



Environment Material in Science Learning Using Problem Based Learning Model with the SETS Approach in Terms of Students' Activities and Learning Outcomes

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Article Info

Article History :
Received March 2020
Accepted April 2020
Published April 2021

Keywords:
PBL, SETS, students'
activities, learning
outcomes

Abstract

This research is aimed to analyze science learning that applies the PBL model with the SETS approach of students' activities and learning outcomes. The research methodology used pre-test and post-test group design with each one of experimental and control classes. The findings obtained by an average gain score of the experimental class 0.2895 and the control class 0.2135, so that the experimental class has an increase in learning outcomes higher than the control class. The category of students who were very active and active in the experimental class was higher with a percentage of 87%. The conclusion of the study was the science learning model applying the PBL model with the SETS approach can optimize students' activities and learning outcomes.

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INTRODUCTION

Science is an interesting subject to make students aware of cleanliness and protect the environment so that environmental damage and pollution does not occur. The teacher needs to create student learning activities that lead to the science concept implementation to protect the environment. The survey results at students' school and neighborhood show that there is still a lot of trash scattered around the classroom and school environment, and also found environmental damage around the school and the environmental pollution in their homes, including due to domestic animal dung. Students' attitudes have an impact on sincerity in learning science so that they can influence the mastery of concepts. Analysis of the daily test scores for the 2015/2016 school year at SMP Negeri 2 Bulu Temanggung for environmental material is still low, there are 40% of 7th-grade students who scored less than the minimum criteria of mastery learning in the science of 75. This is due to the teacher's learning still uses methods that have not integrated between the concept and the form of the concept application in the environment and their impact on people's lives. Learning has not been linked with SETS (Science Environment Technology and Society), so it needed to do PBS (Problem Based Learning) approach to SETS so that students' awareness of the science concept application to maintain environmental hygiene increases.

PBL is a learning model that is applied to encourage students to know how to learn and work together in groups to find problem solutions in life (McPhee, 2002; Peterson, 2004). Jonassen (2011) PBL is a student-centered learning strategy by allowing students to conduct research, integrate theory and practice, apply knowledge and thinking skills to develop solutions to solve problems (Savery, 2006; Wulandari & Surjono, 2013). The application of learning models that provide opportunities for students to practice doing learning activities to solve problems can arouse learning motivation (Sardiman, 2007; Arends, 2008). Based on the analysis of expert opinions and the findings in previous researchers, it is increasingly clear that PBL is a learning that exposes students to real-world problems so it needs to integrate concepts with their application in life.

The SETS approach has the power of integrating concepts with their application forms in society. Conceptually, SETS has deep thoughts about the existence of science as a unit that is not separate from the environment, technology, and society (Binadja, 2000; Shofiyah, 2014). The main emphasis of the SETS approach is on preserving nature to ensure the stability of the various creatures in the environment. This approach as an eco-friendly approach, both the physical environment and its biodiversity as a focus of attention that is applied as well as possible in applying the SETS approach (Indriyanti, 2014). The environment is a source and one of the target science. The environment is also a source and target technology. At the same time, the environment is also needed by society as a target of society interests.

Analysis of Affita et al.'s research findings (2018) science learning activities in schools are determined by the selection of learning strategies used by considering the characteristics of each material being taught. The selection of learning strategies considers the role given to students to learn, this role is effective in science learning if there is credibility between teachers and student colleagues during the learning process (Indirasari et al., 2018). Learning activities carried out in science produce learning products. So that learning products can help students understand the subject matter must be used as material for the preparation of evaluation questions to determine the completeness of learning of each student (Meltasari et al., 2019).

Based on problem identification and need analysis that has been done through the preliminary study of this research, it can be formulated this research aimed to analyze the students' activities and learning outcomes on PBL Model sciences learning with the SETS approach. The research is important to do because the initial facts are found that students' awareness of maintaining the school environment is still low so it is feared to harm students' attitudes towards learning science. Negative attitudes have the potential to occur because students can assume that the science concept is not useful for protecting the environment so that it can impact motivation to learn and ultimately have an impact on mastery of concepts.

