

SE-003

MISCONCEPTION REDUCTION EFFECTIVENESS IN PHYSICS LEARNING THROUGH LABORATORY WORKING METHODS IN THE CONCEPT OF TEMPERATURE AND HEAT

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ABSTRACT

The purpose of this study was to determine the initial knowledge, misconceptions profile and significance of laboratory working methods to reduce misconceptions on the material temperature and the heat of class X of SMAN 1 Paya Bakong North Aceh. This study design using *pre-experimental research with one group pretest-posttest design*. The sample used is 50 students of X-1 and X-2 classes. Before and after the implementation of the laboratory working methods, students were given 14 questions of diagnostic test that equipped with Certainty of Response Index (CRI) to distinguish students who know the concept (TK), do not know the concept (TTK), and misconceptions (MK). The amount of student's misconceptions in pretest and posttest were analyzed using Microsoft Excel. The results of analysis showed that the method of the laboratory working was able to significantly reduction the misconceptions of students on the material of temperature and heat.

Keywords : *Misconceptions, laboratory work methods, temperature and heat, CRI index*

INTRODUCTION

During this, physics learning is not in accordance with the intended purpose. The teachers still follow the old paradigm in the present study, such as the various efforts made by many teachers, ranging from search, collect, solve and communicate information to students. This resulted in physics it becomes difficult and boring lessons, so that by the time the exam is still a lot of students to guess the answer, there are also students who are very confident with the answer when it learned during one or commonly called misconceptions.

Misconceptions caused by the quality of the teacher's knowledge, so no clear presentation of lessons did. The misconception is also caused by the shape of everyday experience that brought students to the class, because it tends to look at an object from his own eyes (Suparno, 2013).

A preliminary test to discover misconceptions temperature and heat is given to the students of SMAN 1 Paya Bakong who have received lessons on this matter at the high school junior class X and class IX, finally still got errors student understanding as follows. (1) The longer heated the water temperature will be higher, (2) The mass of objects affect the level of

heat energy needed these objects, (3) When the heat is given to the rapidly boiling water, then boil the water temperature will increase, (4) The temperature of an object depends on the size of the object, and so on.

Efforts should be made to reduce these misconceptions is to choose appropriate learning methods, where students are directly involved in learning. The method can be used the method of laboratory work, this method is expected to reduce misconceptions students. Asriani (2008) clarify that the use of laboratory work with peer tutors approach can reduce students' misconceptions. Furthermore Maulana (2010) mentions the effectiveness of methods of laboratory work can be seen from the student activity during laboratory information.

Indicator of student success in the laboratory can be observed with the increase of students during the learning process skills and experiment. Poedjiadi (2005) explained that the process skill involves observation, count, measure, classify, and make hypotheses. These skills can train students to find and solve problems scientifically to produce products Physics i.e facts, concepts, generalizations, laws and new theories.

Based on the above, the basis of the sources of misconceptions experienced by students, this study was conducted in order to know the initial knowledge and misconceptions profile on the temperature and heat, as well as see how far the process of upgrading the skills of students in the experiments on the temperature and the heat of students High School at Paya Bakong.

METHODOLOGY

This study was an experimental study with pre-experimental design (Sugiyono, 2011). Form of research is one-group pretest-posttest design. The sample used is 50 students of class X - 1 and X - 2 SMAN 1 Paya Bakong. For pretest and posttest were used diagnostic test of 14 items that are made with the same concepts but in different words. Indicator tests are shown in the following table

Table 1. Concepts of diagnostic test

No	Concepts	No. Item test
1	Heat	1, 7, 9, 14
2	Temperature	6, 10, 12, 13
3	Temperature and heat transfer	2, 3, 4, 5
4	Thermal properties	8, 11

The concept of temperature and heat intentionally made equal to pretest and posttest in order to know the level of consistency of students' answers. In a matter of pretest and posttest supplied column Certainty of Response Index (CRI) with a score of 1 to 5 by the student must fill in the prediction was based on the level of confidence in answering.

Table 2. Criteria of CRI indexes

CRI	Criteria
0	Guess totally
1	Little guessing
2	Not sure
3	Sure
4	Less certain
5	Certain

Source: Hassan.et.al 1999.

Based on the results of students' answers and CRI index can distinguish students who know the concept (TK), do not know the concept (TTK), and misconceptions (MK) and each is the average CRI for correct and incorrect answers. The analysis methods of data referenced in Tayubi 2005 (table 3).

Table 3. Decision matrix table based on CRI indexes

Criteria of students' answers	Average of CRI Low (<2,5)	Average of CRI High (>2,5)
Correct answer	Guess (TTK)	Concepts Correct (TK)
Incorrect answer	Lack of Knowledge (TTK)	Misconception (MK)

Source: Hassan *et.al* 1999.

RESULTS AND DISCUSSION

Here is a graph showing changes in the level of misconceptions from pretest to posttest on each question. Based on the following chart can be found any students who have misconceptions on the results of the pretest and posttest results also. The misconception is based on understanding the concept of temperature and heat is wrong at the time of junior high school students occupying the ninth grade.

