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THE EFFECT OF PROJECT-BASED LEARNING MODEL ON SCIENCE LITERACY SKILLS OF GRADE V ELEMENTARY SCHOOL STUDENTS

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ABSTRACT

Regarding technological advances, it is necessary to make innovations so that project-based learning is more suitable for learners who, on average, are digital natives. Therefore, combining project-based learning with technology can offer a solution. This study aims to see the project-based learning model's effect in improving elementary school students' science literacy skills. This study used a nonequivalent control group research design with 56 samples divided into experimental and control groups. The instruments used were science literacy tests and observation sheets. The results of the control group's pretest and posttest mean difference test using paired sample T-test. The results of data calculation obtained Sig. (2-tailed) of 0.000, $p<0.05$, so it can be concluded that there is a difference between the pretest and posttest results in the control group. The results of this test indicate that the treatment given to both the experimental and control classes affects science literacy skills. Based on the research conducted, it is concluded that the project-based learning model can effectively improve students' literacy skills. The results of the analysis of science literacy skills of students whose learning uses project-based learning are higher than those who do not.

Keywords: project-based learning, science literacy skills,

INTRODUCTION

Technological developments in the Industrial Revolution 4.0 Era have changed how we live, learn, and work, impacting the changing skills needs in the 21st Century (Wong et al., 2015). Science education plays an important role in creating a reliable and qualified young generation to face the challenges of globalization. To raise the academic standard of instruction in schools, it is essential to manage the traits of today's pupils, who are considered members of the post-millennial generation and have extensive technological competence. (Czaplinski, I., & Fielding, A. L., 2020)

According to Rusilowati (2013), several countries have set science literacy as the goal of science education. Scientific literacy is the ability to engage with science-related discourses and concepts. Someone with scientific literacy is willing to engage in discourse about science and technology (OECD, 2017). Scientific literacy has an important role in achieving students' understanding of concepts. The primary goal of higher-order cognitive processing is the learning consequence of comprehending concepts. (Kuhlthau et al., 2015). It is also a prerequisite for achieving learning outcomes at the next level (Kirna, 2012; Laksana, 2017). This is reinforced by (Walsh et al., 2007) that students can only become problem solvers after having a conceptual understanding. (Willis, 2000) argues that someone can be said to understand when he can demonstrate the next phase of practice. Conceptual understanding includes all conceptual knowledge, more complex knowledge (e.g., classification, categorization, principles and generation, theories, models, and structures (Wilson & Leslie, 2001)

Students' low level of science literacy is one of the problems in the Indonesian education system. Although educators have recognized science literacy, students' science literacy needs to be better trained. The low science literacy skills of students in Indonesia can be influenced by several factors, including the learning model applied by teachers and the teaching materials used by students (Kurnia et al., 2014).

Research conducted by Asyhari and Hartati (2015) showed that scientific learning can improve students' science literacy skills. Science learning in the 2013 national curriculum has provided guidelines for selecting learning models using the scientific approach. Learning models may include project-based learning (PjBL), problem-based learning (PBL), or discovery learning. The selection of learning models is left to the teacher to adjust to the characteristics of the teaching materials.

Many studies have conducted project-based learning by linking scientific literacy, including research from (Tunggu et al. et al., 2019), which states that the results of improving students' scientific literacy skills in classes that apply the Project Based Learning model are better than classes that apply the expository model; the results of improving 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 effectively improves scientific literacy skills and student learning outcomes. The same thing was done by (Afriana et al., 2015): Project Based Learning integrated with STEM can improve scientific literacy learning outcomes.

Project-based learning is a student-centered learning process based on the principle of contextual learning (Kokotsaki et al., 2016; Guribie et al., 2021). The application of *project-based* learning to improve learning outcomes has been studied by (Ergül & Kargın 2014Sulistiyarini et al. 2021). Based on the background of the problems described, assessing the project-based learning model on the scientific literacy ability of science subject V students of Gugus IV Kec is necessary. Tamalanrea Makassar City.

RESEARCH METHOD

Purpose of the study

This study aims to analyze the effect of the project-based learning model on science literacy skills in grade V students of cluster IV Tamalanrea sub-district Makassar city.

