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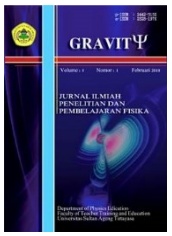

Implementation of problem based learning with cmaptools Media for increasing problem solving abilities

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ABSTRACT

This study aims to analyze the comparison of increasing the problem solving ability between groups of students who get problem-based learning with cmaptools media, and groups of students who get conventional learning. The research method used was a quasi experiment with the Randomized Control Group Pretest-Posttest design and descriptive method. The instruments used include: problem solving ability test. The improvement of problem solving ability is determined through the average N-gain. The results of the calculation of the average N-gain obtained that the average N-gain group of students who get problem-based learning with cmaptools is 0.78 (high category), while the average N-gain group of students who get conventional learning is 0.68 (medium category). The results of statistical tests (t-test) show that problem-based learning with cmaptools can further improve problem-solving abilities compared to conventional learning

Keywords: *Cmaptools, PBL, problem solving abilities*

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INTRODUCTION

Learning physics at school is a scary thing for students, so the goal of learning is difficult to achieve. One of the objectives of learning physics is to develop the ability to think, the reality in schools is still a low effort to develop thinking that leads students to actively solve a problem. This study aims to provide benefits in the world of education in order to overcome problems in the learning process, especially in the field of physics in high school.

The specific purpose of this study is to improve student learning outcomes and ability to solve problems related to the physical sciences by providing solutions that are implementing problem-based learning with cmaptools media. Cmaptools media in this study is the product produced in the form of teaching materials based on concept maps. Concept maps using cmaptools media have several advantages including being able to link to various other media sources such as, microsoft word, power point, PDf, or other web addresses related to teaching material, can be used by students online or online, with the interactive appearance is expected to be able to attract students' interest to be more active in learning.

Cmaptools as one of the concept map based learning media has advantages that can be utilized by students and teachers in the learning process, this is in line with previous

research conducted by (Muliani 2013) that increasing the understanding of physical concepts in groups of students who receive interactive conceptual learning with cmaptools media is higher than the group of students who get interactive conceptual learning without the help of cmaptools media. Problem-based learning with media aid cmaptools is expected to be able to attract students' interest in learning physical material, especially abstract material, student-centered learning where students are more actively looking for problem solving for a given case.The use of cmaptools media in this study was carried out by the teacher when the learning process took place as a reinforcement. The goal is to avoid misconceptions among students, this is in line with previous research, (Muliani 2019) that the application of cmaptools media-assisted learning can minimize student misconceptions

The research method used in this research is quasi-experimental method with Nonequivalent Control Group Design. This study specifically aims to determine the extent to which differences in the improvement of problem-solving abilities and cognitive learning outcomes achieved after receiving treatment with problem-based learning assisted cmaptools compared with conventional learning.

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RESEARCH METHODS

The method used in this research is quasi experiment with Nonequivalent Control Group Design (Sugiono 2010). Experimental Method pseudo can provide information that is an estimate of information that can obtained through actual experimentation in circumstances which make it impossible to control or manipulate all relevant variables. This research specifically aims to find out the extent to which differences in problem solving and improvement cognitive abilities learning outcomes achieved after receiving treatment with learning problem based assisted cmaptools compared to conventional learning.

RESULTS AND DISCUSSION

Research using problem-based learning with cmaptools conducted in six meetings. At the first meeting a carried out *pretest* or preliminary test is in the experimental class and the control class to find out the cognitive learning outcomes and students' problem solving abilities before learning. Then apply the problem-based learning model aided by cmaptools four times in the experimental class and apply conventional learning four times in the control class. After the four meetings ended each class was given a post- *test* with the same problem in the *pretest* to find out the cognitive learning outcomes and problem-solving abilities after learning.

The ability to solve problems is very important for students and their future. Learning experts agree that the ability to solve problems within certain limits, can be formed through the fields of study and disciplines taught Suharsono in (Wena 2010). Basically the ultimate goal of learning is to produce students who have skills in solving problems faced later in the community. To produce students who have reliable competence in problem solving, a series of learning strategies for solving problems is needed. According to G.Polya in (Sezgin 2010) stages in problem solving include:

1. **Understanding the problem (Understanding)**

   In this first stage students can visualize and imagine problems. Identify what variables are known and what variables are asked by describing them in physics terms, translating sketches into the physical description of the problem, making specific symbols relevant to physical matter.

