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THE INFLUENCE OF PROJECT-BASED LEARNING MODELS ON LITERACY ABILITIES AND CLASS IV SCIENCE LEARNING OUTCOMES

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Abstract. *The study's objective was to examine how the Project Based Learning Model affected the scientific literacy and learning outcomes of class IV SDI Hombes Armed, Gowa Regency students with regard to the concept of energy sources. This kind of study makes use of desalin Desalin is the non-equivalent control group. There were 60 samples in total for this study, with 30 individuals in the experimental class and 30 in the control group. A learning achievement test was used to measure learning outcomes, questions about scientific literacy were used to assess scientific literacy skills, and documentation was also used. Descriptive statistical methods, inferential analysis, and hypothesis testing are the data analysis techniques employed. The Malcal 0.000 < 0.05 Manova hypothesis test resulted. The conclusion that there was an impact on the learning model of Project Balsed Learning on copy literacy abilities and student learning outcomes in the first place on the learning of IPAl class IV SDI Hombes Alrmed led to Ho's rejection in terms of acceptance. Therefore, it can be said that learning with the project-balanced learning model has an impact on students' learning outcomes in the class IV SDI Hombes Alrmed material related to the concept of energy sources as well as their scientific literacy abilities.*

Keywords: *Project Based Learning Learning Model; Science Literacy; Learning outcomes*

I. INTRODUCTION

The Law on the National Education System, namely Law No. 20 of 2003, states that the goal of national education is to help students reach their full potential as godly, god-fearing individuals of high character. honorable, robust, competent, creative, self-sufficient, and able to become a citizen. responsible and democratic nation. Learning is a process to develop the potential and change in student behavior as a result of educational collaboration in schools, families and communities. Someone who has been said to have learned if he has obtained a change in himself[1]. Science education in schools has the task of creating students with high scientific qualifications in order to prepare responsible citizens who are sensitive to surrounding issues. and become a key competency in preparing generations who are able to use knowledge and information to face life's challenges. [2]. Science (natural science) is a subject that needs to equip students with scientific skills. Science instruction needs to benefit both the environment and the students, with opportunities for future advancement in how it is applied to daily life. [3]. Learning outcomes are the results of the entire student body, an indicator of core competencies and associated levels of behavioral change (Mulyasa, 2007).

1. Definition of Science Learning

The process of systematically exploring knowledge, facts, concepts, principles, the process of discovery, and adopting a scientific mindset is known as the Science of Science (IPA). [5]. The foundation of IPA is made up of scientific methods, products, and processes. [6]. It is anticipated that science instruction in elementary schools will help pupils learn about both the natural world and themselves. [7]. In order to find new scientific products through a scientific process and based on a scientific attitude, students must be trained to become scientists. This is the essence of studying Natural Sciences (IPA). These new scientific products come in the form of theories, laws, generalizations, facts, and concepts [8]. Science is knowledge of the physical world whose impact is not only changing the environment, but also changing human views and approaches to problems encountered in everyday life, science is composed of processes and products where the process is the scientific method and the product is scientific knowledge and attitudes with development of students' logical thinking skills [9]. Science is the study of the outcomes of human activity, which is always dynamic and active and is acquired through specific techniques, such as regular, systematic, objective, and systematic. The method is universally applicable. Science education emphasizes providing direct experiences to develop students' skills so they can explore and understand nature. good science. In addition, science education needs to help students deeply understand the natural environment by finding out and doing things independently [10].

2. Learning model

A learning model is a conceptual framework that guides teachers and lesson planners in creating and carrying out learning activities. It describes in detail how learning experiences are organized to meet specific learning objectives [11]. The learning model outlines various phases of the learning process that need to be completed from the start of the teaching and learning process to the finish, including activities involving teachers and students in a specially created learning design bolstered by unique teaching activities and how the interaction between teachers and students of instructional materials occurs [12]. A learning model is a set of procedures and materials or a specific theoretical basis for specific learning objectives [13].

A learning model has a learning model syntax, which is a model that describes the overall sequence of steps that typically accompany a sequence of learning activities [14].

