

Enhancing of Students' Learning Outcomes in the Environment Pollution Concept through Project Based Learning (PjBL)

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Abstract

This study aims to improve the learning outcomes with the use of Project Based Learning (PjBL) model on the concept of environmental pollution. The research method used was Classroom-based Action Research (CAR) conducted in two cycles. Each cycle consisted of planning, implementing, observing, and reflecting. The subjects of the study were the students of class X MIPA 1 SMAN 9 Tangerang Selatan in academic year 2016/2017 with the number of students was 38. The research instruments used were test and non-test instrument. Instrument test was in the form of multiple choices (30 questions), while the non-test instruments were in the form of observation sheets and field notes. The data analysis technique was by using N-gain test. The result of this research showed that the improvement of learning outcome in the concept of environmental pollution with the use of learning model based learning (PjBL) in each cycle was 47.37% in the cycle I, and 94.73% in the cycle II. The learning activity of the students showed the increase of activity with the use of learning model Project based learning (PjBL) in the cycle which was 72% in cycle I, and 78% in cycle II. The result of N-gain analysis showed the increase of N-gain from pretest to posttest in which the average of N-gain value in cycle was 0.32 in cycle I and 0.53 in cycle II. Thus it can be concluded that there is influence from the application of the model of Project Based Learning (PjBL) to improve student learning outcomes on the concept of environmental pollution.

Keywords: Classroom Action Research, Learning Outcomes, Project Based Learning (PjBL) Model

INTRODUCTION

The concept of environmental pollution in class 10 of high school is in the subject of environmental change. According to the High School Biology syllabus guidelines (Kemdikbud, 2016) it is suggested that the learning activities include (1) Reading, observing, discussing and analyzing various media reports / environmental / environmental cases regarding environmental damage and recycled products. (2) Conducting water / air pollution experiments or make recycled products. (3) Discussing experimental results and causes, ways to prevent, how to cope with global warming, depletion of the ozone layer, greenhouse effect, activities of human activities, concluding and presenting with various media. (4) Making a campaign about the impact of climate change, efforts that can be done and present the results of recycled products.

Based on the results of the preliminary study through interviews with biology teachers, it is known that in the last two years, namely in 2015 and 2016, the learning concept of environmental pollution is usually used the assignment method. In the assignment, the students are asked to read the subject themselves and make waste recycling products with the assignment time of 2 weeks. The first reason for applying the method is

because it often lack face-to-face learning time. The second reason is to assess this concept as an easy concept so that students are considered capable of understanding it themselves. With the application of learning, learning outcomes are usually obtained with an average value of 70 (according to Minimal Completion Criteria).

The 2013 curriculum develops two learning processes, namely the process of direct teaching and indirect learning (indirect teaching). The direct learning process is a learning process that develops students' knowledge, thinking abilities and psychomotor skills through direct interaction with learning resources (Kemdikbud, 2016). One of the suggested learning models is Project Based Learning or PjBL.

What is Project Based Learning or PjBL? Some experts have defined PjBL as a student-centered learning approach that is used to promote active and in-depth learning by involving students in investigating real-world issues in collaborative environments (Yam and Rossini, 2010). PjBL is a systematic teaching method that involves students in learning knowledge and skills through an investigation process, which is composed of complex and authentic questions and carefully designed products and tasks (Cook and Weaver, 2015).

PjBL is a form of student-centered active learning characterized by student autonomy, constructive investigation, goal setting, collaboration, communication, and reflection in real world practice (Kokotsaki, Menzies, and Wiggins, 2016). PjBL provides an opportunity for students to use inquiry approaches to solve problems with real issues that exist in the daily lives of students (Kemdikbud, 2016).

In this study PjBL learning steps applied are as developed by the George Lucas Educational Foundation (2007) consisted of:

1. Start With the Essential Question

Learning begins with essential questions, namely questions that can explore students' initial knowledge and assign assignments to students in carrying out an activity.

2. Design a Plan for the Project

Project planning is carried out collaboratively between teachers and students, in determining the rules of the game for the project. At this stage the teacher helps students determine the project title in accordance with the material and the problem.

3. Create a Schedule

Stage when the teacher and students collaboratively arrange the activity schedule in completing the project.

4. Monitor the Students and the Progress of the Project

The teacher is responsible for monitoring the activities of students while completing the project.

5. Assess the Outcome

Assessment is carried out to assist teachers in measuring the achievement of standards and learning objectives.

6. Evaluate the Experience

The teacher and students reflect on the activities and final results of the project that has been carried out.

