict strategy on the subject matter of rectilinear motion. Based on the research results obtained, it is advisable that matters; 1) The physics teacher at SMA Negeri 1 Watopute in order to implement the strategy of cognitive conflict as one of the alternative learning strategies in learning physics; 2) To further research is expected to consider and better understand the cognitive conflict

strategy, so that in future studies will no longer face obstacles in the learning process, in particular efforts to enable students optimally.

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