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The Impact of Project-Based Learning Models on Improving Students' Value and Understanding on Natural Sciences Lessons

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Abstract

In the era of independent learning, there was a low interest in and understanding of Natural Sciences (IPA) subjects among students. The project-based learning model emerged as an alternative to overcoming these constraints. So researchers want to know the impact of project-based learning in primary schools. The method used is pre-experimental quantitative, with the design as follows: taking samples, pretest, providing guidance, post-test after guidance, looking for the average value of the pretest and post-test, and T test results. The research was conducted at Surakarta Basic School with a 30th grade student. Types of bound variables are the values and understanding of students in the V class of Natural Sciences (IPA) and project-based free learning variables. Collecting techniques with post-test and post-test as well as data analysis with pairs of T tests. Research finds that project-based learning models have an influence on elementary school students in the fifth grade in natural science subjects (IPA). Based on the analysis, results show that t hitung > t table (2.977 > 1.6991) means there are significant differences, so the project-based learning model has an influence on value and understanding.

Keywords: Impact of Project-Based Learning, Project-Based Learning Models, Improving Students' Value

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INTRODUCTION

A generation of successors who have the ability to think critically, creatively, and able to apply scientific concepts in everyday life. In this context, the Natural Science (IPA) subjects play a central role in developing students' understanding of natural phenomena, science, and technology. One of the emerging learning approaches is the project-based learning model, which emphasizes on practical experience and application of scientific concepts in practical situations (Degita et al., 2019) From the research, it is recommended that teachers can use the model of Project Based Learning in an effort to increase the activity and student learning outcomes in learning science.

In general, primary school learning still relies on conventional methods that focus on teachers providing information without maximizing student involvement in the learning process (Winiharti et al., 2022). This often affects students' low interest and understanding of IPA subjects. The Project-Based Learning Model emerges as an alternative to overcoming these constraints, by presenting a more contextual, active, and relevant learning situation.

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(Issn et al., 2020) presented ideas about project-based learning. Dewey emphasized that learning should be centered on experience and that experience should be contextual and relevant to the daily lives of students. It highlights the importance of learning through real actions or activities that have meaning to students, not just passive reception of information from teachers. In the context of project-based learning, practical projects involving students in real problem solving are the most effective forms of learning. (Latif, 2020).

Impact execution mastering based venture to Abilities think imaginative logical secondary school understudies in material liquid dynamic. Abilities think innovative logical is one of Abilities vital 21st century possessed by members instruct so Can adjust to change. Research configuration utilized _ is a one-bunch pretest - posttest plan. Based on the effect size calculation (d), it turns out that there is an influence to enhance skills to think creatively and scientifically after learning-based projects were implemented on the studied sample (Tangerang, 2021).

According (Burgumbaeva et al., 2019), Through these projects, students can learn in an active and in-depth way, developing critical skills, creativity, and a better understanding of concepts. The "learning by doing" approach or learning through doing. He stressed that the learning process should enable students to actively engage in exploration, investigation, and reflection on their practical experiences (Lawe, 2018). In this context, project-based learning becomes a tool to encourage student engagement, associate learning with everyday life, and develop deeper skills and understanding. The philosophical foundation for the development of project-based learning concepts, which later became one of the most relevant approaches in modern educational innovation. This approach supports the idea that learning should not only be about receiving information, but involve students actively in the process of building their own knowledge. The study's objectives are to improve students' creativity at Primary School (PGSD) through the use of project-based learning models in courses on Learning Resources and Media. Concentrate on This held with A single Shot Contextual investigation plan with subject exploration of 38 understudies of the UM Lamongan Elementary Teacher Schooling concentrate on program pardon subject Learning Assets and Media (Stkip & Banjarmasin, 2022)'G

Gap analysis is the process of comparing the actual state with the desired state or target. In the context of research on the influence of Project Based Learning Models on the improvement of grade V students' grades on IPA subjects at SDN Pajang, gaps analysis can help to identify differences between the current situation and the expectations or goals to be achieved, namely the learning outcomes of students who apply the project based learning model with students who are still using conventional methods (Arrasyid, 2021). The outcomes showed that there was an expansion in the capacity to tackle numerical issues in 5th grade understudies at SDN No. 64/I Muara Bulian by utilizing the creative problem-solving model. In light of the aftereffects of the review, it very well may be presumed that the use of the imaginative critical thinking model can work on the capacity to take care of numerical issues in 5th grade understudies at SDN No. 64/I Muara Bulian (Parwati et al., 2019).

