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THE EFFECTIVENESS OF PROJECT-BASED LEARNING WITH A DEEP LEARNING APPROACH TO IPAS LEARNING OUTCOMES

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ABSTRACT

The low learning outcomes of Natural and Social Sciences (IPAS) in elementary schools are largely influenced by learning practices that are still teacher-centered and have not encouraged students to think deeply. This study aims to (1) How to apply the Project Based Learning (PjBL) model with a Deep Learning approach, (2) How the learning outcomes of social studies students before and after the application of the model, and (3) test its effectiveness in improving the learning outcomes of social studies of class V students at UPT SPF SD Inpres Tangkala 1 Makassar City. The study used a quantitative approach with a pre-experimental one group pretest-posttest design, involving 18 students as research subjects. Data was collected through learning outcome tests, observation sheets, and documentation, then analyzed descriptively and inferentially using the Wilcoxon Signed Rank Test with the help of SPSS version 29. The results showed an increase in the average score from 40.00 in the pretest to 92.22 in the posttest. The Wilcoxon test yielded a Z-value of -3.725 with Asymp. Sig. (2-tailed) < 0.001 (p < 0.05), so H0 is subtracted and H1 is accepted. Observation of teacher and student activities reached the very good category with a percentage of 87.5% and 80%, respectively. These findings prove that the application of the PjBL model with a Deep Learning approach is effective in improving the learning outcomes of IPAS students in class V, because it encourages meaningful learning, mindful learning, and joyful learning in an integrated manner in the real project stage.

1. INTRODUCTION

21st century education requires fundamental transportation in the learning approach so that students do not just memorize information, but are able to think critically, creatively, and solve real problems (Afni, 2021) . The 2023 National Assessment data shows that the percentage of Indonesian students who meet the minimum literacy competencies increased from 59.49% in 2022 to 68.13% in 2023, while numeracy increased from 45.24% to 62.51% (Ministry of Education and Culture, 2023. Although it shows an improvement trend, these achievements indicate that about one-third of Indonesian students have not reached the minimum competency, a condition that requires serious attention, including in the learning of Natural and Social Sciences (IPAS) in primary schools.

In response to these needs, the Ministry of Primary and Secondary Education introduced the Deep Learning approach as a learning paradigm that emphasizes three main principles, namely meaningful learning, mindful learning, and joyful learning (Ministry of Education and Education, 2024). This approach is in line with the spirit of the Independent Curriculum which encourages student-centered, contextual, and oriented learning to strengthen the character of the Pancasila Student Profile (Ministry of Education and Culture, 2022). One of the learning models that is structurally aligned with these three principles is Project Based Learning (PjBL), which is a learning model that puts students in an active position to solve real problems through the stages of planning, implementing, and evaluating projects. . (Bell, 2010) (Abd Rahman et al., 2024a)

Initial observations at UPT SPF SD Inpres Tangkala 1 Makassar City show that science learning in class V still tends to be teacher-centered, has minimal exploratory activities, and has not involved students in the high-level thinking process. This condition contributes to the low mastery of the concept of IPAS, especially in applicable materials such as ecosystems and food chains. In fact, a number of previous studies have proven the potential of PjBL in improving learning outcomes. shows that the problem-based learning model is able to significantly improve the critical thinking skills of elementary school students. report on the effectiveness of audio-assisted PjBL in inclusive learning in higher education. develop the DEDEn-PjBL model to stimulate the creativity of elementary school-age children. (Afni & Alannasir, 2024) (Erniati et al., 2024) (Sadaruddin et al., 2023)

However, these studies generally test PjBL independently without explicitly integrating it with the framework of the Deep Learning approach that is now the direction of national education policy. Research that specifically measures the effectiveness of PjBL combined with three principles of Deep Learning in science subjects at the elementary school level, especially in the context of schools with heterogeneous student characteristics such as SD Inpres Tangkala 1 Makassar City, is still very limited. This research gap is the basis for the need for this research to be conducted, in order to provide empirical evidence on the extent to which the integration of PjBL and Deep Learning can improve the learning outcomes of science science students in class V.

