Journal of Primary Education
10 (3) (2021) : 242 – 247

https://journal.unnes.ac.id/sju/index.php/jpe/article/view/34897

Science Literacy Ability and Student Learning Outcomes On Project Based Learning (PjBL)

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Article Info

History Articles
Received:
September 2019
Accepted:
October 2019
Published:
December 2021

Keywords:
project based learning, science literacy ability, student learning outcome

DOI
https://doi.org/10.15294/jpe.v10i3.34897

Abstract

This study aimed to analyze the effectiveness of Project Based Learning in the ability of science literacy and student learning outcomes in science teaching. The research method used is quantitative in the form of an experimental quasy design with an unequal control group design. The sample in this study were fifth grade students at SDN Jambu 4 and fifth grade students at SDN 3 Sobrong. The sampling of this research used the purpose random sampling technique. Quantitative data were analyzed by t-test and gain test based on the value of scientific literacy abilities and student learning outcomes. The results showed that the average difference in students' scientific literacy skills in classes that apply the Project Based Learning model is better than classes that apply expository model (t_{value}= 3.559 > t_{table}= 2.479); the average difference in student learning outcomes in classes that apply the Project Based Learning model is better than classes that apply the expository model (t_{value}= 3.848 > t_{table}= 2.479); the results of increasing students' scientific literacy skills in classes that apply the Project Based Learning model are better than classes that apply expository model; the results of improved student learning outcomes in classes that apply the Project Based Learning model are better than classes that apply the expository model. The Project Based Learning model is very effective in improving the ability of scientific literacy and student learning outcomes.

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p-ISSN 2252-6404
e-ISSN 2502-4515

INTRODUCTION

Science education encourages students to think in understanding natural phenomena or events with scientific methods as practiced by scientists (NRC, 1996). At the elementary school level, natural science or science has an important role in education because it can be a provision for students to face various global challenges. The science learning process is carried out through scientific activities that provide direct experience so students can solve problems and make decisions, have a positive attitude towards technology and society, instill knowledge and understanding of scientific concepts, and are able to develop science process skills to investigate the natural environment so that learning outcomes Science increases.

The ability of scientific literacy is the ability to apply scientific knowledge, identify questions to gain new knowledge, and explain an event scientifically, so that it gets a conclusion based on scientific facts (OECD, 2013). Science literacy is not only an understanding of scientific knowledge, but also the ability to apply scientific processes and scientific attitudes in real situations, both for oneself and for society at large.

The ability of scientific literacy has an important role to prepare students in facing the rapidly changing daily social life. According to Mahardika, *et al* (2016), the problems found in everyday life are very related to science, so it is important to develop students' scientific literacy abilities. According to Chiapetta (Rusilowati *et al*, 2015) suggested that, the characteristics of scientific literacy are characterized by four categories, namely: (1) science as the body knowladge; (2) science as the investigative of nature; (3) science as a way of thinking; (4) interaction of science, environtment, technology, and society.

Data from the PISA (Program for International Student Assessment) in 2012 shows the achievements of Indonesian students in science ranked 64 out of 65 countries with an average score of 382. Rusilowati & Basam (2017) research results show that the average acquisition of student scores is 41 from the maximum score 100 with the percentage of scientific literacy ability in the aspect of the body of knowledge by 39%, in the aspect of ways of thinking by 50%, in the aspects of how to investigate by 37%, and in the aspects of SETS (Sciene, Environment, Technology, and Society) by 36%. The results of the study showed that students' scientific literacy skills were still low.

Low scientific literacy ability affects cognitive learning outcomes of students. Therefore, innovation is needed in learning. The application of innovative learning models can increase student motivation to follow the learning process. Applying the right learning model can improve scientific literacy skills and student learning outcomes. The application of innovative learning models that can explore and engage students actively and creatively (student center) is needed to develop scientific literacy skills and student learning outcomes. One learning model that can develop scientific literacy skills and student learning outcomes is the Project Based Learning (PjBL) learning model

The PjBL model is a learning model that uses projects (activities) as the core of learning. According to Kizkapan & Bektas (2017), the PjBL model has an important role in increasing students' scientific literacy because it can provide meaningful learning for students. Afriana (2016) explained that learning with the PjBL model can increase student creativity. Hosnan (2016) explained that project based learning or learning models that invite students to be active with activities to create a project that is used as a medium to explore the abilities of students.

Implementing project-based learning students will practice planning, carrying out activities according to plan and displaying or reporting the results of activities. The character of the Project Based Learning model begins with the existence of a product at the end, which is based on the topic at the beginning to be solved and to find a solution (Ngalimun, 2016).