Abilities think imaginative become accomplishments primary alumni of instruction in the modern period 4.0, but Abilities the Still insufficient prepared at school. Thusly that is the objective review This is For realize impact learning based project joined technique critical thinking towards Abilities think imaginative understudy in middle school science learning (. et al., 2018). Type study: A kind of experiment with a pre- and post-test control group design. Populace review is understudy class IX Muhammadiyah Center School 6 Krian . Test taken with purposive examining procedure so got by 54 understudies in classes IX-C and IX-D. Instruments utilized is test think imaginative with pointer familiarity, adaptability, inventiveness, and elaboration (Issn et al., 2020).

The role of teachers has a major impact on the success of implementing the Project Based Learning Model. Well-trained teachers, facilitating learning, and providing effective support can improve the effectiveness of this model. (Hanipah et al., 2018) The limited creativity of teachers in choosing the right learning model has an impact on student learning outcomes. The study aims to compare the effectiveness of problem-based and project-based learning models in improving IPA learning outcomes. The type of research used is experimental research with a pretest-posttest design. The population is 7th grade high school students of Humanitarian Building Semarang. Sampling is done using the cluster random sampling technique. The research data was analyzed using the independent sample t test on α 0.05. The results of the study showed: (1) there was a difference in cognitive learning outcomes between group-based and project-based learning with a significance of 0.001 < 0.05, (2) there was no significant difference between problem-based Learning Group and project based learning in improving student abilities. Both models show no significant differences in improving attitudes of concern to the student's environment. The benefits of this research can find synthesis to add knowledge in the field of IPA learning (Firdaus & Senen, 2022).

The understudy's imagination in delivering IPA items is exceptionally high, with a typical score of 84. In light of these outcomes, it tends to be presumed that the use of venture-based learning can work on the imagination of understudies of the PGSD Study Program on the essential ideas of the IPA (Hairunisa et al., 2019). The impact of task-put-together learning models with respect to understudies' imaginative reasoning abilities in science mastery The design of the non-equivalent pretest-post test control group was the subject of this experimental study. The examination population was seventh grade understudies in the sixth state secondary school, with an all-out example of 124 understudies separated into exploratory and control gatherings. The instrument used to determine the capacity to think innovatively is the trial of the ability to reason inventively. The information I got is a standardized g-score. The examination was finished using a one-way ANAVA. In light of the consequences of the examination, there was a rate expansion in the worth of every part of imaginative reasoning abilities in both trial and control classes. In light of the information examination, the acquired F count was 29,251. The F count is more noteworthy than the F table (3,89) at the importance level of 0.05, so it tends to be reasoned that there is a distinction in imaginative reasoning abilities between understudies who master project-based learning models and regular learning models (Dwiyani Putri et al., 2019).

One-way anova examination got a F-count of 168.86 with a P-esteem of 0.000 < 0.05, which meant that there was an extremely tremendous contrast in critical ability to think between the trial class and the control class. The typical critical thinking score of the exploratory class is higher than that of the control class. Understudies actually experience issues at the phase of interfacing a few actual ideas and deciding arrangements (Makrufi & Hidayat, 2018). Effects of Undertaking Put together a learning model with respect to learning results in essential subjects of visual communication for understudies of X grade TKJ at SMK State 1. One experimental group and one control group of State SMK 1 Modifying Class X of TKJ students served as the research subjects. The information utilized in this review came from the pre-test and post-test, then was broken down with the t test. Students in the experimental group had significantly better learning outcomes than students in the control group, according to the findings of the study's data collection and analysis. It shows that the utilization of an undertaking-based learning model can successfully improve the learning impact of understudies (Tumuyu et al., 2021).

The undertaking-based learning model was created with the expectation of having an instructive effect, for example, (1) working on the understudy's capacity to dominate the learning material, (2) fostering the understudy's capacity to think basically, inventively, and imaginatively, and (3) assembling the understudy's useful innovativeness

(Widiarini et al., 2021). Mayer and Wittrock clarify that maintenance is an understudy's capacity to recall what has been realized until a specific time, while move is the understudy's capacity to comprehend and utilize what they have figured out how to tackle new issues, answer new inquiries, or work with in getting another example (Ramayanti (Nurmantoro et al., 2022)

Understudy imagination gathered utilizing test techniques. Inventiveness information is investigated utilizing illustrative measurable examination procedures and inferential insights. Graphic Measurements is utilized to portray the typical consequences of understudy inventiveness while inferential details are utilized to test research speculations utilizing a one-way ANCOVA test with a level of meaning of 0.05. The aftereffects of the review showed that understudies concentrated on utilizing the model were superior to understudies concentrating on utilizing the STAD type agreeable learning model. The average post-test scores of 88.67 and 33.86 in the PJBL model group and STAD model cooperative group, respectively, demonstrate this (Helmiati, 2019).