Project Based Learning is a learning model that focuses on solving problems through real projects, where learners are faced with challenges that demand active involvement in critical, creative, and collaborative thinking. in its systematic literature review, it is emphasized that PjBL has consistently been proven to improve 21st century skills, including problem-solving and teamwork skills, at various levels of education. The stages of PjBL used in this study include six steps, namely determining basic questions, preparing project planning, preparing schedules, monitoring students and project progress, testing results, and evaluating learning experiences. In line with that, Deep Learning in the context of education is defined as a learning approach that integrates three dimensions, namely meaningful learning, conscious learning, and fun learning, so that students not only gain surface knowledge but are able to transfer understanding to new situations. Fullan and Quinn (2016) emphasize the importance of coherence between policies, leadership, and classroom practices so that deep learning changes can have

a systemic impact, not just temporary surface innovations. This framework was then adapted as one of the directions of the national learning policy to answer the challenges of the results of the National Assessment which still showed a gap in minimum competence. (Bell, 2010) (Abd Rahman et al., 2024) (Abd Rahman et al., 2024) (Fullan et al., 2018) (Ministry of Education and Education, 2025)

Several previous studies have reinforced the urgency of integrating active learning models with deep understanding-oriented approaches. found that the application of Problem Based Learning improved social studies learning outcomes of class V students, but the study has not explicitly touched on the dimension of Deep Learning. developed a DEDEn-PjBL model that successfully stimulated creativity, but the focus of his research was early childhood education, not cognitive learning outcomes in elementary school. Meanwhile, proving that the Teaching Campus program is able to improve the literacy and numeracy of elementary school students through active involvement, reinforcing the argument that the direct involvement of students is a determining factor for learning success. (Afni & Wahid, 2023) (Sadaruddin et al., 2023) (Nurdiansyah et al., 2022)

Compared to these studies, this study provides novelty by quantitatively testing the effectiveness of PjBL which is explicitly integrated with the three principles of Deep Learning in science subjects, a combined subject of science and social studies that is relatively new in the structure of the Independent Curriculum and still lacks empirical studies at the elementary school level. The framework of this study places the application of the PjBL model with the Deep Learning approach as an independent variable (X) which is suspected to have an effect on the learning outcomes of IPAS students as a bound variable (Y), with the research hypothesis: there is an influence of the use of the PjBL learning model with a Deep Learning approach on the learning outcomes of IPAS students in grade V of SD Inpres Tangkala 1 Makassar City.

Based on this description, this study aims to: (1) to find out the application of the PjBL learning model with a Deep Learning approach in grade V students of SD Inpres Tangkala 1 Makassar City; (2) to find out and analyze the learning outcomes of social studies of students before and after the application of the model; and (3) to determine the effectiveness of the PjBL learning model with a Deep Learning approach in improving the learning outcomes of social studies of class V students.

2. METHODS

This study uses a quantitative approach with a pre-experimental design method in the form of one group pretest-posttest design, which is a research design that compares the conditions of students before and after being given treatment without a comparative control group. The research was carried out at UPT SPF SD Inpres Tangkala 1 Makassar City in the even semester of the 2025/2026 school year, with the research subjects of all class V students totaling 18 people, consisting of four study groups. (Scott, 2019)

The research data source consists of primary data in the form of pretest results, posttests, observation sheets of teacher and student activities during the implementation of the PjBL model, as well as secondary data in the form of books, scientific journals, and other relevant supporting documents. The data collection technique was carried out through: (1) learning outcome tests in the form of multiple-choice questions as many as 10 items given at the first meeting (pretest) and fourth meeting (posttest); (2) observation using structured observation sheets to record the activities of teachers and students during the learning process; and (3) documentation in the form of photos and field notes during the four meetings, namely the orientation stage and initial tests, material presentations and group discussions, the creation of food chain projects, as well as project presentations and final tests.

