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The Effect of Green School-Based Inquiry Learning Model on Students' Ability of Scientific Literacy

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Abstract: A Green School is an environmentally friendly educational program designed in such a way as to create a meaningful learning experience. learning environment contributes to the development of students' scientific literacy skills. The involvement of students in nature or environmental-based learning can increase students' sensitivity to the relationship between humans and the environment. Therefore, Green School was chosen as a way to teach environmental material. Using the Pre-post Experimental Group Design research design that was applied to SMPN students on the interaction of living things, the results showed that students who learned to use the Green School-based inquiry model experienced a significant increase in their scientific literacy skills. It is hoped that there will be further research on environmental learning using Green School-based inquiry, so that references can be obtained in developing students' scientific literacy skills in the future.

Keywords: Green school; Scientific literacy; Inquiry learning model

Introduction

A green school or what is known as a Green School is a school that intensively implements environmental education programs (Shay-Margalit et al., 2017). Meanwhile, according to Cole et al. (2019) Green Schools can also be in the form of school buildings designed to facilitate school residents to be involved in environmental problems. In particular, these buildings can support the process of environmental education in schools beyond just presenting information on information boards or bulletin boards. The school is designed in such a way that students can learn things related to the environment through the green school (Vakalis et al., 2021). It was further explained that green school planning can affect the improvement of student performance outcomes. The results of previous studies also explain that Green School is positively correlated with student learning outcomes in several schools, even across subjects (Ghent et al., 2014). The application of the Green School is expected to teach students about environmental care and sustainability principles so that in the future, a green movement based on environmental care can be applied by students as the young generation who are responsible for the sustainability of life on earth (Wee et al., 2018).

Based on the results of previous research on Green School, indirectly Green School can be related to students' scientific literacy. This means that students can practice their scientific literacy skills through the Green School program. This is because in Green School students are taught and involved with environmental issues, which according to Kähler et al. (2020), the learning environment contributes to the development of students' scientific literacy skills. The involvement of students in nature or environment-based learning can increase students' sensitivity to the relationship between humans and the environment (Goldman et al., 2013). The scientific literacy in question is the ability of students to find the relationship between the sciences (Natural Sciences) they learn in their daily lives (Sarkar et al., 2014). It is complemented by Dragoş et al., (2015) that scientific literacy is the basis of scientific knowledge that is used as a basis for determining decisions in

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everyday life. It was further explained that through scientific literacy skills, students can use evidence and data as filters for information and arguments found in everyday life, both in the real world and in cyberspace. Overall it can be stated that scientific literacy is a broad and functional understanding of science to be used for other educational purposes (Fives et al., 2014). Therefore, scientific literacy is an ability that must be possessed by students to apply scientific concepts to solve problems in everyday life (Jufrida et al., 2019).

Students express their scientific literacy in complex and different ways (Garthwaite et al., 2014). The results of previous studies show that students' scientific literacy is honed when the general subject matter they learn is associated with Natural Science subjects, one example of which is geography (Čipková et al., 2018). Students' scientific literacy was found to be low in general subjects (Čipková et al., 2020). As for students in Slovakia, their level of scientific literacy ability is only at the average limit, there is no difference based on the sex of students. Given the importance of scientific literacy skills as a provision for better student life in the future, the researchers want to develop these abilities through inquiry learning, especially for students who attend schools with the Green School program.

The results of previous research indicate that inquiry learning is considered appropriate for teaching Natural Science subjects (Ristanto et al., 2018). It was further explained that inquiry based learning can have a positive influence on students' literacy skills because inquiry learning requires direct student involvement to find new concepts through their respective creativity. Because of some of these things, the researcher intends to know the effect of inquiry learning on the scientific literacy skills of students at the Green School.

Method

The method used in this study is the Quasy Experimental Research method, with a nonequivalent control group design. This study compared two groups of students, namely the experimental class and the control class. The experimental class was given treatment in the form of using an inquiry learning model that applied scientific literacy through the Green School environment, while the control class was only given an inquiry learning model but did not use the Green School environmental science literacy. Both classes were given a pretest and posttest with the same questions. The participants in this study were students from two public junior high schools in Banten (SMPN A and SMPN B), with 28 students in each school. The selection of participants was not done randomly because of the impossibility of random selection for students in schools, so researchers had to adjust to the policies of the schools. Students at SMPN A as an experimental group received material about the interaction of living things with an inquiry learning model that uses the Green School environment as a medium for scientific literacy. Meanwhile, students at SMPN B were given material about the interaction of living things with the environment using the inquiry learning model, but not using Green School environmental science literacy media.

