The Effect of Problem-Based Learning for Environmental Change Concept on Students' Learning Outcomes

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Article Info	Abstract
	The interview at SMA Negeri 1 Petarukan showed that learning for environmental change was almost done by lecturing. The glecturin made students less active in, so that student learning outcomes were low.. The learning was also not linked to environmental awareness. One of learning models could be applied to improve learning outcomes and environmental awareness attitudes is problem-based learning (PBL). This study would determine the effect of PBL learning material on ecological changes to learning outcomes and environmental care attitudes. This research is a Quasi-Experimental Design with Nonequivalent Control Group Design. The samples in this study were class X MIPA 1 (experiment) and X MIPA 2 (control) taken by objective sampling technique. The results of the t-test show that t-count = 3.28 > t-table (df = 68) = 1.99 means that the learning outcomes of the experimental class on environmental change material are higher than the control class. The N-gain test show that the experimental class obtains the N-gain category with high criteria, while the control class obtained the N-gain category with moderate criteria. The classical completeness of learning outcomes in the experimental class is 91.1% while the control class is 75%. PBL learning can also foster an attitude of caring for the students as indicated by the results of the environmental awareness questionnaire obtaining very good criteria. Based on the results of the study it is concluded that learning material changes in the environment of the PBL model had a significant effect on student learning outcomes in SMAN 1 Petarukan.

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INTRODUCTION

The development of science and technology that is increasingly modern and rapid requires quality human resources (HR). One of the ways to improve and shape the quality of human resources is through education. The Law Number 20 of 2003 concerning the National Education System states that education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble character, and needed skills for their self, society, nation, and country.

According to Slametoin Saleh (2017), the success or failure of the goals of education in schools today depends largely on the learning process experienced by students. Teachers are required to be able to improve the quality of school subjects, especially regarding the mastery of student learning material by the field of study taught. Sugiyarto (2012) said that the learning process carried out emphasized giving direct experience to develop competencies to explore and know the natural surroundings scientifically.

The results of the teacher's interview about the implementation of learning material on environmental changes in the 2016/2017 school year obtained data that the material learning was carried out by lectures combined with practicum. Learning with lectures makes students less active in the learning process. The material learning also did not link the material with an environmental care attitude, so that the assessment of environmental care was not carried out in the learning process. The classical completeness of the material on environmental change has not yet achieved optimal completeness, because students who have completed learning on the material of environmental change have not reached ≥85%.

The use of lecture models combined with practicum turned out to be less useful to be applied in the material of environmental change. The learning that is applied needs to use an interesting and effective learning model to improve learning outcomes and environmental care attitudes, one of which is PBL. PBL is an innovative learning model that can provide active learning conditions for students. PBL is a learning model that involves students to solve problems through the stages of the scientific method so that students can gain knowledge of the problem and have problem-solving skills (Mudlofir, 2016).

Fergiyanti & Masjudin (2016) stated that learning by PBL could make students more active when compared to conventional learning. Learning by using PBL also makes student learning outcomes better than conventional learning. This is evidenced by the post-test score of the class with PBL which is better than the class without PBL (Saleh, 2017).

Environmental change concept is is very suitable if it is associated with students' environmental awareness attitude. This study will look at how much influence the PBL model has on students' environmental care attitudes. Allibeli & White (2011) define environmental awareness attitude is how much a person's awareness of existing environmental problems and efforts to solve environmental problems or show his willingness to contribute to finding solutions to environmental problems around them. Environmental awareness attitude consists of three value orientations that are correlated with one another. This orientation value includes altruistic social values that focus on concerns about human welfare, biosphere values that show concern for the environment, and egoism.

Learning by using problem-based learning can increase students' environmental awareness as indicated by changes in student behavior toward environmental awareness (Purwono *et al.*, 2013). According to Suein Tamara (2016), stating that environmental awareness is the general attitudes that a person shows towards environmental quality manifested in his willingness to express actions that can improve and maintain environmental quality in every environment-related behavior.

Based on these problems, a study should be conducted to determine the effect of the application of PBL learning models on environmental changes to learning outcomes and environmental awareness attitudes of students at SMA Negeri 1 Petarukan.

RESEARCH METHOD

This research employed Quasi-Experimental Design study with Nonequivalent Control Group Design. The population in this study were all students of class X of academic year 2017/2018 consisting of 6 classes. The two classes used as the sample in this study were X MIPA 1 (experimental class) and X MIPA 2 (control class) classes with objective sampling techniques. The data collected were learning outcomes, students' environmental awareness attitude, and student responses to the implementation of PBL learning. The retrieval data of cognitive aspects of learning outcomes data was done through posttest, psychomotor aspects were through individual assignments, nvironmental awareness attitude and students' responses to PBL learning were taken by questionnaires.