RESEARCH METHODOLOGY

The method used was pre-test and post-test group design with each one of the experimental and control classes. The population in this research were all students of class VII A and VII B in SMP Negeri 2 Bulu, Temanggung Regency in the 2016/2017 school year. The sample of this research was 2 classes of 3 classes. The observation method is used to obtain data on students' activities and teacher performance during learning activities. The test is used to obtain data about students' learning outcomes through pre-test and post-test. The test used multiple-choice questions and the description which is done twice at the beginning and end of learning.

The research design is referred by Sukmadinata (2006) with the initial stages of the research provided pre-test for students in the experimental and the control class. The pre-test is done to find out students' initial knowledge before learning. Different treatment in the implementation of learning in both classes, in the experimental class applying PBS with the SETS approach while the control class applies a conventional learning model. Students' activities that were observed included: making a material connection with the SETS, asking/answering questions, proposing ideas, solving problems and engaging in conclusions.

The research was started by conducting a study of research object which includes the readiness of the teacher to teach the PBL learning model with the SETS approach. Student readiness and infrastructure used in learning. At this stage, it is carried out by direct observation and interviews with teachers and students. First, the researcher

determined the research object consisting of the experimental and the control class. Second, developed PBL learning tools using the SETS approach which includes syllabus, lesson plans, worksheets and research instruments consisting of written test questions, attitude questionnaires, and interview guidelines, followed by trials in small classes with a limited number of students. The last, researched in the experimental and control class in school that has been determined, as well as analyzing research data, writing reports and disseminating research results through scientific publications journals.

Analysis of research data by analyzing the average score of pre-test and post-test is calculated using the gain formula by calculating the ratio of actual gain average with maximum average gain. Analysis of students' activities data was to describe students' activities in science learning with PBL model with the SETS approach. The data obtained were analyzed descriptively by using a percentage (%) by calculating the number of students' activities frequencies divided by all activity frequencies multiplied by 100%. Pre-test and post-test data were analyzed using Microsoft Excel computer programs and SPSS (statistical package for social science) with 10.0 for window specification. T-test findings are compared with the independent-samples test output table.

FINDINGS AND DISCUSSION

Students' activities were observed of 23 students using PBS Model with the SETS Approach obtained data and presented in Table 1

Table 1. Students Learning Activities in Science Learning PBL Model with the SETS Approach and Conventional Learning.

Category	Experiment Conventional	
	The Number of Students (%)	The Number of Students (%)
Very Active (>84)	7 (30)	3 (13)
Active (65-84)	13 (57)	13 (57)
Less Active (<65)	3 (13)	7 (30)

Based on Table 1, the activeness average of students in learning used the PBL Model with the SETS approach is better than the conventional learning model. The findings of this study are reinforced by Mariani's (2014) findings that learning with a problem-based learning model makes

students active in interacting during the learning process because students carry out practical activities undertaken to overcome problems. Students seem to have an interest during learning activities by overcoming problems that are done through obvious learning experiences. In this

research, the application of PBS model with the SETS approach stimulated students to be active in learning because students were interested in solving problems in the environment by the practice of making compost to overcome the soil fertility problems in the school environment.

The learning model applied can organize students to be more active during the learning process. The students' activeness during the learning process happened because they are allowed to solve problems through obvious activities by practice of making compost. Student activeness had an impact on the seriousness of student learning so

that efforts to understand the science concept are done in earnest. In fact, students learning outcomes in the experimental class are better, students had more accomplished knowledge because the environment is associated with the concepts of knowledge, technology, and the impact on people's lives and environment. This finding is reinforced by Selcuk's findings(2013) that PBL learning model has a positive influence to improve problem-solving skills, critical thinking and creativity. The findings of students' activities data in the trial I and II can be illustrated in Figure 1 below