The novelty of this research is a project-based learning model that is used to raise the value of fifth-grade elementary school students. The theory used (Tika & Agustiana, 2021) supports learning that is centred on practical experience and the application of concepts in everyday life.

The results of this study are expected to contribute to a deeper understanding of the project-based learning model and improve the grade V students' scores on IPA subjects. The practical implications of this research can be used as a basis for the development of educational policies at the school level and as a guide for teachers to improve the quality of learning in the classroom. In addition, this research can contribute to the literature on innovative learning strategies at the elementary school level.

METHOD

The study was a pre-experimental study using quantitative methods and a single group design with pretest posts. (1) taking samples; (2) pretesting; (3) providing guidance; (4) post testing after guidance (5) Looking for the average value of the pretest and post-test; (6) T test results.

This research subject was conducted at Surakarta Basic School on a local loading subject in November 2023. Population subject for fifth grade student research of 30 students. This type of research variable is a bound variable for improving the value of understanding of students in the IPA V class and a project-based learning-free variable.

The data collection technique is carried out using the pre-test-post-test evaluation section. The research instruments used are the post-test pretest and the heading sheet to evaluate the student's task in finding a problem.

Data analysis for knowledge is done with t-tests in pairs. After that, there was an enormous impact of learning media on the values and understanding of students.

(Sugioyono, 2022) argues that the hypothesis is a quick answer, not a problem formulation in research. While (Munawaroh, 2021) meant a hypothesis as a theoretical assumption that can be accepted or empirically rejected, A hypothesis is necessary to test the validity of a research assumption or question and is usually found in quantitative research (Nurmantoro et al., 2022). The researchers made an action hypothesis based on the previous background as follows:

H0 = There is no influence of project-based learning media on student values.

H1 = There is influence of project-based learning media on student values. Therefore, the design of this research can be described as follows:

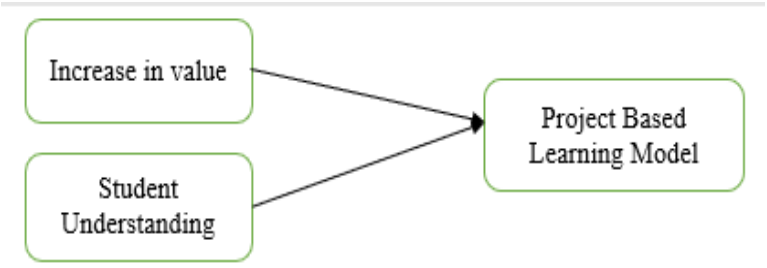

Figure 1. Research Design

In the research step, there are several stages in implementation to find out the influence of project-based learning media, namely design with pretest posts. (1) taking samples; (2) pretesting; (3) providing guidance; (4) post testing after guidance (5) Looking for the average value of the pretest and post-test; (6) T test results. The following steps are taken;

Figure 2. Research Circuit Diagram

RESULTS AND DISCUSSION

Research was carried out to determine the influence of project-based learning media with variables dependent on the learning medium and its independence on student values and students' understanding implemented at the same time. A summary of the use of learning methods in the achievement of each set of competencies is made before asking questions. The question was asked. with pre-test and post-test data collection. Number of questions: 5 for the post-test and 5 for the post-test. Here are the competency standards made in learning projects by elementary school teachers;

Table 1. Summary of the use of learning methods in achievement
Each of them has a set of competencies.

No	Learning Level	Description
1	Define learning goals.	Identify academic goals and skill development.
2	Project Theme Selection	Choose a relevant and interesting project theme.
3	Project Output Identification	Specify the type of product or expected result.
4	Project Planning and Development	Design learning steps and projects.
5	Development of Learning Materials	Prepare learning materials that support the project.
6	Learning Facilitation	Determine the role of teachers as facilitators and guides.
7	Project Evaluation	Determine the role of teachers as facilitators and guides.
8	Reflection and Enhancement	Do reflection with students and teachers; improve in the future.
9	Results and learning documentation	Record project outcomes and learning experiences.

In some basic competencies, teachers process evaluation by creating questions, which are used to evaluate project-based learning undertaken in the study of natural sciences at elementary schools. As listed in the following table:

Table 2. About the Pretest and Post-test

Jenis	Pertanyaan
Pretes	1. Respiratory disorders are usually caused by excessive smoking. 2. Carbon dioxide gas poisoning can cause respiratory dysfunction because 3. The way to prevent respiratory diseases is by means of 4. Speak of the airway arrangement! 5. Speak of diseases caused by the respiratory tract.
Posttest	1. Identify academic goals and skill development. 2. Choose a relevant and interesting project theme. 3. Specify the type of product or expected result. 4. Design learning steps and projects. 5. Prepare learning materials that support the project.