Based on the description above, this study aims to analyze how the effectiveness of learning by applying the Project Based Learning learning

model to the ability of scientific literacy and student learning outcomes.

METHODS

The research method used in this research is quantitative research. The design used is a sequential explanatory design with a non equivalent control group design (Sugiyono, 2015).

This research was conducted at SDN UPTD Jepara, Central Java. The population in this study were all fifth grade students at SDN UPTD Jepara, while the sample in this study were fifth grade students at SDN Jambu 4 as an experimental group and fifth grade students at SDN 3 Sobrong as a control group. The sampling of this research used the purpose random sampling technique.

The data of this study are the results of scientific literacy skills and student learning outcomes. The data obtained were analyzed quantitatively. Quantitative data analysis in this study is a comparative test using independent sample t-test and an increase in the ability to solve mathematical problem solving in the N-Gain test.

RESULTS AND DISCUSSION

The results of this study are used to analyze the effectiveness of the Project Based Learning model for the ability of scientific literacy and student learning outcomes in sciences learning.

Science Literacy Ability

Before conducted a hypothesis test to determine the effectiveness of the Project Based Learning model on the ability of students' scientific literacy, the prerequisite test is normality test and homogeneity test to determine the distribution of research data.

Normality test aimed to determine the post-test data on the scientific literacy ability of students from the experimental class and the control class with normal distribution or not. The normality test results of students' scientific literacy abilities were presented in Table 1.

Table 1. Normality Test Results

Normality test	Signification	α	Criteria	Conclusion
Experiment	0.200	0.05	H_0 accepted	Normal
Control	0.172	0.05	H_0 accepted	Normal

Based on Table 1 the normality of the experimental class and the control class are more than α (sig. > 0.05) so that it can be concluded that the scientific literacy ability of students is normally distributed.

Homogeneity test aimed to determine the post-test data from the experimental class and the control class have the same variance or not. The results of the normality and homogeneity tests were presented in Table 2.

Table 2. Homogeneity Test Results

Homogeneity test	Signification	α	Criteria	Conclusion
Experiment Control	0.453	0.05	H_0 accepted	Homogeneous

Based on Table 2, the homogeneity test results of the experimental class and the control class are more than the α value (sig. > 0.05) so that it can be concluded that the students' scientific literacy ability data has the same variance or the data is declared homogeneous.

The results of t-test analysis obtained $t_{value} = 3.559 > t_{table} = 2.479$ at 95% confidence level, so it can be concluded that the average scientific literacy ability of students in the experimental class is better than the control class. The results of the N-Gain analysis showed that the scientific literacy ability of the experimental class students was 0.61 and included in the medium criteria.

Comparison of the average increase in the pre-test and post-test results of students' scientific

literacy skills between the experimental and control classes can be seen in Figure 1.

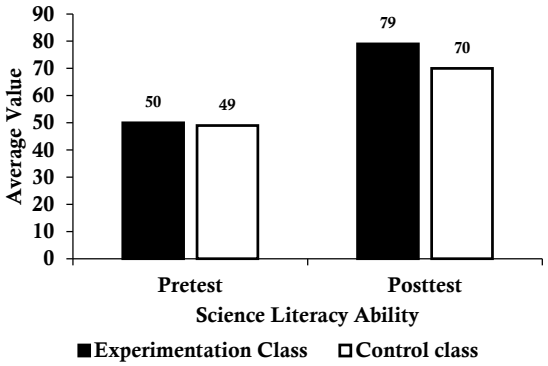

Figure 1. Results of Increased Science Literacy Ability

Based on Figure 1 an increase in students' scientific literacy skills can be seen from the difference between pre-test and post-test. In addition, it appears that the results of an increase in classrooms with the Project Based Learning model are better than the results of improvements in the classroom with expository model.

Figure 2. Students Working on Projects

Based on Figure 2 students are seen actively with their groups in completing projects given by the teacher. Learning by doing projects greatly motivates students to learn. In figure 2 student were making water filter from plastic bottle, sponges, an cotton as the materials. What the student do was part of science literacy implematation.

The ability of scientific literacy emphasizes students to analyze, predict and apply scientific concepts in everyday life. Science in the view of literacy is not just knowing, but far from it is how they undrastand to apply the science to conditions in their surrounding environment (how they know and apply in daily life not what they know).

Hapsari (2016) explained that the learning process that runs dynamically and openly from various directions can improve students' scientific literacy abilities. The application of the Project Based Learning model that is applied is very effective in improving students' literacy abilities. This is evidenced by the enthusiasm of students in participating in learning shows that the Project Based Learning learning model can make students active in learning.