Experimental class students were given scientific literacy using Green school, students were invited to the school yard. Students observe the school yard to observe the biotic and abiotic components that exist in the school environment according to the Students Worksheet, then students are made into groups of 4 students to observe an ecosystem that has been determined by the teacher, the ecosystem (grass, pond water, and existing tall plants) behind the school). Students participate in all series of Students Worksheet activities. Students are given the opportunity to explain all the results they get from the literacy, then students receive learning with the guided inquiry method, students are presented with learning videos on the interaction of living things with their environment, the teacher asks students what questions students can take from the video. they watch. The teacher explains the material on the interaction of living things with their environment using the lecture method. The teacher evaluates learning with questions. Then the teacher gave a posttest to the experimental class. As for the control class, learning is carried out in the same way as in the experimental class, but the control class that does not have a Green School uses only the school yard as scientific literacy. After all the series of learning activities have been completed, the teacher then gives a posttest in the experimental class and control class (Figure 1).

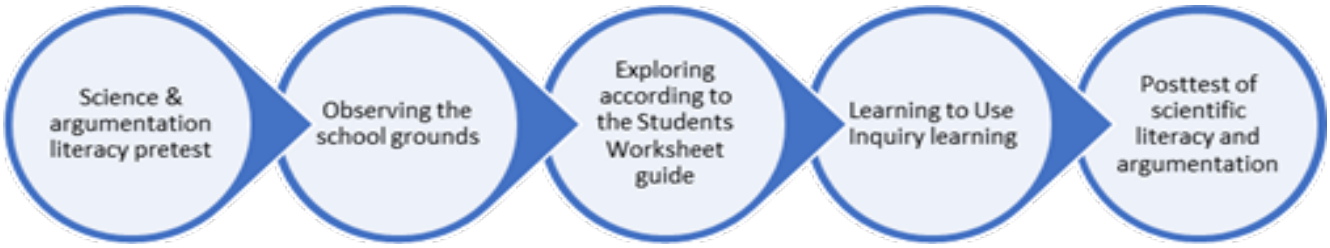

Figure 1. The research flow

Data analysis was carried out after data collection on all series of learning activities in the treatment and control classes was completed. Data analysis regarding the understanding obtained from the pretest and posttest was carried out using the SPSS application. Descriptive analysis was first carried out on the pretest data. Because the results of the pretest showed a significant difference between the experimental and control groups, the next step the author took was to analyze the gain value of each treatment and control class to see how much difference or improvement occurred in the two classes. After the data analysis was completed, a more in-depth discussion was carried out and supported by several references, until finally a conclusion was obtained from the results of this study.

Result and Discussion

In this section, data from the research results and their discussion along with references from several previous studies will be presented. The data in question include data from the results of the pretest, posttest, and others. The results of the pretest data analysis showed that the initial scientific literacy ability of students in the experimental class was significantly the same as the scientific literacy ability of students in the control class. This means that the scientific literacy skills of the students in the two classes are not different, before being given inquiry learning. Because the initial abilities of students in both classes were the same, the data analysis was continued by conducting an average difference test on the test results after the implementation of inquiry-based learning. Based on the results of the average difference test, the data presented in Table 1.

Table 1. Data Analysis of The Ability of Scientific Literacy

Data Type		Pretest		Posttest	
		Exp.	Control	Exp.	Control
Total Students		28	28	28	28
Average		50.18	49.29	84.92	72.32
Standard Deviation		5.850	6.627	6.452	6.452
Normality Test	Sig.	0.005	0.014	0.001	0.020
	Inter.		Abnormal		Abnormal
Homogenity Test	Sig.		0.494		0.566
	Inter.		Homogeneous		Homogeneous
Mann- Withney Test	Sig.		0.660		0.000
	Inter.		Not significantly different		Significantly different

The data in Table 1 shows that after conducting inquiry learning at the Green School, the test scores of students in the two classes showed significant differences. This means that the scientific literacy ability of students in the experimental class is significantly different from the scientific literacy ability of students in the control class. Of course, the scientific literacy skills of students in the experimental class were better than students in the control class. This means that the treatment given to students in the experimental class has an impact on their scientific literacy skills. In contrast to the results research of Jamaluddin et al. (2019) which showed that the scientific literacy skills of the subjects in their research were in the sufficient category, even those with a good category were fewer than those in the good category. Green School-based learning media and guided inquiry (Figure 2) have a good impact on student learning outcomes, especially on their scientific literacy skills. The same thing was found in the research of Ristanto et al. (2018), which shows that guided inquiry learning has a better effect on students' scientific literacy skills. Scientific literacy can be developed through what is found in the environment around students (Smith et al., 2012). It was further explained that students' scientific literacy skills were applied when they faced problems in everyday life in their environment, both at home and at school, then with this ability they tried to identify where the relationship between these problems and scientific concepts was. So it is not surprising that Green School has a significant influence on students' scientific literacy skills.

