JISE 10 (1) 2021 : 43–49

Journal of Innovative Science Education

http://journal.unnes.ac.id/sju/index.php/jise

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

Abdul Karim Budi Sulistiyo[1]✉,Dyah Rini Indriyanti[2], Parmin[2]

[1] SMP Negeri 2 Bulu, Temanggung, Indonesia
[2] Pascasarjana, Universitas Negeri Semarang, Indonesia

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.

✉ correspondence :
SMP Negeri 2 Bulu, Temanggung, Indonesia
Reban, RT 01/RW 01, Reban, Malangsari, Kecamatan Bulu,
Kabupaten Temanggung, Jawa Tengah, Indonesia 56253
E-mail: akbudist@gmail.com

p-ISSN 2252-6412
e-ISSN 2502-4523

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 conceptimplementationto 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 theminimum criteria of mastery learningin 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 targettechnology. 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 theSETS approach while the control class applies a conventional learning model. Students' activities that were observed included: making amaterial 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 andcontrol 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 pree-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.

RESULTS 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.

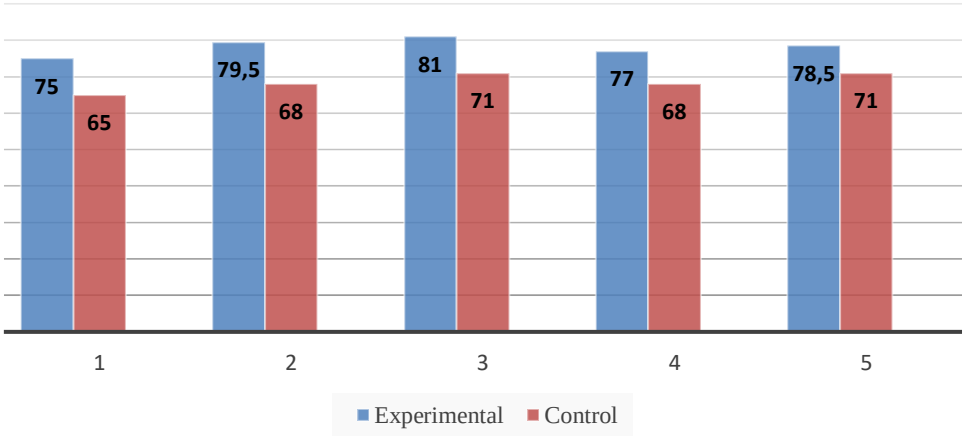

Figure 1. The Students' Activities Average in Learning of Experimental Classand Control Class

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 showedthat 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-testwere 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
Highestscore	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_{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 theexperimental class post-test average was higher than the control class.

The t-test samplefindings of the experimental class obtained t_{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_{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_{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 higherthan 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 classwasdoubtful 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 modelmore 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 averagewas 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 withthe 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.

REFERENCES

Affita, N, A., Hartono, dan Khumaedi. 2019. Analysis of Problem Solving Skills and Students Scientific Attitudes through the Implementation of Problem Based Learning Module. *Journal of Innovative Science Education*, 7 (2), 68-75.

Ajeng, R., Sri, Y., dan Suryadi, B. 2013. Penggunaan Pendekatan SETS (Science, Environment, Technology and Society) pada Pembelajaran Asam, Basa, dan Garam untuk Meningkatkan Minat Belajar, Rasa InginTahu dan Prestasi Belajar Peserta Didik Kelas VII A Semester 1 SMP N 3 Karanganyar Tahun Pelajaran 2012/2013. *Jurnal Pendidikan K*imia, 2 (3), 108-113.

Arends, R. 2008. *Learning to Teach. Penerjemah*: Helly Prajitno & Sri Mulyani. New York: McGraw Hill Company.

Binadja, A. 2000. *SETS (Science, Environment, Technology dan Society) dan Pembelajaran Biologi*. Semarang MIPA UNNES.

Indirasari, Sri, M., dan Niken, S. 2019. The Linkages of Laboratory Facilities and Motivation to the Learning Outcomes of Semarang High School Students. *Journal of Innovative Science Education*, 7 (2), 86-91.

Indriyanti, D.R. 2014. Pengembangan Perangkat Pembelajaran Bervisi SETS Kompetensi terkait Pengendalian Hama dan Penyakit Organ Tumbuhan. *Jurnal Lembaran Ilmu Kependidikan,* 43(1).

Jonassen, D. 2011. Supporting Problem Solving in PBL. *The interdisciplinary Journal of Problem Based Learning,* 5 *(2),* 95 – 112.

Mariani, Scolastika, Wardono, and Elyn. D. K. (2014). The Effectiveness of Learning by PBL Assisted Mathematics Pop Up Book Againts The Spatial Ability in Grade VIII on Geometry Subject Matter. International Journal of Education and Research. Vol. 2, No 8

Meltasari, S., Sri, N., dan Talitha, W. 2019. The Development of Booklet about the Variety of Macroscopic Fungi Species in Arboretum Sylva Western Borneo as the Supplement of Learning Material at High School. *Journal of Innovative Science Education*, 8 (1), 99-107.

McPhee, D.A. 2002. Problem Based Learning Initial Teacher Education: Taking the Agenda Forward. *Journal of Education Enquiry,* 3 *(1).*

Ngalimun, 2013. *Strategi dan Model Pembelajaran*. Yogyakarta: Aswaja Pressindo

Peterson, O.T. 2004. So You're Thinking of Triying Problem Based Learning? Three Critical Success Factor for Implementation. *Journal of Management Education,* 28*(5), 1-6.*

Rita, R., dan Supramono. 2015. Pembelajaran I-SETS (Islamic, Science, Environment, Technology and Society) terhadap Hasil belajar Siswa. *Anterior Jurnal*, 14 (2).

Sardiman.2007.*Interaksi dan Motivasi Belajar Mengajar*. Jakarta: PT. Raja Grafindo Persada.

Savery, J.R. 2006. Ovier of Problem Based Learning: Definitions and Distintions. *The Interdiciplinary Journal of Problem Based Learning,* 1*(1),* 1-6.

Shofiyah, S. 2014. Pengembangan Perangkat Pembelajaran IPA Bervisi SETS Kompetensi Terkait Pengendalian Hama dan Penyakit Organ Tumbuhan. *Jurnal Lembaran Ilmu Kependidikan, 43(1).*

Sukmadinata, N. S. 2006. *Metode Penelitian Pendidikan.* Bandung: Remaja Rosdakarya Offset.

Selcuk, G. S. 2013. A Comparason Of Achievement In Problem Based, Strategic and Tradisional Learning Classes In Physics. *International Journal on New Trends in Education and Their Implications,* 4 *(1).*

Simanjuntak, M.O., (2014). Efektifitas Model Problem Based Learning Terhadap Penguasaan Konsep Suhu dan Kalor. *Jurnal Inpafi.* 2*(3).*

Wulandari,B. & Surjono., H.D.2013. Pengaruh Problem Based Leraning Terhadap Hasil Belajar ditinjau dari Motivasi Belajar PLC di SMK. *Jurnal Pendidikan Vokasi*, 3 (2), 178-190.