The data analysis technique is carried out through two stages. First, descriptive statistical analysis was used to obtain an overview of the data in the form of mean values, standard deviations, variances, minimum values, and maximum values, which were further categorized referring to the

guidelines of the Ministry of Education and Culture into five categories: very low, low, medium, high, and very high. Second, inferential statistical analysis is used to test research hypotheses. Before the hypothesis test, a data normality test was carried out using Shapiro-Wilk with the criteria of normal distributed data if the significance value > 0.05. Because one of the learning outcome data was not normally distributed, the hypothesis test was continued using the non-parametric Wilcoxon Signed Rank Test with the help of the IBM SPSS Statistics version 29 program, with the data criteria being declared significant if the Asymp value. Sig. (2-tailed) < 0.05.

3. RESULTS AND DISCUSSION

1. Application of the PjBL Learning Model with a Deep Learning Approach

The research was carried out during four meetings on April 7-30, 2026. At the first meeting, the researcher conducted an orientation and provided a pretest in the form of 10 multiple-choice questions to measure students' initial understanding of the science material. The second and third meetings were focused on the implementation of the PjBL stages, starting from the provision of basic questions related to food chain materials, the formation of four working groups, the preparation of project plans and schedules, to the monitoring of the process of working on the Student Worksheet (LKPD) by teachers who acted as facilitators. The fourth meeting was used for the presentation of project results, reflection on learning, and the administration of the final test (posttest).

The results of observations on teacher activities showed a score of 14 out of 16 (87.5%), which reflects the success of teachers in facilitating the PjBL stages systematically. Meanwhile, the results of the observation of the students' activities showed a score of 12 out of 14 (80%), indicating that the students were able to respond well to the project challenges, although some still had difficulty in detailing the more complex impacts of changes in the food chain. In general, the results of these two observations are classified as very good, showing that the learning process takes place in accordance with the principles of meaningful, conscious, and fun learning that are at the core of the Deep Learning approach.

2. IPAS Learning Outcomes Before Model Implementation (Pretest)

The data of the pretest results of 18 students showed a descriptive statistical picture as presented in Table 1.

Table 1. Descriptive Statistics of Pretest Scores

Statistics	Shoes
N	18
Mean	40,00
Std. Deviation	23,01
Variance	529,41
Range	80
Minimum	10
Maximum	90

Sum	720

Source: IBM SPSS Statistics Version 29 Output

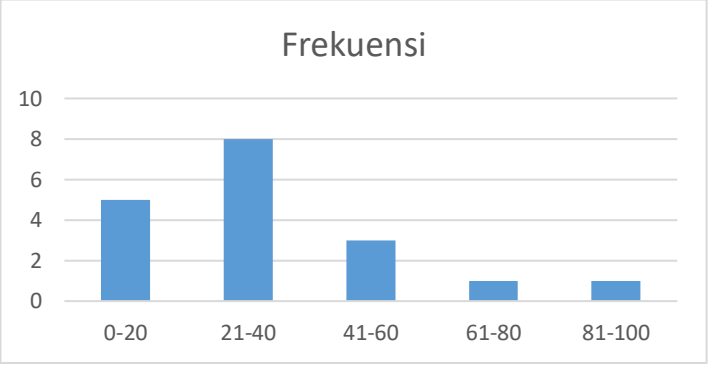
The average pretest score of 40.00 with a standard deviation of 23.01 indicates a high data distribution, strengthened by a variance value of 529.41 and a range of 80 between a minimum score of 10 and a maximum score of 90. Based on the categorization guidelines of the Ministry of Education and Culture, the distribution of the level of mastery of students' material at the pretest stage is presented in Table 2.

Table 2. Students' Material Mastery Level in the Pretest

No	Interval	Frequency	Percentage (%)	Category
1	0-20	5	27,8	Very Low
2	21-40	8	44,4	Low
3	41-60	3	16,7	Medium
4	61-80	1	5,6	Height
5	81-100	1	5,6	Very High
Quantity		**18**	**100**	

Source: Primary data processed, 2026

Table 2 shows that most of the students (44.4%) were in the low category and 27.8% in the very low category, while only 5.6% reached the high and very high category. These findings confirm the initial condition in the field that teacher-centered social studies learning has not been able to encourage in-depth conceptual understanding in most students before being given an intervention.