Figure 2. Process of Green School Based Learning Activities

Green School provides an environment-based experience to students (Wee et al., 2018). In other studies, it is considered that the environmental education applied is the same as learning at the Green School (Shay-Margalit et al., 2017). It was further revealed that environmental education had an effect on students' knowledge of the environment. Similar to what was said by Al Mufida et al. (2022) that learning based on something real can have a positive effect on student knowledge. Knowledge of conservation related to living things can also be taught through environment-based learning (Schelly et al., 2012). In addition, environment-based learning also strengthens students' perceptions of the relationship between humans and the environment and the relationship between human behavior and all elements of life and non-life within the scope of the ecosystem (Goldman et al., 2013).

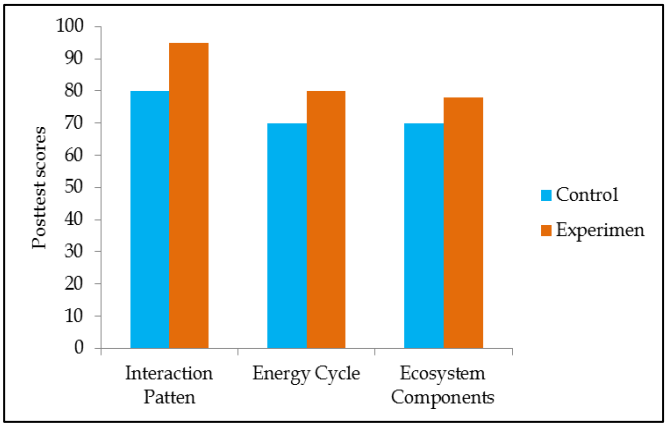

Figure 3. Student science literacy posttest score

Figure 4. Nature-based learning process

Through direct observation of several ecosystems at the Green School, students in the experimental class have more scientific literacy about the interactions of living things than students in the control class. It is evident from the results of the data analysis of the students' posttest scores which show that there is a significant difference between the posttest scores of the experimental and control class students (Figure 3). This is because there are many components of the ecosystem that can be observed in the Green School. The results of the research by Tal et al. (2019) also say that teachers are very enthusiastic to provide more interesting insights to students through learning outside of school. Teachers choose nature-based learning (Figure 4) with the aim of bridging students' experiences outside the classroom with the science curriculum, and this can support the development of students' scientific literacy (Eick, 2012). Scientific literacy ability is assessed as an ability that can support students to interact with everything related to their environment in the present and in the future (Jeong et al., 2021). It was further explained that with scientific literacy skills, students can face challenges and can maintain the sustainability of life on earth. However, there are still many students who have low scientific literacy skills (Hasasiyah et al., 2020).

Scientific literacy skills have a role in realizing a sustainable life in the future, as well as understanding students that there is a close relationship between humans and their environment (Jeong et al., 2021). Students who have an understanding of the environment can overcome environmental problems (Yeh et al., 2021). However, it is explained in more detail that students who have higher scientific literacy or environmental literacy skills are actually able to offer better environmental problem solving strategies, are able to analyze sharper solutions to environmental problems, and can present various plans for solving environmental problems. But unfortunately, the limited opportunity to develop the learning process affects the limited development of scientific literacy concepts taught to students (Sarkar et al., 2014). One of the lessons that can be developed to increase scientific literacy is inquiry-based learning (Komalasari et al., 2019). In addition, PBL-oriented learning can also be developed to improve students' scientific literacy skills (Mutiaramses et al., 2022).

Conclusion

Based on the results of statistical data analysis showed that the scientific literacy ability of students in the experimental class and control class had a significant difference after learning the material interaction of living things using the inquiry learning model. Students in the experimental class had better scientific literacy skills than students in the control class after studying at Green School. The experience gained during observations at the Green School provided broad insight to the experimental class students, thereby increasing their scientific literacy skills. It is hoped that in the future there will be more research on Green School, so that it can be a reference for the development of environmental-based inquiry learning.

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