The learning outcomes were then tested for the average difference with the one- t-test (right) to determine the effect of the application of PBL on material changes in the environment on learning outcomes. The score of the pretest and posttest were then analysed by the N-gain test to determine the increase in student understanding after being given treatment. Classical learning completeness is determined by considering the students' final grades which were measured by combining the post-test and task score. Data on student responses to PBL learning were analyzed quantitatively to determine students' responses to learning about environmental changes.

RESULT AND DISCUSSION

The Effect of PBL on Learning Outcome

The learning outcomes based on the 2013 Curriculum are achievements of KD 3 (aspects of knowledge) and KD 4 (aspects of skills) that are integrated into the learning. The learning outcomes were assessed using post-test and assignment, while the final grades of students are obtained from the merging of the two values. Students are success if the final grade of students is greater or equal to the Minimum Completion Criteria (KKM). KKM for Biology subjects at SMA N 1 Petarukan is 70.

The data from the experimental and control classes' learning outcomes were tested for normality by using the Kolmogorov-Smirnov test to determine the distribution of the two data. Furthermore, the mean difference test of the two data was carried out to determine the effect of applying environmental change learning to the PBL model. The results of the normality test and the average difference in the value of learning outcomes can be seen in Table 1 below.

Table 1 The Result of Normality Test and Mean Difference Value Test of Post-test

Type of Statistic Test	Experiment Class	Control Class	Information
Kolmogorov Smirnov	0.021	0.200	-Experiment: not normally distributed -Control: normally distributed
Mean	80	75.1	
t-*test*	0,001<0,05		There is significant difference
	$t_{hitung}=3.28> t_{tabel}$ (df= 68) = 1.99		Experimental class' learning outcome > control class

Based on Table 1 shows that the Kolmogorov Smirnov test for the two groups of data is normally distributed, so the test of the difference in the average value of learning outcomes using parametric test is the t-test. The results of the analysis of the t-test for the learning outcomes are

0.001 <0.05 and the t-count = 3.28> t table (df = 68) = 1.99 means that the experimental class learning outcomes are higher than the control class. In line with the results of the study from Supiandi & Julung (2016) stated that learning using PBL had a significant effect on student learning outcomes.

The application of the PBL model has the main characteristic of using contextual problems as a focus in learning activities. The use of contextual problems in learning would help students to be able to associate academic lessons with the real-life context they face. In line with this, Johnson (2007) argues that contextual learning can lead students to find meaning in the learning process so that students benefit from the applied learning process. According to Sumantri (2015), the application of the PBL model that uses real problems in the learning process can improve students' ability to solve problems so students can gain knowledge through these activities.

The use of problems in PBL can help to learn that is originally only the transfer of knowledge from teacher to student into student-centered learning. According to Arnyana (2006), PBL learning also gives students the opportunity to build their knowledge and at the same time utilize their knowledge to solve actual problems that exist in the surrounding environment. The learning activity that is carried out in the control class tends to be teacher-centered, so students gain knowledge from the transfer of knowledge delivered by the teacher during learning. Such learning makes students lack learning experience. This is one of the causes of student learning outcomes in the control class is lower than the experimental class

Learning with PBL models provides opportunities for students to work together with group members in discussion activities. The group discussion activities can be a bridge for students to exchange information with other group members to solve problems. Collaboration between students in completing learning assignments also provides many opportunities for students to process and improve their communication skills (Lie in Sulastri & Rochintaniawati, 2009).

The results of the pretest and posttest from the experimental class and the control class are then conducted by the N-Gain test to determine the increase in students' understanding before and after being given learning about environmental change. The results of the experimental and control N-Gain tests are presented in Figure 1 below.
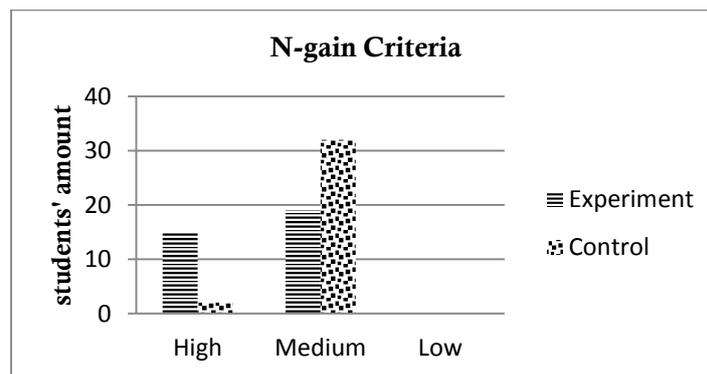
Figure 1 The Number of Students in Experiment and Control Classes based on Gained N-gain criteria

Figure 1 shows that the proportion of the N-gain category of the experimental class is better than the control class. The results of the N-gain test shows that the increase in students' understanding of environmental change material in the experimental class is better than the control class. This means that the application of PBL in the environment changes material influences improving student understanding.

