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EFFECT OF PROJECT-BASED LEARNING TOWARDS SCIENCE LITERATION OF ELEMENTARY SCHOOL STUDENTS

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ABSTRACT

This research aims to investigate the effects of Project-Based Learning towards Science Literation of Elementary School Students. Students on fifth-A grade and fifth-B grade Ma'arif Al-Fattah Elementary School Surabaya in the academic year 2018-2019 conducted this research, with fifth-A grade population as the control class and fifth-B grade population as the experimental class. This research is quantitative research with a Paired Sample T-test analysis, where the independent variable is Project-Based Learning and students' Science Literacy skills as a dependent variable. Data analysis shows that t arithmetic > t table is 21,308 > 1,705, so rejected Ho and accepted Ha. Sig. (2-tailed) 0,000 < 0.05, so rejected Ho and accepted Ha. This research concludes that there is a significant effect of Project-Based Learning on elementary school students' scientific literacy skills.

Keywords: ***Project-Based Learning, Science Literacy, Ecosystem.***

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Introduction

Science plays an essential role in our lives taught since elementary school. Science studies the universe and everything in it with the various changes that occur in it. Science asks fundamental questions about the universe. For instance, how did the universe form? What is the universe's state now? What will happen to the universe in the future? Pupils can answer these questions through various scientific activities through observation, problem formulation, data collection, hypothesis formulation, experimentation, data analysis, data interpretation, and conclusion formulation. Spellings (2006) argue that science is not just a collection of facts. Still, further, science involves several aspects such as observing what happens, classifying, predicting what is likely to happen, testing, and drawing conclusions from the experiments.

Elementary school is a formal education level for students to get to know science for the first time. Students gain experience while carrying out Science learning will be a provision to continue to a higher level of education. The learning objectives of Science in Elementary Schools are to develop knowledge and understanding of science concepts that can be applied in everyday life and build curiosity, positive attitudes, and awareness about the interplay of relationships between science, environment, technology, and society. It is important to make science concepts applied to the environment, technology, and society.

The advancement of science and technology, which is increasing rapidly, has significantly improved human life quality. However, this development is accompanied by the emergence of new problems related to ethics, morals, and global issues that can threaten humans' dignity and survival. Therefore, people need to have scientific literacy to solve these problems (Rahayu, 2014). Science literacy can engage with issues directly related to science and technology as a reflective citizen. Science literacy is the ability to use scientific knowledge, identify questions, and draw conclusions based on evidence to understand and make decisions about changes made to the environment through contextual human activities (OECD, 2003).

PISA divides science literacy into four components: competency as the core being assessed, context, knowledge, and attitudes. Students who have high science literacy skills are expected to understand the issues that occur and relate the experience they have in everyday life.

PISA 2015 also reported that the five levels of science literacy of students in Indonesia were still very low below the average OECD score. The results of the Science literacy score of Indonesian students were 403. It shows that the students' ability to connect science concepts with problems found in everyday life is still low. It is because so far, Science learning is even focused on remembering theories. Obviously, it is causing Indonesian students were below the average international value issued by PISA and TIMSS (Utaminingsih et al., 2018).

The low condition of students' scientific literacy skills in Indonesia, if not addressed immediately, will impact the low quality of human resources and hinder the development of science and technology in Indonesia. Therefore, the learning process is packaged in an attractive learning model to encourage student concepts. In addition, learning with a scientific approach, contextual in nature, involving students 'daily aspects, and utilizing the surrounding environment, environment, and local potential, can increase student activity and develop students' scientific literacy (Suastra, 2005). Unfortunately, scientific literacy has not received too much attention, and teachers have not yet developed scientific literacy in learning.

Ngalimun (2013) states that Project Based Learning can be an alternative learning model to train students' Science literacy skills. It involves students in the process of solving problems through the stages of the scientific method. The impact is that students can learn knowledge related to issues and also promote problem-solving skills. Teachers can think critically and creatively to relate Science concepts to current and contextual problems because that is the basis of scientific literacy. Based on the background that can formulate the question in this study: "Does Project-Based Learning affects the Science literacy of elementary school students?"

Research Methods

This study used a quantitative approach with a pretest-posttest control group design. Project-Based Learning as an independent variable will affect the dependent variable (elementary school students' science literacy ability).

The subjects in this study were 30 students of class V-A SD Ma'arif Al-Fattah Surabaya (as the control class) and 30 students of class V-B SD Ma'arif Al-Fattah Surabaya (as the experimental class). The selection of these two classes was

carried out by purposive sampling. This research was conducted in the even semester of the 2018-2019 school years.

This main research data is the science literacy ability of elementary school students, which includes context, competence, knowledge, and attitudes. The supporting information is in the form of student response scores to Project-Based Learning and the level of learning implementation.