The diagram presented illustrates the pretest results obtained by students are categorized into various levels of understanding, namely very low, low, medium, high, and very high. From the diagram, it is evident that the initial understanding of the material by students requires improvement. This is shown by the existence of 8 students who are classified as low (21-40) in the very low category (0–20) there are 5 students, the medium category (41–60) as many as 3 students, and 1 student each is in the high (61–80) and very high (81–100) categories.

3. Social Science Learning Outcomes After Model Implementation (Posttest)

After applying the PjBL learning model with a Deep Learning approach for four meetings, learning outcome data was obtained as presented in Table 3.

Table 3. Descriptive Statistics of Posttest Scores

Statistics	Shoes
N	18
Mean	92,22
Std. Deviation	8,09
Variance	65,36
Range	20
Minimum	80
Maximum	100
Sum	1660

Source: IBM SPSS Statistics Version 29 Output

The average posttest score increased sharply to 92.22, with a much smaller standard deviation (8.09) than the pretest, indicating that the distribution of students' scores became more homogeneous after the treatment. The range of scores narrows to 20 points (minimum score of 80, maximum of 100). The distribution of the category of material mastery level in the posttest is presented in Table 4.

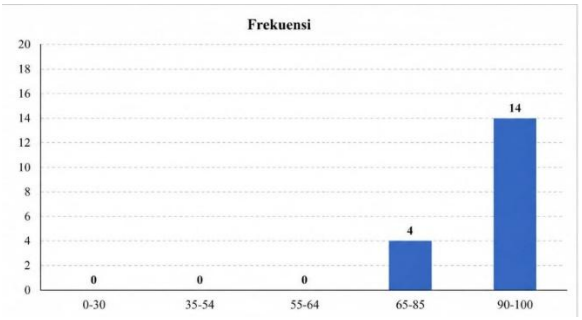
Table 4. Students' Material Mastery Level in Posttest

No	Interval	Frequency	Percentage (%)	Category
1	0-30	0	0	Very Low
2	35-54	0	0	Low
3	55-64	0	0	Medium
4	65-85	4	22,22	Height
5	90-100	14	77,78	Very High
Quantity		**18**	**100**	

Source: Primary data processed, 2026

Table 4 shows a very significant shift in distribution: there are no more students in the very low, low, or medium categories, while 77.78% of students are in the very high category and 22.22% in the

high category. A visual comparison between pretest and posttest conditions is presented in Graph 1 and Graph 2.



The results of the students' posttest after applying the Project Based Learning *(PjBL)* learning model with *a deep learning* approach have improved very well. No students received scores in the very low (0–30), low (35–54), or medium (55–64) categories. A total of 4 students (22.22%) were in the high category (65–85), while 14 students (77.78%) were in the very high category (90–100).

4. Prerequisite Test and Hypothesis Test

Before testing the hypothesis, a normality test was carried out using Shapiro-Wilk to determine the right inferential statistical technique. The results of the normality test are presented in Table 5.

Table 5. Results of Pretest and Posttest Data Normality Test (Shapiro-Wilk)

Data	Statistic	df	Say.	Remarks
Pretest	0,928	18	0,178	Normal
Posttest	0,786	18	< 0.001	Abnormal

Source: IBM SPSS Statistics Version 29 Output

The results of the Shapiro-Wilk test showed a significance value of pretest data of 0.178 (> 0.05) which means that the data is normally distributed, while the posttest data obtained a significance value of < 0.001 (< 0.05) which means that it is not normally distributed. Since none of the data met the assumption of normality, hypothesis testing was continued using the non-parametric Wilcoxon Signed Rank Test. The results of the hypothesis test are presented in Table 6.