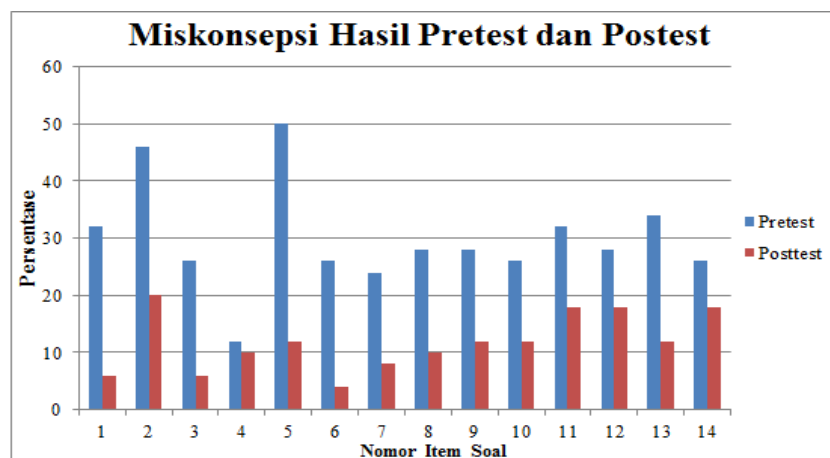


Figure 1. Comparison of Percentage of Students Who Have Misconceptions Before and After Implementation of Learning Methods Laboratory Work

Based on changes in the level of misconceptions on each question, question number 5 with a source of misconceptions on the concept of heat transfer and temperature displacement misconceptions most significantly decreased by 52 % after the implementation of the learning methods of laboratory work. Reduction occurs at least misconceptions about the number 4 and number 9, the source of misconceptions on the concepts of heat and temperature displacement concept, with each decrease of 4% misconceptions.

In question number 1 many students are stuck with an answer B, if the ice cubes are into the water temperature is 5°C. They imagine that the ice when mixed with water temperature is above 0°C. However, there are also some students found the temperature of the ice cubes when the thermal equilibrium is 0°C, so that there are students who answered B. However, the concept of heat should have been very familiar with the students because this concept has been introduced while in junior high school

In question number 2 students are stuck with an answer D, if the water has become the water temperature is 10°C. They imagine that the ice when the temperature is above 5°C to water. However, there are also some students found the temperature of the ice cubes when it becomes water is 10°C so that there are students who answered C. They tend to answer this question based on the definition of the heat transfer from the education they received previously. It is certain misconceptions on this issue is caused by a previous student preconceptions

As for the number 9 and number 14 on the concept of heat. The purpose of this question is to reveal misconceptions of the definition of heat. Students answer a lot of heat is the energy in the body, so each of them will have heat. So that students consider if the temperature of the same keringkat with skin, it will evaporate and carry thermal energy with him. The concept of truth is heat is energy that moves between two objects at different temperatures

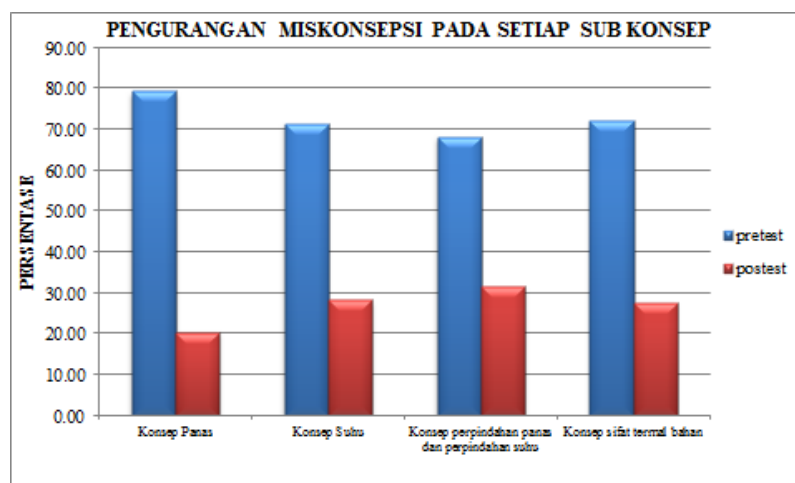


Figure 2. Comparison misconception Reduction On Any Subconcepts

Problem number 10, 12 and 13 reveal misconceptions about the concept of temperature. In question number 10, students assume the use of sweaters function to keep the body from cold temperatures, but the best answer is the use of a sweater when cold temperatures to prevent heat loss from the body . Problem number 12, students assume the temperature is heating value. However, the most appropriate is the scale of the calorific value. While ssoal number 13, students assume the volume of water will affect the temperature of an object. However, the concept of truth is the water will boil at the same temperature water although much the only difference being the time it takes to boil the water in which the water is less likely to need a little time to boil than water. This concept should be well understood by the students because of the material they've got when I was in junior high. So that misconceptions that occur in this concept caused by prakonsep students who previously brought

CONCLUSSIONS

Based on the analysis of research data , it can be concluded that the learning method is able to reduce misconceptions laboratory work on the concept of temperature and heat significantly

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