The research data collection has been carried out using the test, observation, and questionnaire method. The test was used to obtain data on students' Science literacy abilities (Student Science Literacy Test). Compilation of tests based on the PISA indicators (OECD, 2003). The observation method is used to assess the level of learning implementation. The questionnaire method was used to determine student responses to the application of Project-Based Learning (see table 1).

The research instruments used were the Student Science Literacy Test, Project-Based Learning Implementation Sheet, and Student Response Questionnaire Sheet on the application of Project-Based Learning. The Student Science Literacy Test Instrument aims to obtain data on Science literacy skills, capturing aspects of the content, process, context, and science literacy attitudes of elementary school students. The test is in multiple-choice questions totaling 20 questions, with four answer options to capture aspects of the content, process, and scientific context. Tests are given at the beginning of learning (pretest) and the end of learning (posttest). The test used has passed the validation stage by experts. The teaching used in this study refers to theme 5: Ecosystems, sub-theme 2: Relationships between living things in the ecosystem.

Table 1. Project Details on Project-Based Learning

Teams	Name of the project
1	*Ecobag*
2	*Vertical Garden Bottle System*
3	*Save the cambium*
4	#SOSharks

The Project-Based Learning Implementation Sheet instrument aims to assess the level of learning implementation by applying Project-Based Learning. This instrument contains learning steps by the Project-Based Learning syntax, filled out by the Observer. The Student Response Questionnaire Sheet instrument on Project-Based Learning includes several indicators of the learning process assessment.

Data analysis for hypothesis testing was carried out by assuming the normality test and homogeneity test. The normality test aims to determine whether the data is normally distributed or not. The homogeneity test seeks to determine whether the variance of the data to be analyzed is homogeneous or not. Furthermore, the hypothesis test was carried out using the paired sample T-test, with SPSS Statistic 22. The basis for decision making is based on the comparison of t-count with t-table at a 5% error degree (Sugiyono, 2012).

Result and Discussion

Project-Based Learning with several projects is aimed at preserving the ecosystem. The projects include Ecobag, Vertical Garden Bottle System, Save the cambium, and #SOSharks (table 1). The provision of four types of projects is expected to train students to use scientific knowledge, identify questions, and draw conclusions based on evidence to understand and make decisions regarding nature and changes made to nature through human activities. This ability was later called scientific literacy.

At meetings in the experimental class, students apply Project Based Learning. Students in the class are divided into four groups, and then each group gets their respective projects. Each group discusses and solves problems in their separate projects. Then each group came to the front of the class to present their different projects. Group 1, with the eco-bag project, aims to invite students to care about their surroundings, especially using plastic waste in their daily lives. Through the use of eco-bags, students are trained to reduce the use of plastic waste. Students are asked to make eco-bags according to their creativity and invite them to be more interested in using eco-bags rather than plastic bags. In this case, the aspects of scientific literacy taught are aspects of knowledge and context about inorganic and organic waste, the kinds, and their impacts. Students can also teach aspects of a caring attitude towards the environment.

Group 2, with the vertical garden bottle system project, aims to encourage students to care about the surrounding environment, train students in greening activities, the importance of clean air plants. The aspects of scientific literacy that can be taught are aspects of competence and student

attitudes. Students are introduced to make a vertical garden by utilizing plastic bottles from mineral water in competency aspects. Besides being able to reduce the amount of plastic waste, it can also be useful for reforestation. In attitude, students are taught to have a caring attitude towards the environment by actively participating in preventing and reducing pollution.

Group three aims to invite students to care about the environment, especially regarding the large-scale use of tissue and paper made from the cambium. The aspects of scientific literacy taught in this project are parts of knowledge and context about the impact of large-scale felling of trees for paper and tissue production, the dangers of using unhealthy tissue, and excessive use of paper. In addition to that, students are taught aspects of attitude. Frugal life, especially on the use of tissue and paper to protect the environment and trees, and train students to campaign for the impact of excessive use of tissue and paper on the environment.

Group 4, with the #SOSharks project, aims to get students to know about sharks hunting. Humans hunt sharks as one of the protected animals for various reasons. Through this project, students are taught aspects of science literacy knowledge and context about the impact of hunting sharks wild on the ecosystem's balance. The attitude aspect, namely, how can students campaign for the impact of illegal shark hunting on the ecosystem? And train a sense of participating in caring for and preserving protected animals.

The students' science literacy skills after learning in the experimental class were better than the control class. It proves that Project-Based Learning is influential and contributes to teaching Science literacy to elementary school students. Based on Table 2, it can be seen that t-count> t-table is 21,308> 1,705. It can be concluded that there is a significant effect of Project-Based Learning on elementary school students' science literacy. The subsequent analysis is seen from Sig. (2-tailed). If Sig. (2-tailed)> 0.05, then Ho is accepted Ha is rejected, whereas if Sig. (2-tailed) <0.05 then Ho is rejected, Ha is accepted. Based on Table 2 below, it can see that Sig (2-tailed) is 0.000 <0.05; it can be concluded that there is a significant effect of Project-Based learning on the science literacy of elementary school students.

