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# THE EFFECTIVENESS OF PROJECT-BASED LEARNING-BASED LKPD LAPBOOK ON SCIENCE LITERACY IN GRADE V ELEMENTARY SCHOOL

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## Abstract

*Education in the 21st century requires students to develop broad scientific understanding and strong thinking skills. However, elementary school students still demonstrate limited scientific knowledge, particularly in topics related to the human digestive system. This study investigates the effect of Project-Based Learning (PjBL) integrated with student worksheets and lapbook (LKPD-Lapbook) media on improving the scientific literacy of fifth-grade elementary students. The research employs a quantitative approach with a quasi-experimental pretest–posttest control group design. The participants consisted of 42 students divided into two groups: an experimental class and a control class, each comprising 21 students. The research instruments included a scientific literacy test, a learning implementation observation sheet, and a student questionnaire. Data analysis was conducted using prerequisite tests of normality and homogeneity, followed by hypothesis testing through an independent samples t-test. In alignment with the Merdeka Curriculum, this study is expected to contribute to the development of innovative IPAS (Integrated Science and Social Studies) learning approaches and provide an alternative contextual learning media to support scientific literacy improvement in elementary schools.*

*Keywords: Scientific Literacy, Worksheets-Lapbook, Project-Based Learning, IPAS, Elementary School*

## INTRODUCTION

21st century education requires students not only to understand concepts and theories, but also to have critical thinking skills or 4Cs: *critical thinking, creativity, collaboration,* and *communication*[1] Students need these skills to adapt to the development of science and technology and the demands of the world of work in the future. One of the efforts to develop these skills is through science literacy, which is the ability to understand, evaluate, and apply scientific knowledge responsibly in a real-life context.[2]

The Merdeka Curriculum emphasizes deep *learning* that is contextual, reflective, and student-centered.[3] This approach can be applied in IPAS education because it helps students understand the relationship between scientific ideas and everyday life. Science literacy is an important competency because it gives students the ability to think scientifically to solve problems and make evidence-based decisions, which is an important competency.[4]

However, field conditions show that the science literacy of elementary school students is still low. Learning of the material of the human digestive system is usually focused on lectures and the use of textbooks. This causes students to only memorize the names of organs and the order of the digestive process without understanding the function of each organ thoroughly. As a result, they face difficulties in scientifically explaining the digestive process and answering questions related to it. As a result of observations carried out in several schools in Kalijati District, it was found that almost 25% of students have not reached the KKTP. Most students can only give factual answers when they are asked to explain the digestive process or solve contextual problems. This condition shows that their conceptual understanding is still weak, and this causes them to lack in science literacy.

PISA 2022 data is in line with this phenomenon, Indonesia's science literacy score of 383 is far below the OECD average of 485, with only 34% of students reaching level 2 or higher, while the OECD average is 76%.[5] The absence of interesting and interactive learning media causes low

[1] OECD., *PISA 2022 Results (Volume I): The State of Learning and Equity in Education*, vol. 46 (OECD Publishing, n.d.), https://doi.org/https://doi.org/10.1787/ee4d0a78-en.

[2] OECD., *PISA 2022 Results (Volume I): The State of Learning and Equity in Education*, vol. 46.

[3] Ministry of Education and Culture, *Independent Curriculum Learning and Assessment Guidelines* (Ministry of Education, Culture, Research, and Technology, 2023).

[4] Weny J.A Musa et al., "Analysis of Science Literacy Ability Reviewed from the Aspect of Students' Science Competency in Global Warming Materials," *Jambura Journal of Educational Chemistry* 5, no. 2 (2023), https://doi.org/10.34312/jjec.v5i2.12705; Tri Joko Raharjo et al., "Training on Strengthening Science Literacy for Indonesian School Teachers-Jeddah, Saudi Arabia," *Journal of Community Empowerment,* 3, no. 1 (2023), https://journal.unnes.ac.id/sju/index.php/jce.

[5] OECD., *PISA 2022 Results (Volume I): The State of Learning and Equity in Education*, vol. 46.

science literacy. Current modules and LKPDs are typically passive and do not integrate kinesthetic, visual, and critical thinking thoroughly.[6]

To overcome this problem, new learning is needed that involves creative, active, and cooperative students. One potential solution is the PjBL-based LKPD-Lapbook.[7] According to the PjBL model, students are placed as learning centers in real projects that produce the final product, and *lapbooks* help students organize information visually and *manipulatively*.[8] This method supports science literacy, critical thinking skills, and active participation of students.