2. **Designing a Plan (Planning)**

   Identify the principles, rules and laws that will be used to solve the problem. Determine the mathematical approximation that is suitable as a solution.

3. **Carry out the Plan (Solving)**

   Based on the pattern of the solution plan approach that has been carried out, take appropriate mathematical actions into the planned equation.

4. **Reviewing (Checking and Evaluating)**

   At the last stage, the problem solving parts will be checked. Check answers, quantities and units on the answer. Evaluating results.

From the activities that have been carried out, data obtained from the initial test score (pretest) and final test (posttest) about the ability to solve optical material material problems. Based on the pretest and posttest score data, it can be determined the average value of the normalized gain can be seen an increase in students' problem solving abilities in optical instrument material between classes that apply problem-based learning media assisted cmaptools (experimental classes) and classes that apply conventional learning (control classes). Comparisons of normalized pretest, posttest and normalized score between experimental and control classes are presented in Table 1.

Table 1. Average Score Normalized Pretest, Posttest, and Gain Ability

Groups	Average score		
	<Pretest>	<Posttest>	<g>
Control	2.89	21.24	0.68
Experiment	3.34	24.23	0.78

Comparison of data in the table above can be illustrated by the bar diagram seen in Figure 1.

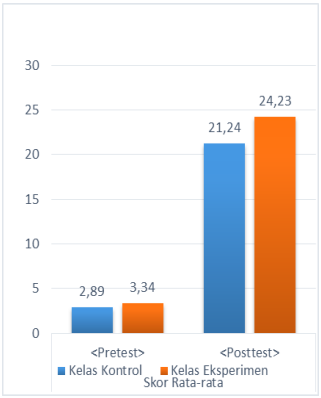

Figure 1: The average bar chart of the scores of the pretest, posttest

Based on Figure 1, it was found that the average pretest score of the experimental class students was 3.34 and the percentage of the average pretest score of the control class students was 2.89. Furthermore, based on the average acquisition of the experimental class posttest was 24.23 and the average score of the control class posttest was 21.24.

The normalized gain for the experimental class is 0.78 with the high category and the average value of the normalized gain for the control class is 0.68 with the medium category. In general, the normalized average gain for the experimental class is greater than the control class.

Statistics test Improved Problem Solving Abilities:

Data Distribution Normality Test

To find out whether or not normal data on the optical problem solving abilities of students for the experimental class and the control class were performed using the Kolmogorov - Smirnov One - Sample normality test. Normality test results in both classes showed that the normalized gain data of the experimental class and the control class were normally distributed with a significance of 0.200 for each experimental class and 0.156 for the control class. Significance value is greater than α (0.05).

Data Variance Homogeneity Test

Homogeneity test of the problem solving ability optical data tools of the experimental class and control class students using the Levene Test (Test of Homogeneity of Variances) shows that homogeneous data variance is at a significance of 0.988.

Hypothesis testing

Testing for increasing the ability to solve problems with normal and homogeneous distribution is done by parametric tests (t-test with α = 0.05) because the experimental class and control class data are normally distributed and have homogeneous variance. Significance value of 0.001, the significance value is smaller than the significance level of 0.05, which means that the hypothesis states there is no significant difference in the average score of problem solving ability tests between students applying problem-based learning with cmaptools and conventional learning students (H_0) rejected. The rejection of the null hypothesis shows that there are significant differences in problem solving abilities

between students who get problem-based learning with camptools and students who get conventional learning (H_1 accepted). From the results of the t-test analysis, it can be concluded that the increase in the ability to solve physics problems of students who received problem-based learning with cmaptools was significantly higher compared to students who received conventional learning.

CONCLUSION

Based on the results of the research and discussion presented earlier, the problem-based learning with cmaptools in improving problem-solving skills obtained conclusions Improving of physics problem solving abilities groups of students who get problem based learning with cmaptools higher than the group of students who get conventional learning.

Learning by using multimedia can foster motivation from students because of the appearance learning that becomes more interesting. This is in line with the opinion of (Abidin, Mulyati, and Yunansah 2018) which states that By using communication media not only can simplify and streamline the learning process, it will but it can also make the learning process more interesting. Likewise, according to (Darmawan 2012) stated that interactive multimedia learning, able to enable students to learn with high motivation because his interest in a multimedia system that is capable of presenting the appearance of text, images, video, sound and animation..

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