The syntax of a particular learning model shows clearly what activities the teacher or students should do, along with a series of learning activities.[15]. The 2013 program learning model meets the following criteria: 1) Fact-based learning material explained with logic or reasoning, 2) When teachers and students interact educationally, subjective reasoning or thinking diverges from logical thought processes. 3) Motivate and inspire students to use critical, analytical, and appropriate thinking to recognize, comprehend, and resolve issues. 4. To help students see the differences, similarities, and connections between them from the learning materials, foster in them the ability to think hypothetically. 5) Learning objectives are written simply; 6) They are based on ideas, theories, and empirical facts that can be taken into consideration. An engaging albeit straightforward presentation system [16]. Learning models serve as a roadmap for instructional designers and educators as they implement learning [17]. The selection of a learning model is heavily impacted by the type of material being taught, the objectives of the lesson, and the proficiency level of the students. It also acts as a roadmap for instructors, course designers, and teachers when organizing and carrying out learning activities. Every learning model also includes actions that students can take under their teacher's supervision [18].

3. Project Based Learning

A learning model known as project-based learning employs projects as a communication tool, conducting information synthesis, interpretation, investigation, and research to produce a range of learning outcomes. Students must finish a variety of exercises within a set amount of time, including planning, gathering data, organizing, managing, and delivering products, as well as using projects or activities as media. [19]. The following benefits of the project-based learning model are: 1) Boosts students' desire to learn, supports their capacity to complete significant and well-received tasks, 2) Strengthens topics related to problem-solving techniques; 3) Assists learners in becoming more proactive and efficient in resolving intricate issues; 4) Promotes collaboration; 5) Motivates learners to cultivate and hone their communication abilities; 6) Advances learners' resource management abilities 7) Give students practical experience and instruction in project organization, including how to allocate time and resources like equipment to finish assignments. 8) Provide intricate, real-world-development-focused participatory learning experiences. 9) Establish a joyful learning environment for both teachers and students. Learning is enjoyable when it's done right [20].

In addition, the Project Balsed Learning model is flawed in the following ways: 1) Complex problem-solving takes a lot of time in project-based learning; 2) The additional expense of entering the system makes many parents feel disadvantaged; 3) While many educators find comfort in traditional classroom settings where the teacher assumes a central role, this is a challenging tradition, particularly for educators who lack or have limited knowledge of technology, 4) A multitude of devices must be available for use in the educational process. 5) Students who struggle with experiments and data collection will find it challenging, 6) Students might not participate in group projects, 7) There's a concern that students won't grasp the subject matter if the topics assigned to each group differ [21].

The learning model is implemented using PJBL's syntax, which is as follows: 1) Choose a simple or challenging question to start the lesson with. Essential questions are the first step in learning, especially those that students can be given as homework to complete an activity. 2) Project planning, or creating a project planning design, as a practical first step toward addressing the current issues. Teachers and students work together to plan, and the actual scheduling phase of a project is called scheduling. To ensure that the project is completed on schedule and within the allotted budget, planning is essential, 4) Keep an eye on the project's activities, development, and student assessment. Students are assisted in every step of the supervision process, and to make this easier, a rubric is made that allows for the recording of all significant activities. 5) Assess the finished product When every group presents its products to other groups in turn, product evaluation is done. 5) The experience is evaluated by looking at the project's outcomes, the student's increased knowledge, and the concepts they have learned in accordance with [22].

4. Science Literacy

Scientific literacy comes from two combinations of Latin words, namely literacy and science (Indonesia, 2018). Literatus, which means marked by letters, literacy, or education, is the root of the word literacy. Scintia, which means having knowledge, is the root of the word science [24]. The ability to identify questions, learn new information, explain scientific phenomena and draw conclusions based on evidence, comprehend the characteristics of science, recognize how science and technology shape the natural, intellectual, and cultural environments, and be prepared to engage with and be interested in science-related issues are all considered aspects of scientific competence [25]. Scientific culture is a science and understanding of scientific concepts and processes allows a person to make decisions with available knowledge and participate in the development of the state, culture and economic, including the specific capabilities it possesses [26].