The use of the PjBL model can provide benefits for students, teachers, and the development of school quality, as mentioned below (Railsback, 2002):

1. Preparing the students for the workplace. Children are exposed to a wide range of skills and competencies such as collaboration, project planning, decision making, and time management.
2. Increasing students' motivation to learn, and encouraging their ability to do important work.
3. Linking the learning in schools to the real world. By implementing the project students not only memorize facts, but also connect and think how to apply the knowledge they have to the real world.

4. Establishing student work attitudes.
In working on the projects, the students are invited to listen to each other's opinions and negotiate to find solutions.
5. Improving communication and social skills.
6. Improving problem solving skills.
7. Improving students' skills to use information with several disciplines they have.
8. Increasing student confidence.
9. Improving students' ability to use technology in learning.

The problem found in this study is that there is still no application of learning as suggested by the High School Biology syllabus. So that the student learning outcomes obtained have not reached maximum value. To improve student learning outcomes to the maximum, in this classroom action research PjBL learning model will be applied, so the aims of this research is to improve the learning outcomes with the use of Project Based Learning (PjBL) model on the concept of environmental pollution

METHOD

The method used in this study was Classroom Action Research (CAR). The design of this study consisted of two cycles and each cycle consisted of four stages, namely, planning, acting, observing, and reflecting. For the action

stage, namely the application of the PjBL model, the students were given 2 projects. The first project was making posters related to environmental pollution, carried out in cycle I. The second project was the manufacture of waste recycling products, carried out in cycle II. In detail the PjBL learning stage can be seen in Table 1.

The participants of this study were students of class X MIPA 1 of SMAN 9 Kota Tangerang Selatan, even semester of the 2016/2017 Academic Year, with 38 students consisting of 21 female students and 17 male students. The instruments used in this study were test and non-test. The test instruments in the form of questions were given before treatment (pretest) and after treatment (posttest) in the form of multiple choice questions. Non-test instruments were in the form of an observation sheet and field notes. The observation sheet was to assess student behavior or the process of the occurrence of a teaching and learning activity. Field notes contained the learning process in the classroom, the teacher and the student interaction, the students' interaction with other students and classroom management. The results of the expected intervention were 75% of students achieve the Minimum Completeness Criteria of ≥ 75 . To see the increase in pretest to posttest, the calculation of N-gain

(normalized gain) was calculated. This N-gain value is calculated by using the

following formula (Hake, 1999).

$$N - \text{Gain} = \frac{\text{Posttest Score} - \text{Pretest Score}}{\text{maximum score} - \text{Pretest score}}$$

Table 1. Stages of PjBL Learning in the Concept of Environmental Pollution

PjBL Learning Phase	Learning Activities
Start With the Essential Question	<ul style="list-style-type: none"> The teacher presented essential questions that can explore the knowledge that the students already had based on their learning experience. The teacher gave assignments to students namely the project of making posters related to environmental pollution (in Cycle I) and waste recycling products (in cycle II).
Create a Schedule	<ul style="list-style-type: none"> The teacher facilitated the students to schedule activities that referred to the maximum agreed time. The teacher facilitated the students to arrange alternative steps, if there were sub-activities that exceeded the scheduled time. The teacher asked each group to write down the reasons for each choice chosen.
Monitor the Students and the Progress of the Project	<ul style="list-style-type: none"> The teacher monitored the activities of the students while completing the project
Assess the Outcome	<ul style="list-style-type: none"> The teacher conducted assessments during monitoring carried out by referring to the assessment rubric The students presented projects in the form of posters that have been made
Evaluate the Experience	<ul style="list-style-type: none"> The students in groups reflected on the activities and results of the projects that have been implemented. Then another group was asked to respond.

RESULTS AND DISCUSSION

1. Student Learning Outcomes

From the results obtained, the average learning outcomes after the application of PjBL learning to the concept of Environmental Pollution showed an increase on Figure 1.

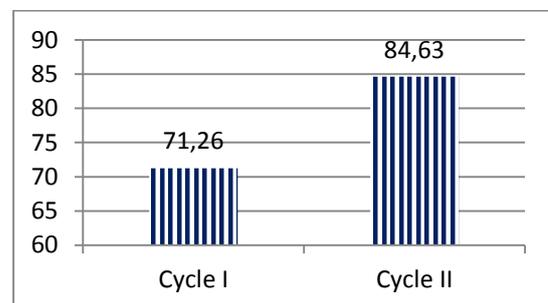


Figure 1. Average Student Learning Outcomes

In the first cycle, the average value of learning outcomes was 71.26 with the

number of students completing as many as 18 people (47.37%). In the second cycle the average value of learning outcomes increased to 84.63 with the number of students completing 36 people (97.73%) (Figure 2).