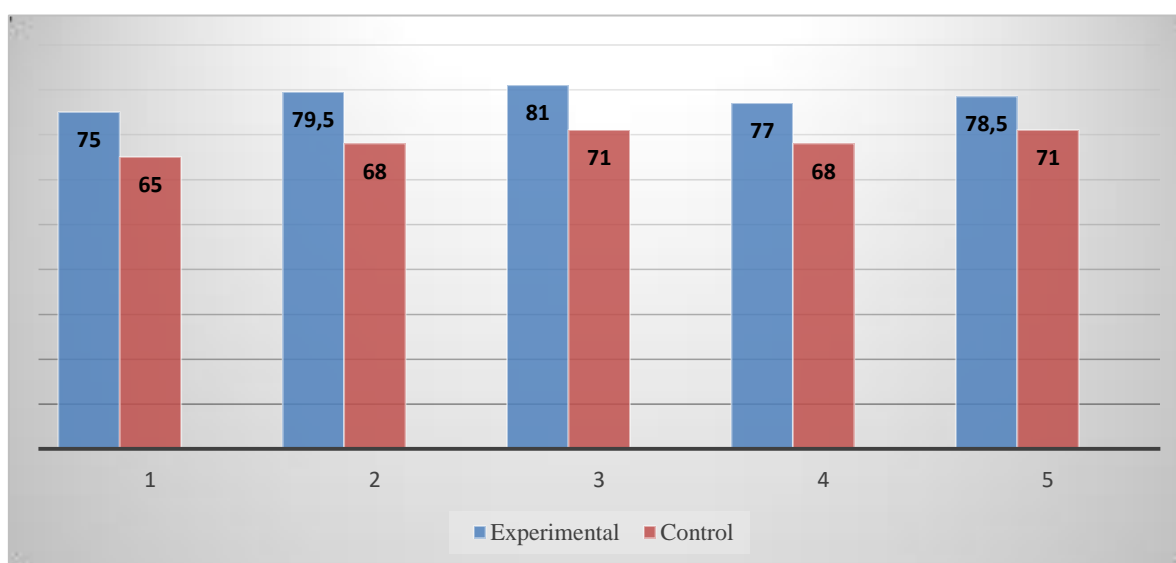


Figure 1. The Students' Activities Average in Learning of Experimental Class and Control Class

Note: (1: making a material connection with the SETS; 2: asking or answering; 3: proposing ideas; 4: solving problems; and 5: concluding)

Based on Figure 1, the students' activities average above showed that students' activities in PBL Model with the SETS approach learning was higher than conventional model learning. Students' activities during learning with problem-based learning models solve the problems that are

formulated in worksheets that are carried out systematically by beginning to make the SETS linkages. The linkages of the four SETS elements were made in writing, supplemented by a brief explanation made by the students themselves. Students in learning are allowed to ask questions and provide answers with an emphasis on ideas to solve problems. Students learning outcomes findings of the pre-test and post-test were in Table 2.

Table 2. Students Learning Outcomes in Science Learning Using PBL Model with the SETS Approach and Conventional Learning.

		Class	
		Experiment	Control
Pre-test Average		68.9	67.2
Post-Test Average		78.2	74.5
Lowest score	Pre Test	62.0	57.0
	Post Test	73.0	67.0
Highest score	Pre Test	80.0	76.0
	Post Test	85.0	80.0

The pre-test findings of both classes were 68.9 for the experimental class and 67.2 for the control class with a difference of 1.7, it meant that the initial knowledge possessed by the two classes did not differ that much. The post-test findings had a greater difference than the pre-test with a difference of 3.7 and the experimental class was higher than the control class. The research findings are strengthened from the t-test findings, obtained $t_{\text{count}} = 3.475$ with a significance score of $0.001 < 0.05$, which meant the post-test average between the experimental and control class was significantly different. Judging from the experimental class average of 78.16 and 74.50 for the control class, it can be concluded that the experimental class post-test average was higher than the control class.