5. Learning outcomes

Learning is the process by which a person uses their personal interactions with their surroundings to try and change their behavior in all areas globally [27]. Learning outcomes are modifications in behavior that follow instruction in accordance with educational objectives. The application of the teaching and learning process in accordance with educational objectives is called learning. The skills that students acquire during a learning experience and the skills they acquire following the process of a learning experience are known as learning outcomes [28]. A few terms associated with learning outcomes are as follows: 1. Assessment is the procedure of gathering and analyzing

data in order to gauge student learning outcomes, 2. The ways that educators conduct assessments and make use of different types of assessment tools are known as assessment techniques. 3. An assessment tool is a tool created and utilized to gather and analyze data in order to gauge how well students are meeting their learning objectives. (4). Minimum completion criteria (KKM) are standards for the degree of learning process completion set by teaching units based on higher cycle competency standards and considering subject characteristics, teaching unit conditions, and learner characteristics [29].

The following factors can have an impact on learning outcomes: 1) Internal factors, such as psychological and physiological factors; 2) External factors, such as instrumental and environmental factors [30]. While the indicators measure whether the learning objectives implicit or explicit in the core competencies are achieved [31]. Learning outcome index is the learning goal that students want to achieve after completing a certain learning process. This learning outcome index is the criterion for success in acquiring a basic skill, so the learning outcome index is the observable ability of the student [32], which is the main indicator of student learning outcomes, namely; 2) Students attain the behavior outlined in the learning objectives both individually and in groups. 3) The ability to assimilate the material taught, both individually and in groups [33].

Indicators of learning outcomes are tools for measuring changes that occur in an event or an activity[34]. Indicators of learning outcomes can be seen from achievement; 1) Intellectual skills and cognitive strategies, 2) Attitude, namely behavior that reflects the choice of action towards science activities, 3) Motor skills[35].

II. Research methods

Types and Research Design

This kind of study combines quasi-experimental research design with quantitative methodology. Although the pseudo-experiments have a control group, they are unable to completely control outside factors that could influence the experiment's outcome [36]. A nonequivalent control group design was employed in this study [37]. The experimental group and the control group are the two groups in this design. While the experimental class received instruction using a project-based learning learning model, the control class received instruction using traditional methods. A posttest measuring scientific literacy and student learning outcomes for the given treatment was given to both classes.

Location and Time of Research

The study was carried out in South Sulawesi's class IV of SD Inpres Hombes Alrmed in the Pattallassang District of the Gowa Regency. The second semester of the 2023 academic year saw the collection of data.

Population and Sample

Only fourth-grade students from SD Inpres Hombes Alrmed, Gowa Regency, were included in the study's population. Additionally, the sample is drawn from the population to some extent [38]. Students from SD Inpres Hombes Alrmed's fourth grade made up the study's sample. sampling with a saturated sample, a non-probability sampling technique.Researchers use sampling techniques because, given the low levels of student learning outcomes in grades IV.Al and IV.B SD Inpres Hombes Alrmed, they would prefer to use a project-based learning learning model.

Data collection technique

This study employed literature, science knowledge tests, and observation panels as data collection methods. Data on the application of the project-based learning model, which involves active student participation in the learning process, was gathered through observations. The suggested scientific knowledge exam is an indicator-based, structured exam. In order to solve basic scientific problems in practical settings, the questions are given in sentences that provide explanations. The written exam that was utilized was created using the PISA test as a model, incorporating knowledge in the domains of analysis, evaluation, and creativity. Using the PJBL model, scientific reading exercises, and student learning outcomes, materials are used as direct input for every step of the learning process.

Data Analysis Techniques

The process below is used to analyze research data analysis techniques:

1. Descriptive Statistical Analysis

The purpose of this study's descriptive statistical data analysis was to characterize scientific literacy abilities. The standards of the Ministry of National Education, which were implemented using scientific culture tests with students in control and experimental classes, served as the basis for the criteria used to ascertain the type of scientific culture of the students in this study [39]

2. Inferential Statistical Analysis

Using the Statistical Panel for Social Sciences (SPSS), inferential statistical analysis was employed to test the research hypothesis. However, preliminary tests, such as the homogeneity and normality tests, are run first before the hypothesis is tested.

3. Hypothesis testing

Manova statistical testing, also known as multivariate analysis of variance, is one of the data analysis methods used to test the study's hypothesis. The criteria used to make decisions is stated as follows: if the Sig value is less than 0.05, Ho is rejected and Ha is accepted. Ha is rejected and Ho is accepted if the Sig value is greater than 0.05..