After performing the pretest and post-test, the normality test should be performed to determine the consistency of the respondent's answers;

Table 3. Normality test

		PRETEST	POSTEST
N		30	30
Normal Parameters[a,b]	Mean	69.10	75.50
	Std. Deviation	9.586	8.874
Most Extreme Differences	Absolute	.105	.147
	Positive	.103	.147
	Negative	-.105	-.066
Test Statistic		.105	.147
Asymp. Sig. (2-tailed)		.200[c,d]	.099[c]

a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.
d. This is a lower bound of the true significance.

From the normality test result, sample number 30 is 69.10 0.5. And protest 75.50 0,5. So the data is normal. Next test: Paired Samples Statistics.

Table 4. Paired Samples Statistic

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	PRETES	69.10	30	9.586	1.750
	POSTEST	75.50	30	8.874	1.620

The average pretes are 69.10, while the average post-test is 75.50, with a significance of 0.006 below 0.05, which means no difference. Next Test Paired Samples Correlations;

Table 5. Uji Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	PRETES & POSTEST	30	.188	.320

Paired Samples Correlations are not commonly used because, basically, correlations are measured between two continuous variables to see how far the linear relationship is between the two. Paired samples are generally used to compare the averages of two groups measured at two different times or conditions on one group of subjects. In the context of this test, we see if there is a significant difference between the two measurements that are of a pairing nature. The result is 0.188 0.5.

Table 6. Uji Paired Sample Test

		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1	PRETES - POSTEST	-6.400	11.775	2.150	-10.797	-2.003	-2.977	29	.006

Then there is the paired sample test, which is used to find the difference value by the lower way in decreasing the upper value; the difference value is -10.797 - -2.003 = -8.794. Analysis of the data from the pre-test and post-test data obtained. (Tabel 4).

Table 7. Data on pretest and posttest results

n	Pre-test	Post test	Difference	T count	T table	note
30	69.10	75.50	1.699	2.977	1.6991	sig different

Based on the analysis of the pair, t tests show that if t counts are larger than t tables, then Ho is rejected, so it can be concluded that there is a significant difference, so in the pretest and posttest, there are significant differences.

The results of the computational analysis showed that the project-based learning model influenced the value and understanding of children in the learning of natural sciences at Surakarta Basic School. Project-based learning media influence the value and understanding of children finding research problems because, in this model, it starts with a problem. From the examination, it is suggested that educators can utilize the model of

venture-based learning with the end goal of building action and understudy learning results in learning science (Degita et al., 2019). A total of 124 students who had taken the Animal Structure course served as the sample, which was obtained through the purposive sampling method. The outcomes showed that there was a tremendous distinction ($p<0.05$) in understudy learning results in the control and exploratory classes. By and by, there was no impact of characteristic elements on PjBL in the two classes ($p<0.05$). All understudies had high natural variables to partake in web-based learning, but the improving learning results were not direct (Maulina et al., 2022).

The significance of examination in learning issue-based learning models altogether increases creative reasoning abilities, while research indicates that elementary teachers can constantly and consistently utilize issue-based learning models, so their utilization for grade school understudies proceeds to increment and add to successful and productive learning (Setiawan et al., 2022). Understudies comprising the exploratory gathering have communicated that with the flipped homeroom application, their prosperity and their investment in the class have improved, and they viewed this technique as more fun than paying attention to what the ongoing system requires. Likewise, the understudies have expressed their shortfall of web access at home, and the issues they experience because of equipment deficiencies on their PCs are the disadvantages of the execution (Teguh, 2020).

The statistical inference analysis revealed a significant difference in the Wilcoxon test between the problem-parameter scores of the VA model assisted by Mathica Problem-Based Learning and the parameter scores of the V class problem-based learning model's students' ability to solve problems. From the consequences of this review, conclusions were drawn about the impact of Mathica-Helped Issue. Put together learning models with respect to understudies' critical abilities to think (Waluyo, 2022). The instruments utilized are perception and testing. Perceptions were made to see the exercises of students while carrying out a video-based CIRC model, while tests were directed to check understudy skills recorded as a hard copy video-based process. There are two kinds of data that were collected: qualitative data and quantitative data. The quality information is obtained by utilizing the perception sheet of the understudy movement, while the quantitative information is handled by (Sugiarti et al., 2018).