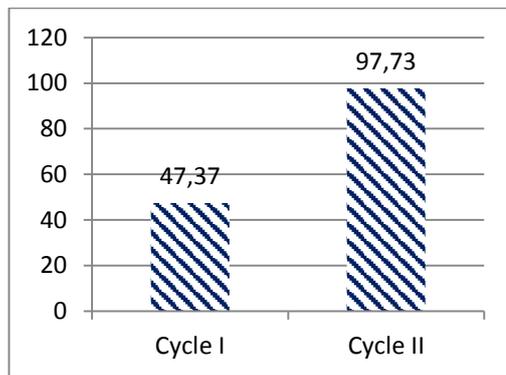


Figure 2. Percentage of mastery learning.

In the first cycle, the result of the calculation of the N-gain value obtained was by the value of 0.32, this indicates that the increase in the value of student learning outcomes from pretest to posttest is in the medium category. As for the second cycle, for the value of N-gain obtained value of 0.53, this indicates that the increase in the value of the student learning outcomes from the pretest to posttest in the second cycle is in the medium category. Thus it is clearly seen from the first cycle to the second cycle there is an increase in the value of student learning after using the PjBL learning model and it can be seen in Table 2.

Table 2. Average N-gain in Cycle I and Cycle II

Data	Cycle I	Cycle II	Category
N-gain	0.32	0.53	Medium

2. Results of Observation of Student Learning Activities

Based on the results of observation of learning activities in the first cycle and second cycle, it is known that there was an increase in the student learning activities and it can be seen on Figure 3. This shows the activity and response of students were quite good by using the PjBL learning model.

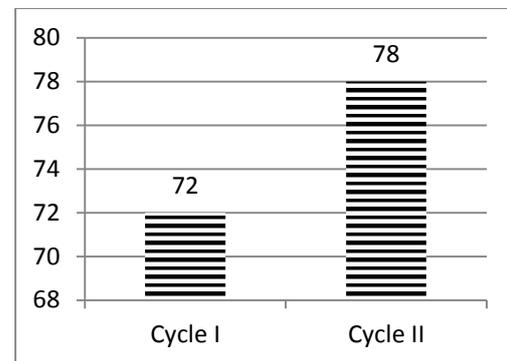


Figure 3. Student learning activities

The results of previous studies indicated that PjBL learning models can improve cognitive learning outcomes (Mahanal et al, 2010; Insyasiska, Zubaidah, and Susilo, 2015). Similarly, in this study the same results were obtained.

The increase in learning outcomes is due to the benefits of applying the PjBL learning model as proposed by Krajcik et al (Yam and Rossini, 2010): First the students develop an integrated understanding of the concepts learned; the point is that when students were given assignments in the form of poster-making projects about environmental pollution and the manufacture of waste recycling products, they learned and practiced to

integrate understanding of content and processes. In the beginning, the students must first understand the content of the concept of environmental pollution and its impact on the environment, then ended with presenting efforts that can be done to prevent environmental pollution as outlined in a poster.

Secondly, the students learned to collaborate with each other in solving the problems appeared; the students in working on projects given namely posters and waste recycling products work in heterogeneous groups collaborated with their group friends to solve the problems given. In this case, the students proposed environmental preservation efforts and producing a product that was recycled waste, in this study the waste used was newspapers. The products were produced by various types of products, for example pencil cases, frames, piggy banks, mailboxes, and so on.

Third, promoting independent learning as students assume greater responsibility for their learning; students in PjBL learning independently, starting from designing project planning to evaluate experiences. Fourth, PjBL involves various types of tasks, so as to fulfill a variety of student learning styles, : students in carrying out the given project certainly carry out a series of activities that are in accordance with various

learning styles, ranging from visual, aural, read / write, and kinesthetic.

CONCLUSION

Based on the results of classroom action research conducted in class X MIPA 1 of SMAN 9 Kota Tangerang Selatan, it can be concluded that the application of the learning process given by the teacher to the PjBL learning model can improve student learning outcomes on the concept of environmental pollution. This is due to an increase in learning outcomes from cycle I to cycle II. In the first cycle, students who achieved the Minimum Completion Criteria were 18 people (47.37%) and increased in the second cycle to 36 people (94.73%). Based on the analysis, the N-gain value has increased from cycle I to cycle II, which is from 0.32 increasing to 0.53 with a medium category.

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