Table 6. Wilcoxon Signed Rank Test Hypothesis Test Results

Test Statistics	Value
Z	-3,725
Asymp. Sig. (2-tailed)	< 0.001

Source: IBM SPSS Statistics Version 29 Output

The results of the Wilcoxon Signed Rank Test produced an Asymp score. Sig. (2-tailed) is < 0.001, much smaller than the significance level of 0.05. Thus, H0 who stated that there was no influence of the PjBL learning model with the Deep Learning approach on the learning outcomes of IPAS was

rejected, and H1 who stated that there was a significant influence was accepted. These findings statistically prove that there is a significant difference between students' learning outcomes before and after the application of the model, which indicates the effectiveness of the learning model.

DISCUSSION

The findings of this study show that the application of the PjBL model with a Deep Learning approach has a positive and significant influence on the learning outcomes of IPAS students in grade V of SD Inpres Tangkala 1 Makassar City, with an average increase in scores of 52.22 points. These findings reinforce the results of the research and confirm that PjBL consistently improves the learning outcomes and high-level thinking skills of students across educational levels, because this model places students as active subjects who construct their own knowledge through real experience, rather than just recipients of information from teachers. (Bell, 2010) (Abd Rahman et al., 2024)

When compared to studies that applied Problem Based Learning to social studies learning and obtained a meaningful increase in learning outcomes but without an explicit Deep Learning framework, this study showed a proportionately larger improvement result. This is suspected to be due to the integration of the three principles of Deep Learning, namely meaningful, conscious, and fun learning, strengthening the effect of PjBL by ensuring that each stage of the project demands not only the physical activity of the learners, but also deeper cognitive and emotional engagement. In line with the view of Fullan and Quinn (2016), significant impact learning changes require coherence between classroom activity design and deep learning orientation, not just the procedural application of models. (Afni & Wahid, 2023)

The decrease in standard deviation from 23.01 in the pretest to 8.09 in the posttest is an important finding that is rarely explicitly discussed in similar PjBL studies. These findings indicate that the PjBL model with a Deep Learning approach not only increases average class achievement, but also contributes to the equitable distribution of learning outcomes among students. This is relevant to the findings in the Teaching Campus program, which shows that the active involvement of students in collaborative activities helps students with low initial ability to catch up, so that the achievement gap between students can be reduced. (Nurdiansyah et al., 2022)

The results of observation of teacher activities (87.5%) which are higher than student activities (80%) also indicate that the role of teacher facilitation greatly determines the success of the implementation of PjBL, especially at the stage of project monitoring and providing feedback. These findings are consistent with the view that the success of PjBL, even in groups of students with special needs, is highly dependent on the quality of teacher guidance and assistance throughout the project process, not just on instruction at the beginning of learning. (Erniati et al., 2024)

Overall, the main contribution of this research lies in empirical proof that the integration of PjBL with the three principles of Deep Learning can be an effective strategy to answer the challenges of the results of the National Assessment which still shows the gap in the minimum competency of Indonesian students, especially in science subjects that require cross-disciplinary understanding. These findings provide practical implications for elementary school teachers not to view Deep Learning as a stand-alone policy, but rather as a principle that can be integrated into established active learning models such as PjBL

4. CONCLUSIONS AND SUGGESTIONS

Based on the results of the research and discussion, it can be concluded that:

1. The application of the PjBL learning model with a Deep Learning approach in grade V students of SD Inpres Tangkala 1 Makassar City was carried out well through four stages of meetings, with the results of observation of teacher and student activities in the very good category (87.5% and 80%).

2. The learning outcomes of social studies students before the implementation of the model were relatively low with an average score of 40.00, and increased significantly to 92.22 after the application of the model, accompanied by a decrease in the variability of scores between students.
3. The PjBL learning model with a Deep Learning approach has been proven to be effective in improving the learning outcomes of social studies of grade V students, as evidenced by the Wilcoxon Signed Rank Test which produces Asymp scores. Sig. (2-tailed) < 0.001 ($p < 0.05$), so H0 is subtracted and H1 is accepted.

Based on these findings, it is recommended that elementary school teachers integrate the principles of meaningful, conscious, and fun learning into the stages of PjBL consistently, especially in science subjects that require an understanding of cross-disciplinary concepts. Further research is suggested to expand the scope of the sample, add control groups, and examine the long-term impact of the application of Deep Learning on the retention of students' conceptual understanding.

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