III. Research results Discussion funds

Research result

This study was carried out over the course of five meetings in the control and experimental classes at SDI Hombes Armour, Gowa Regency, Class IV. In the first lesson, for the control group, students are pre-tested to know their initial abilities; in the second, third and fourth lessons, students learn according to the usual learning method in science class with the concept of energy sources, and in the regular classroom. The fifth session, the students went through a post-test to find out their final ability after conventional learning.

Five meetings of the experimental class were also used for research; in the first, students received a pretest; in the

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second, third, and fourth meetings, research was conducted. Project-based learning was used with the students, and in the fifth session, they were given a post-test to determine their scientific understanding and learning outcomes after receiving the learning model project-based internships. Data on scientific competency and learning outcomes of students were collected and analyzed using SPSS 25 software. The information on the scientific proficiency of the control group and the real.

Table 1 Statistical Test of Science Literacy

Statistics

		literasi kontrol	literasi eksperimen
N	Valid	30	30
	Missing	0	0
Mean		64.23	80.90
Std. Error of Mean		1.220	1.820
Median		63.00	83.00
Mode		60	73[a]
Std. Deviation		6.683	9.970
Variance		44.668	99.403
Range		27	37
Minimum		50	60
Maximum		77	97
Sum		1927	2427

a. Multiple modes exist. The smallest value is shown

The experimental class had a maximum value of 97 and a minimum value of 60, while the control class had a maximum value of 77 and 50, respectively, according to the statistical test mentioned above. The experimental class has an average value of 83, while the control class's average is 63. The average and mode values for the control class are 73 and 60, respectively. The total control class value The experimental class is 2427, and the control class is 1927. The experimental class has an average value of 80.90, while the control class's average value is 64.23.

The pre- and post-test results were used to determine the learning objectives of the students in the experimental and control groups. Prior to receiving treatment, the students in the experimental class (which used the project learning model) and the control class (which used the conventional learning method) underwent pre-testing to determine their learning outcomes. Students receive treatment in the second through fourth sessions, and in the fifth session, they take a post-test to determine their level of learning.

Table 2 Statistical Test of Learning Outcomes

Statistics

		kontrol postest	eksperimen postest
N	Valid	30	30
	Missing	0	0
Mean		65.97	79.43
Std. Error of Mean		1.870	2.412
Median		67.00	80.00
Mode		73	73[a]
Std. Deviation		10.240	13.208
Variance		104.861	174.461
Range		40	47
Minimum		47	53
Maximum		87	100
Sum		1979	2383

a. Multiple modes exist. The smallest value is shown

According to the table above, statistical analysis can explain why the experimental class's minimum value is 53 and the control class's minimum value is 47. The real class experimental class has a value of 100, while the control class has a maximum value of 87. The control class's average value is 65.97, and the experimental class's average value is 79.43. We can conclude that fourth grade students at SDI Hombes Armed, Gowa Regency, can achieve better learning outcomes when they use the project-based learning model.

1. Normality test

Conducted to test the data under study came from the population and whether or not it was normally distributed using the chi square formula. The normality test can be said to be normal if the significant value is more than or equal to 0.05.

Table 3 Normality Test

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	216.524[a]	112	.012
Likelihood Ratio	142.753	112	.026
Linear-by-Linear Association	46.525	1	.012
N of Valid Cases	60		

a. 135 cells (100.0%) have expected count less than 5. The minimum expected count is .03.

In order to make decisions within standards, it is known that the significance value of Pearson chi square 0.012 is greater than 0.05 based on SPSS results of the chi squalre test data on scientific understanding ability and academic performance. Using the chi squalre (caliqualdralt) above, it is possible to determine that the distribution of the data is normal. Therefore, based on students' scientific understanding and learning objectives, hypotheses and data requests are frequently assigned.

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2. Homogeneity Test

To determine whether the study data originates from a homogeneous population, homogeneity testing is employed. A value > 0.05 indicates that the experimental group and the control group are the same variation (homogeneous), whereas a significant value <0.05 indicates otherwise. These findings are based on the analysis of the homogeneity test. In other words, the control group and the experimental group are not the same, making them heterogeneous.