The results of students' understanding of Science literacy can be measured using the student's Science Literacy Test instrument. This instrument aims to obtain data on science literacy skills and capture aspects of elementary school students' content, process, context, and science literacy attitudes. The pretest and posttest values can be seen in Table 3.

After learning in the experimental class, the students' science literacy skills were better than the control class (table 4). The data supports that Project-Based Learning is influential and contributes to teaching Science literacy to elementary school students. In Table 5, the results of the analysis of the recapitulation of students' initial and final Science literacy abilities are presented.

The posttest score in the experimental class is greater than the posttest score in the control class. These results indicate that the application of Project-Based Learning has a more significant effect in terms of practicing Science literacy skills in elementary school students. In Project-Based Learning, the developing aspects of students' scientific literacy are not only limited to parts of knowledge but also include all aspects, namely aspects of competence, context, and attitudes. Whereas in the control class, the scientific literacy aspect that developed was only in the knowledge aspect. Firman (2007) explained that one of the causes of Indonesian students' low scientific literacy skills was textual and less contextual learning.

The students' science literacy skills at the beginning of the lesson were below level 1, level 1, and level 2. These results increased at the end of learning in the experimental class to level 2, level 3, and level 4 (Table 5). These results indicate that Project Based Learning has a significant effect on teaching Science literacy to elementary school students. These results are supported by Farida (2014) research, which shows that Project Based Learning has a significant effect on improving students' Science literacy and student attitudes.

Table 2.T-test Result

		Mean	Std. Dev.	Std. Error Mean	t	df	Sig. (2-tailed)
Pair 1	pretest - posttest	-29.50000	7.58288	1.38444	-21.308	29	0.000

Table 3. Pretest and Posttest Score

No.	Information	Students score			
		Control Class		Experiment Class	
		Pretest	Posttest	Pretest	Posttest
1.	Number of Students	30	30	30	30
2.	Higher Score	45	55	55	85
3.	Lower Score	10	30	15	55
4.	Average Score	22,67	46,33	43,67	73,67

Table 4. Literacy Science Level before Learning Activity

No.	Level of Science Literacy	Number of Students	%
1.	Below level 1	14	46,67
2.	Level 1	13	43,33
3.	Level 2	3	10,00

Table 5. Literacy Science Level after Learning Activities

No.	Level Literasi Sains	Number of Students	%
1.	Level 2	5	16,67
2.	Level 3	14	46,67
3.	Level 4	11	36,67

Projects given by teachers to students can practice their problem-solving skills. According to Poedjiadi (Toharudin, U., Hemdrawati, S & Rustaman, 2011), scientific and technological literacy is characterized by having the ability to solve problems using science concepts obtained in education according to his level. In addition, students will get to know the technology products around them and their impacts and use technology products and maintain them. In addition, students become creative in making technological results to make decisions based on values and culture in society.

The learning implementation is included in the excellent criteria, but there are still some obstacles during the learning process. These constraints are because Project-Based Learning requires a little more time. Teachers must be more assertive and precise in using the allocation of learning time that has been stated in the lesson plan. There are still obstacles from students; many students who are disorganized during learning still need guidance from the teacher during the project work process. Following the opinion of Marx et al. (1997) in (Hapsari, 2016), project work that takes a long time makes students disorderly in learning.

Meanwhile, the student's response to the learning that has been implemented gets an average score of 90% with excellent criteria. Students strongly agree with the Project-Based Learning that has been implemented to teach Science literacy to students. Students are delighted to participate in Project-Based Learning because learning becomes more interesting than usual; combining various learning processes is not dull. The teacher uses a lot of exciting media to explain problems and give assignments so that students can understand the tasks that must be done. Project-based learning can also make students more motivated toward learning science. Students feel more interested in understanding science concepts because it is easier to apply science learning in everyday life. Students become increasingly aware of the importance of protecting the environment by generating their creative ideas.

Students are more motivated to look for supporting sources that support students to get new ideas in developing projects during the learning process. Students become more confident and enthusiastic about making research designs for solving problems and finding solutions to solve problems. Project-Based Learning can also train

students to cooperate and appreciate the ideas and ideas of others. Project-Based Learning focuses on issues that require factual investigation. Learning with a scientific approach will provide students' direct experience to be more meaningful for students and more comfortable to understand the material being studied (Ine, 2015) (Safitri, 2016).

Conclusion

Finally, Project-Based Learning affects the Science Literacy of Elementary School students. It is supported by several factors, both from science literacy tests, the implementation of learning, and student responses to education, indicating a change in students' scientific literacy skills after project-based learning. Projects developed by students are also able to encourage students to develop scientific concepts through a problem-solving process.

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