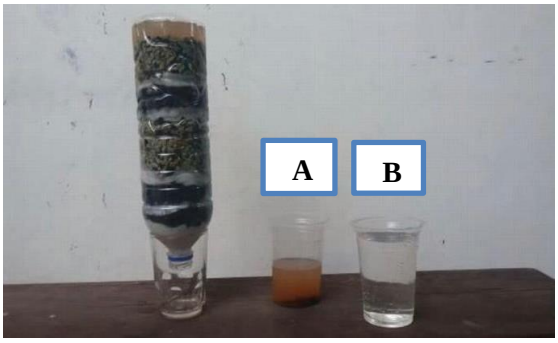

Figure 3. Student Literacy Products

Based on Figure 3 students can make water cycle literacy products on Project Based Learning model. The picture above show the product that has been made by students with the composition is arranged and repeated twice. Glass A show that if the water looks turbid, when filtered with the student product the water become glass B. The picture above proves that the product made by student succeeded in making turbid water clear.

Student Cognitive Learning Outcomes

Before conducted a hypothesis test to determine the effectiveness of the Project Based Learning model on cognitive learning outcomes of students, the prerequisite test is conducted, namely the normality test and homogeneity test to determine the distribution of research data.

Normality test aims to determine the post-test data of student learning outcomes from the experimental class and the control class with normal distribution or not. Normality test results

of student learning outcomes data were presented in Table 3.

Table 3. Normality Test Results

Normality test	Signification	α	Criteria	Conclusion
Experiment	0.157	0.05	H_0 accepted	Normal
Control	0.132	0.05	H_0 accepted	Normal

Based on Table 3, the normality test results of the experimental class and the control class are more than the α value (sig. > 0.05) so that it can be concluded that the student learning outcomes data are normally distributed.

Homogeneity test aimed to determine the post-test data from the experimental class and the control class have the same variance or not. The results of the normality and homogeneity tests are presented in Table 4.

Table 4. Homogeneity Test Results

Homogeneity test	Signification	α	Criteria	Conclusion
Experiment Control	0.366	0.05	H_0 accepted	Homogeneous

Based on Table 4, the homogeneity test results of the experimental class and the control class are more than the α value (sig. > 0.05) so it can be concluded that the data have the same or homogeneous variance.

The results of the t-test analysis obtained $t_{value} = 3.848 > t_{table} = 2.479$ at 95% confidence level, so it can be concluded that the average student learning outcomes in the experimental class are better than the control class.

The results of the N-Gain analysis showed that the learning outcomes of the experimental class students were 0.64 and included in the medium criteria. Comparison of the increase in the average pre-test and post-test student learning outcomes can be seen in Figure 3.

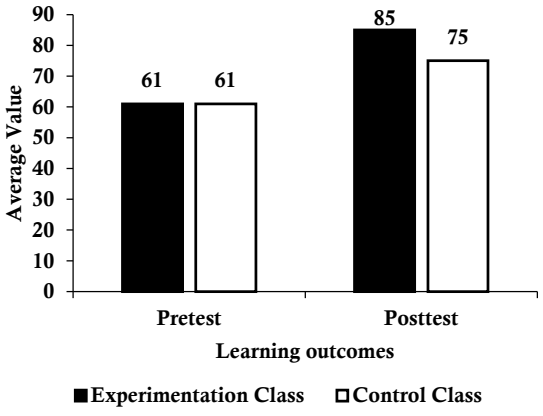

Figure 4. Student Learning Outcomes

Based on Figure 4, the increase in student learning outcomes can be seen from the difference in the pre-test and post-test. In addition, it appears that the results of an increase in class using the Project Based Learning model are better than the results of an increase in class using the expository model.

Based on data analysis the results of the study indicate that the Project Based Learning model is very effective in improving student learning outcomes in the cognitive realm in natural science learning. The increase in student learning outcomes is due to the Project Based Learning model providing broad space for students so that they are active during the learning process.

The learning process with the Project Based Learning model begins with the submission of fundamental questions and ends with a project created by the students themselves. The steps during the learning process take place triggering students' creativity in thinking to produce something tangible, increasing self-management, awareness of attitudes in themselves, and habits to evaluate themselves.

CONCLUSION

Based on the results and discussion, it can be concluded that learning using the Project Based Learning model is very effective in

improving the ability of scientific literacy and student learning outcomes.

ACKNOWLEDGMENT

The author would like to thank for the principals, teachers and students of class V SDN Jambu 4 dan SDN 3 Srobrong.

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