Table 4 Homogeneity Test

Test of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
Unstandardized Residual	Based on Mean	1.414	1	58	.239
	Based on Median	1.210	1	58	.276
	Based on Median and with adjusted df	1.210	1	51.674	.276
	Based on trimmed mean	1.454	1	58	.233

The significance value of 0.233 is greater than 0.05 based on data analysis of academic performance and learning skills of students, demonstrating that these two variables are consistent with a statistical level of 1.454.

3. Hypothesis testing

One of the data analysis methods used to test the study's hypothesis is Manova statistical testing, also known as multivariate analysis of variance. The decision is based on the premise that Ho is accepted and Ha is rejected if the Sig value is less than or equal to 0.05..

Table 5 Hypothesis Testing

Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.
Intercept	Pillai's Trace	.988	2363.411[b]	2.000	57.000	.000
	Wilks' Lambda	.012	2363.411[b]	2.000	57.000	.000
	Hotelling's Trace	82.927	2363.411[b]	2.000	57.000	.000
	Roy's Largest Root	82.927	2363.411[b]	2.000	57.000	.000
kelas	Pillai's Trace	.575	38.482[b]	2.000	57.000	.000
	Wilks' Lambda	.425	38.482[b]	2.000	57.000	.000
	Hotelling's Trace	1.350	38.482[b]	2.000	57.000	.000
	Roy's Largest Root	1.350	38.482[b]	2.000	57.000	.000

a. Design: Intercept + kelas
b. Exact statistic

The above SPSS test yielded a 2-sided significance value of 0.000. That's accurate. Less than 0.000 Malka The conclusion that the Balsed Learning Project learning model has an effect on students' science literacy abilities and learning outcomes based on their experiences led to Ho's rejection in terms of acceptance. class IV SDI IPA Hands Alarmed.

Discussion

Student response is a supporting data in this study which provides a response to learning with project-balanced learning on the concept of energy sources, so that it affects students' learning outcomes and their capacity for scientific literacy. A summary of the various facets of the learning process that have been engaged in is provided in the response. According to the results of the hypothesis test, the malkal Given the conclusion that the Balsed Learning project's learning model affects students' reading-copying abilities and learning outcomes in terms of their experience in IPA class IV, Ho was rejected in terms of acceptance. SDL Hands Alarmed.

The learning process from start to finish provides a lot of experience and skills to be carried out. Students are happier when practicum-based learning is carried out with the project-balanced learning model. According to [40] model project balanced learning, students can develop material concepts through direct experience. This model gives students the opportunity to demonstrate their knowledge, thereby developing better reasoning abilities [41].

Students face problems at the beginning of their studies with basic questions related to the concept of energy sources. In the product planning design stage students are asked to read texts on making windmills, waterwheels and kites. At the stage of testing the results by conducting a practicum and discussing to be able to solve the problem by explaining the data obtained according to the planning stage. In accordance with student responses that this trains students to be confident in expressing opinions.

The elaboration phase causes students to come up with other ideas after discussion, which can affect their science reading skills. Students will think more about finding new ideas to solve other problems, in their view [42] that this model gives students the opportunity to build new knowledge from own mind and find a true concept of learning Student-centered learning will have a major influence on the way of thinking in solving problems. The development of mutual cooperation among students during practice explains how students grasp the material; the teacher's role is merely to facilitate understanding. Students' study habits will be encouraged by the learning process, making them eager to move on to the next task that uses a learning model that is based on practicum.

Students who use the project-based learning model to respond favorably to the concept of project-based learning will discover that this type of learning can help students gain an understanding of the attitudes involved in conducting scientific research and discovery, so that abilities in science are formed, students believe more about the truth based on experiments, fostering someone who can bring breakthroughs new with the discovery as a result of experiments [43]. Positive feedback was received from students regarding the project's balanced learning model for science literacy and the concept of energy sources [44]. [45].

IV. CONCLUSION

The Effects of Project-Based Learning Model on Science Learning Outcomes and Knowledge for Energy Source Concepts for Class IV SDI Hombes Arm, Gowa Regency. That's accurate. Malkal = 0.000 < 0.05 Based on the experience of IPAl class IV SDI Hombes Alrmed, Ho was rejected in terms of acceptance with the conclusion that it has an impact on the learning model of the Balsed Learning project on reading-copying skills and student learning outcomes.

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