This is confirmed by the extremely low extent of cross-over in the subject, which is 0%, which shows that the RADEC learning model definitely affects understudies' higher-order thinking abilities. This increment is helped by learning sentence structure, which can foster higher-order thinking abilities. As a result, this study provides a RADEC learning model that can aid in the development of students' higher-order thinking abilities (Damayanti, 2023). The information assortment procedure utilized a test with an exploration instrument of numeracy proficiency abilities and utilized non-test information, specifically perception, and open meeting rules. The examination discoveries show that the understudies' numeracy proficiency abilities are still in the unfortunate class. Numeracy proficiency has not been created in the frame of mind of the Literasi Development School (GLS). Essential proficiency exercises have not been executed as expected (Rakhmawati & Mustadi, 2022).

To determine this issue in this paper, we have reviewed different designing plan training systems and displayed existing assessing components in a changed innovative strategy and result evaluation structure for group project appraisal. Specifically, we zeroed in on a technique for decently doling out credits by joining group-based and individual-level evaluations. Examining understudies' accomplishments and grade assessments and confirming the legitimacy of the proposed technique was performed (Engineering, 2019). The outcomes got were the Slidesgo-helped quantum showing learning model on understudy movement, inspiration, and learning results with a critical worth of 0.000 <0.05, and that implies that there was an impact of the Slidesgo-helped quantum showing model on action, inspiration, and social examinations learning results

for class V understudies in Locale II Region. Barru Area of Barru So it tends to be inferred that the slidesgo quantum showing learning model can influence the action, inspiration, and social examination learning results of class V understudies, Barru Locale, Barru Regime.

Recruits can follow the educational experience utilizing Moodle-based web-based learning; (2) the animation of correspondence between trainees and speakers in the utilization of Moodle falls into the great classification; and (3) self-directed mastering abilities in quality affirmation The board courses fall into the great classification (Pratama et al., 2023). This produces shrewdness in computerized showing materials neighborhood Android in view of the point heat and its exchange for 5th grade early school, an exceptionally legitimate and extremely commonsense premise (Mudiartana et al., 2021). The aftereffects of this study are as follows: Initial, six dormant classes were removed comparable to mentalities toward SD. Second, landscape architecture majors typically approach the concept of sustainability from an "environmental" and "environmental and economic harmony" perspective rather than an "environmental, social, and economic" one. Third, grades and instructive encounters were found to fundamentally affect the likelihood of having a place with a particular dormant class for primary school. At long last, in light of these outcomes, we recommend a technique for sorting out interdisciplinary courses to get to the 'natural, social, and financial' regions of the educational program thoroughly (Han, 2019).

The consistent utilization of training focused errands in showing science at school will permit the student to sum up and extend information, secure abilities and information regarding the matter, have the option to connect the educational experience with the genuine states of life, to demonstrate enthusiasm and freedom. The analysts depict pedantic objective setting and instances of training focused assignments in math created by the creators. Observing of students ' exercises show that the successive utilization of training focused errands expands the interest of students in instructive exercises, shaping a positive inspiration in the homeroom (Burgumbaeva et al., 2019).

Examination of the information utilized is an autonomous straightforward t-test with use SPSS application. Research result show exists upgrade each pointer think basic previously, then after the fact _ applied _ _ learning based project joined technique arrangement issue. Expertise post-test scores think imaginative in class explore more tall contrasted with class control. Other than consequently, the t-test results are acquired imprint importance < 0.05. As a result, a science learning-based project and a method for solving a problem have a significant impact on students' abilities to think critically and creatively (Issn et al., 2020) .

The effect size (d) value is 1.32, indicating that the project's implementation was learning-based and general influential in increasing skills to think creatively and scientifically. Additionally, based on aspects from Skills think creative scientific, it was determined that learning based projects were influential in increasing aspects of thinking-fluency-technical product and thinking-originality-technical product, with effect sizes (d) of 1.35 and 1.21, respectively. However, only a 0.14 effect size showed that learning based projects were effective in increasing aspects of thinking-flexibility-technical product (Tangerang, 2021). Data for the study were gathered from an observation sheet and a think creative scale (Creative Thinking Scale/CTS). Examination of exploration information finished with strategy rate and handled in a manner distinct. Research result show that imagination understudy in produce item as exceptionally high learning media that is with normal score 84. In view of results that , you can reasoned that use of learning models based projects (project based learning) can increment imagination PGSD Study Program understudies in courses Learning Assets and Media (Stkip & Banjarmasin, 2022).

CONCLUSION

Based on the results of the research, it can be concluded that the project-based learning model has an influence on the students of the Fifth Grade Elementary School in the subjects of Natural Sciences (IPA).

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