The increased understanding of students with PBL learning because PBL learning emphasizes the application of techniques and procedures is making it easier for students to understand the concepts and their application in solving problems. Muslim *et al.* (2015) also gave the same opinion, that the application of PBL in learning can improve the mastery of students' concepts in each subject taught.

The successful implementation of PBL in environmental change material is also evidenced by the classical completeness of the experimental class that exceeds the optimal classical completeness as presented by Trianto (2011) that a class is said to complete learning if ≥85% of students in the class get grades above KKM. The classical completeness of the experimental class in learning material for environmental change reached 91.1% of 34 students, meaning that 31 students in the experimental class scored above the KKM and 3 other students scored below the KKM.
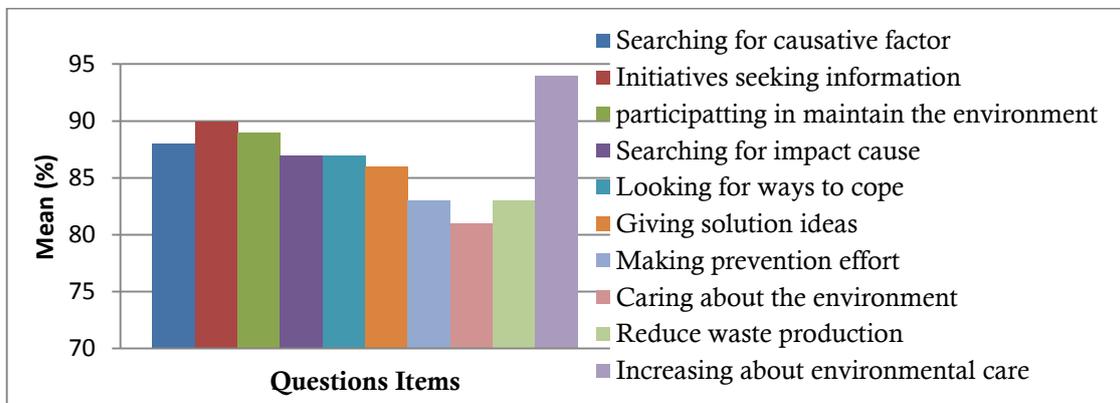
Students' Environmental Awareness Attitude and PBL Learning

The environmental awareness attitude that is assessed in this study is an environmental awareness attitude towards aspects of knowledge and awareness of the importance of protecting the environment. The assessment aimed to find out that the application of PBL to environmental change material can influence students' environmental care attitude. The formation of a caring attitude towards students begins with students' basic knowledge of the environment. The basic knowledge of students was used to search for information about problems that occur in the environment. After students find out about the problem, students' environmental awareness will arise (Imtihana *et al.*, 2014).

Based on the results of the environmental awareness questionnaire analysis, the results show that all students who received material for environmental change with PBL have an excellent environmental awareness with very good criteria. This shows that the application of PBL to environmental change material can foster the caring attitude of students. The results of this study are in line with Djuandi's (2016) research stating that learning using PBL can make students have an environmentally caring attitude that is better than before learning with PBL.

The application of environmental knowledge can be applied through playing, learning and sightseeing activities. Through these activities, the character caring for the environment can be developed by awakening someone to be responsible for their environment (Ngabekti, 2014). Students' knowledge about the environment gives a positive influence in improving attitudes and environmental awareness in students. This means that the higher the students 'knowledge about the environment, the higher the students' attitudes and awareness of the environment.

Based on the results of the questionnaire analysis of environmental care, the percentage of achievement of each item in the questionnaire can be seen in Figure 2 below.

Figure 2 The average of students' environmental care attitude base on questions items

Based on Table 3 shows that all items in the questionnaire on the attitude of caring for the environment have achieved results with excellent criteria. Students' critical attitude in analyzing environmental changes is indicated by the attitude of students' curiosity in more detail related to the factors that cause changes in the environment, efforts to overcome changes in the environment, and awareness of students to participate in preserving the environment. Students' curiosity about the impact caused by changes in the environment is shown by the attitude of students who have the initiative to look for more detailed information to overcome or find solutions to overcome environmental changes. Students 'responsibility in overcoming environmental changes is characterized by students' awareness to participate in maintaining the surrounding environment. Maulidya *et al*. (2014) stated that a sense of responsibility is one component of the goal of environmental care. The results of the Ngabekti *et al*. (2012) study state that to be able to foster a caring attitude towards students, students must be given the responsibility to maintain the cleanliness of the surrounding environment such as maintaining cleanliness in the classroom.

CONCLUSION

Based on the research results and discussion, it can be assumed that learning environmental change material by PBL take effect on students' learning outcome in the SMA Negeri 1 Petarukan which is indicated by experimental class' learning outcome which is higher than control class.

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