The t-test sample findings of the experimental class obtained $t_{\text{count}} = 9.539$ with a sign score = $0.000 < 0.05$, which meant there was a significant increase in learning outcomes in the experimental class. Homogeneity test findings of the post-test data variance between the experimental and control class obtained $F_{\text{count}} = 0.327$ with a sign score = $0.570 > 0.05$, which meant the gain variance between the experimental and the control class was not different or homogeneous, so for further trial using an independent-sample test t-test assuming the variance of the two classes was the same. T-test findings obtained $t_{\text{count}} = 2.324$ with a significance score of $0.025 < 0.05$, which meant the gain average between the experimental and control class was significantly different. Judging from the gain average of the experimental class of 0.2895 and the control class of 0.2135, it can be concluded that the gain average of the experimental class was higher than the control class.

Based on the students' post-test score findings, it is seen that the number of students in the experimental class who got post-test scores higher than the KKM 75 is more than the control class. It showed that the learning process of environmental material by applying PBL model with the SETS approach can encourage students to learn so that there is an increase in knowledge better than learning with the conventional model. Learning activities solved problems through direct practice activities in learning environmental material in research that had an impact on learning outcomes. The material for the questions asked came from learning activities and products.

Students attitudes questionnaire data showed as much as 42.5% of the upper class and 42.5% of the middle class agreed that learning PBL model with the SETS approach has helped students in mastering the material while as many as 15% of students lower class was doubtful on students understanding. In general, 85% of students felt that their understanding of the subject matter increased using the PBL model with the SETS approach. This showed that learning can help improving students' understanding of the subject matter. Students are allowed to solve problems independently by doing activities with objects in the school environment. They are allowed to express their ideas in solving the problem before pairing up to discuss the work that is obtained and presented to the class. The findings of problem-solving activities that students did were in accordance with the characteristics of environmental material so that it can be implemented properly.

Problem-based learning in this research has involved students to solve a problem through stages of the scientific method so that students can learn knowledge while having the skills to solve the problem (Ngalimun, 2013). The students' involvement in problem-solving activities had a positive impact on students' attitudes in learning science. The number of students who answered strongly agreed was 46% and 33% answered agreed that the model applied would be one of the models applied by the teacher in learning science and applied to other materials. There were as many as 18% of students in doubt, 3% said they did not agree because they saw the weaknesses of the PBL model with the SETS approach when applied in science teaching.

T-test was conducted to test the hypothesis, there were significant differences between the learning outcomes of PBL model learning with the SETS approach with conventional learning on environmental material. The findings of the study were in line with Simanjuntak's research (2014) by using PBL learning model more effective in increasing mastery of the material so that it can improve student learning outcomes. Based on the experimental class gain average of 0.2895 and the control class of 0.2135, it can be concluded that the experimental class gain average was higher than the control class gain average. Based on the data and analysis that has been done, the alternative

hypothesis (Ha) in this research is accepted, so there was a significant difference between learning outcomes using PBL with the SETS approach learning and conventional learning.

Learning environmental material in this research was suitable to be taught with the PBL model. Students were active in identifying, solving and finding solutions to environmental concept problems that have been formulated since the beginning of learning. Students learning activities in solving problems have integrated the concept of the environment as science, linked to the environment around the school, and students are also able to mention the simple forms of technology that exist by carrying out the practice of processing school organic waste into compost. The PBL model which is integrated with the SETS approach provided a material presentation as well as a whole learning experience for students so that it had a real impact on the improvement of science learning outcomes. The findings of this study are strengthened by the research of Ajeng et al. (2013); Rita and Supramono (2015) found that learning is intact because concepts are taught and applied with the SETS approach.

CONCLUSION

Science learning in environmental material by applying the PBS model with the SETS approach, based on the findings can improve students' activities and student learning outcomes. The category of students who are very active and active in the experimental class was higher with a percentage of 87%. The conclusion of the study was the science learning model applying the PBL model with the SETS approach can be improve students' activities and learning outcomes.

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