Research design

This research uses the "Nonequivalent Control Group Design." This design has two groups, namely the experimental group and the control group. Each group gets a pretest and posttest during the learning process. (Sugiyono, 2017). In its implementation, this study took two samples that were not randomly selected but based on existing groups or classes, namely the experimental and control classes. The experimental class was treated using a project-based learning model, while the control class used a conventional learning model.

Content validity testing is carried out by comparing test questions with learning outcomes. The question grid is first carried out as a basis for compiling the question items in the test instrument (Dantes, 2012). Validity is carried out on the pretest and posttest instruments. The instrument contains questions that will be answered by students (trial class).

Based on the validation test results, the following table is obtained.

Table.1 Content Validation Test Results of Research Instruments

Instrument Type	Result	Criteria	explanation
RPP Validation Sheet	100	Very High Validation	Valid and suitable for use
Teacher Observation Sheet	77	High Validation	Valid and suitable for use
Student Observation Sheet	75	High Validation	Valid and suitable for use
Problem Solving Ability Test	80	High Validation	Valid and suitable for use
Learning Results Test	83	High Validation	Valid and suitable for use

Participant

The research subjects were 56 grade V primary school students representing cluster IV Tamalanrea sub-district Makassar City South Sulawesi. The research subject selection technique was carried out by purposive sampling. Purposive sampling is a subject selection technique that requires specific considerations (Sugiyono, 2016). The subjects in this study consisted of 2 classes, namely V SDI Tamalanrea 6 and V SDI class. Tamalanrea 5, namely the sample of class V SDI. Tamalanrea 6 as an experimental class with 28 students and class V SDI. Tamalanrea 5 as a control class with 28 students.

Data collection and analysis

This study collected data using test instruments to measure science literacy skills. The test was conducted twice, pretest and posttest. The data obtained in the form of pretest and posttest data were analyzed based on the experimental group and control group. In addition to the test instruments, observation instruments were also used to assess the implementation of learning. Quantitative data analysis of pretest and posttest scores demonstrated students' science literacy skills. Differences in the results of science literacy skills of the two groups with different treatments were compared, and theoretical and actual results were discussed. Descriptive statistical data consists of research data in the form of observation scores of implementing the PjBL model and pretest and posttest results for science literacy skills. The percentage of observation results of implementing the Project Based Learning model is presented in Table 1.

Table 1 Percentage of Observation Results of the Implementation of the PjBL Model by Students

Activities	Percentage	Category
Project Activity 1	76,61 %	Good enough
Project Activity 2	88,39 %	Good
Average	**82,50 %**	**Good**

Based on table 1 shows that the percentage of observation results of the implementation of the project-based learning model by students in Project Activity 1 is 76.61%, which increases to 88.39% in Project Activity 2. More details can be seen in the following comparison chart between the implementation of the project-based learning model in Project Activity 1 and Project

Activity 2:

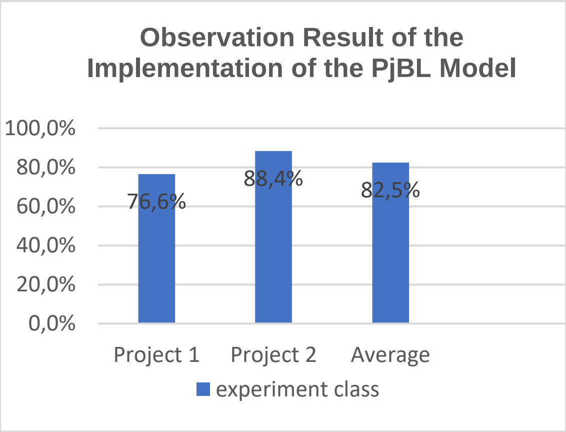

Figure 1 Graph of Observation Results of the Implementation of the PjBL Model

Description of the assessment of the results of science literacy skills of the Experimental Class and Control Class The following is the percentage of criteria for achieving the initial results of science literacy skills of experimental and control classes.

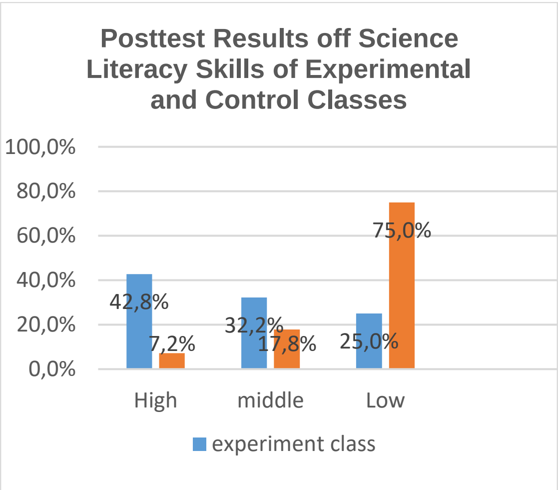

Figure 2 Graph of Science Literacy Posttest Results (Experimental Class and Control Class)

Based on the graph shows the percentage of posttest results of science literacy skills of experimental class students, there are 7 students, or 25%, who are in the low category, 9 students, or 32.2%, who are in the medium category, and 12 students or 42.8% who are in the high category. As for the control class, 21 students, or 75%, were in the low category, 5 students, or 17.8%, were in the medium category, and 2 students, or 7.2%, were in the high category. This indicates that the percentage of high and medium categories of students' science literacy results in the experimental class is higher than in the control class.

Pretest and posttest data were tested for normality and homogeneity to determine the data analysis performed. The results of the normality test using the Kolmogorov-Smirnov test on the experimental group pretest data ($z = 0.169$, $p>0.05$), control group pretest ($z = 0.081$, $p>0.05$), experimental group posttest ($z = 0102$, $p>0.05$), and control group posttest ($z = 0.177$ $p>0.05$). Data analysis shows that the pretest and posttest values of the experimental and control groups are more significant than 0.05, so the data is usually distributed. The next test is the homogeneity test with the results of $p < 0.05$, so it can be concluded that the data is homogeneous. This data analysis information is a reference for determining more in-depth data analysis. In addition, the mean difference test of the pretest and posttest of the control group was also carried out using the paired sample T-test. The results of the data calculation obtained a Sig. (2-tailed) of 0.000, $p<0.05$, so it can be concluded that there is a difference between the pretest and posttest results in the control group. The results of this test indicate that the treatment given to both the experimental and control classes affects science literacy skills.

Discussion

The high science literacy of students who are given treatment using the PjBL model compared to students who are not given the treatment is a manifestation of the advantages of the PjBL model itself. According to Sakti et al. (2021), science literacy skills are not skills that someone carries from birth so that these skills can be trained and developed through the learning process. In the learning process, the teacher acts as a mediator and facilitator. So that in its implementation, the teacher can design and apply learning models to improve students' science literacy skills. The stages carried out in measuring students' science literacy skills with the application of the project-based learning model in this study are through three indicators: explaining scientific phenomena, evaluating and designing scientific research, and interpreting data and scientific evidence.

The results of descriptive analysis and inferential statistical analysis in the experimental class concluded that project-based learning greatly influenced scientific literacy (Hernawati et al., 2019). There was an increase in students' scientific literacy with project-based learning in students' science subjects. The scope of science content is not limited to the knowledge of the 3rd-grade junior high school science curriculum but also includes knowledge gained through other sources of information relevant to real-life situations (Sakti et al., 2021). Blended g project learning-based learning is an effective method to apply based on Kolb's experience model. Students learning from blended learning project-based learning students will gain (1) concrete experience, (2) reflective observation (observation and reflection), abstract concepts and generalizations) Moreover, (4) active experimentation (testing the implications of concepts in new situations) (Henry, 2015).

Project-based learning helps students better understand the nature of science (Alvermann, 2000; Maison et al., 2019). When teachers help students think critically about what they observe in the laboratory and connect their experiences to related readings, it significantly impacts learning. (Yore., et al (2003). In line with research (J. et al., 2000c), project learning can find solutions to problems, and the best way to solve problems is by gathering information; finding and understanding problems has increased students' scientific literacy competence.

CONCLUSION

The results showed that the project-based learning model can effectively improve students' literacy skills based on the research conducted. Research shows that applying the Project Based Learning Model significantly improves the scientific literacy skills of fifth-grade elementary school students. Data shows consistent improvements in understanding scientific concepts, thinking critically about scientific problems, and presenting information in a clear and structured manner.

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