Based on *the multimedia learning* theory put forward by Mayer, learning will be more effective when students use visual representations and activities that involve direct manipulation of objects[9]. This approach allows students to build a more in-depth conceptual understanding through the integration of text, images, and physical activity. In that context, *lapbooks* become the right medium for this situation as they facilitate the active visual and kinesthetic involvement of students. In addition, lapbooks are considered easier to use and access than technology-based LKPDs, especially in schools that have limitations in digital learning facilities and infrastructure.[10]

In addition, Haryanto, found that ethno-STEAM-based project-based learning is effective in improving numerical literacy skills by using contextual projects that are relevant to local culture.[11] This method is in line with the strategies used to improve science literacy in elementary schools that emphasize the relationship between scientific concepts and everyday life. Other research on lapbooks found that lapbooks can improve students' engagement, understanding of concepts, and their critical thinking abilities.[12] Therefore, the combination of lapbook and PjBL can help students improve their science literacy, thinking skills, and desire to learn.

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[6] Shafira Nur Fadlila et al., "Development of Science Literacy-Based Student Worksheets (LKPD) on Ecosystem Materials," *Bioscientist : Scientific Journal of Biology* 13, no. 2 (2025), https://doi.org/10.33394/bioscientist.v13i2.16102.

[7] Nursiwi Nugraheni Endah Retnowati and Lukluk Nur Azizah, *Application of the PJBL Model with the Help of Lapbook to Improve Social Studies Learning Outcomes for Class IV SDN Bendan Ngisor*, Zenodo, July 12, 2023, https://doi.org/10.5281/ZENODO.8139233.

[8] Mustika Dewi Muttaqien and Nurul Apriani Sa'adah, "Lapbook Learning Media: Improving Early Childhood Visual-Spatial Intelligence," *Abata : Journal of Early Childhood Islamic Education* 3, no. 1 (2023), https://doi.org/10.32665/abata.v3i1.1462.

[9] Mayer, R. E., *Multimedia Learning (3rd Ed.)* (Cambridge University Press., 2020).

[10] Yunita Salsa Bila et al., "Development of Jigsaw-Based Lapbook Media to Improve the Preparedness Attitude of Grade VI Students of SDN Garum 01," *Journal of Education: Research and Conceptual* 7, no. 1 (2023), https://doi.org/10.28926/riset_konseptual.v7i1.630.

[11] H. Haryanto et al., "Development of Project-Based Learning Model Based on Ethno-Steam to Improve Numeracy Literacy Skills," *Inovasi Kurikulum* 21, no. 1 (2024), https://doi.org/10.17509/jik.v21i1.63400.

[12] Rani Aulya Anggreni et al., "Development of Science Literacy Instruments in Children," *Journal of Early Childhood Education Undiksha* 10, no. 2 (2022), https://doi.org/10.23887/paud.v10i2.49303; A Putri and T Handayani, "The Integration of LKPD-Lapbook in the Project Based Learning Model to Improve Critical Thinking Skills and Science Literacy," *Journal of Innovation and Learning of Science* 8, no. 1 (2023).

Based on the explanation above, the purpose of this research is to answer the following problem formulation: How does the implementation of LKPD-Lapbook based *on PjBL* affect the improvement of students' science literacy? Students have low science literacy, dominant lecture methods, poor conceptual understanding, and limitations of interactive learning media that make this study important. Students' thinking skills, science literacy, and concept understanding are expected to improve with the implementation of the PjBL-based LKPD-Lapbook. This is in accordance with the basis of the Independent Curriculum, which emphasizes relevant, in-depth, and meaningful learning.

## RESEARCH METHODS

The effect of the application of PjBL-based LKPD-Lapbook on the science literacy of grade V elementary school students was tested through *a quasi-experimental pretest-posttest control group* design. Because *the quasi-experimental design* did not allow researchers to randomize all subjects, they were still able to compare the abilities of students in the experimental group and the control group through before and after test measurements. In science education research, this design is widely used to assess the effects of learning interventions in the context of real education or *natural classroom settings*.[13] The research design can be seen in Table 1.

**Tabel 1**. Desain Penelitian

| Kelompok | Pretest | Perlakuan | Posttest |
|---|---|---|---|
| **Eksperimen** | $O_1$ | $X_1$ | $O_2$ |
| **Kontrol** | $O_3$ | $X_2$ | $O_4$ |

**Source:** (Tosun, C., & Senocak, 2020)

In the research design, *pre-test* and *post-test* control groups were used. The experimental group received LKPD-Lapbook project-based learning (X1), while the control group received learning without special treatment (X2). *Pretest* (O1, O3) and *posttest* (O2, *O4*) are given to measure the improvement of students' science literacy.

The research procedure begins with the preparation stage, including the preparation of learning tools in the form of LKPD-Lapbook which is compiled according to *the Project Based Learning* syntax and science learning outcomes of class V. LKPD-Lapbook was created to help students understand scientific concepts, organize information visually, and complete project activities that focus on solving real-world problems. In addition, at this stage, a science literacy test

[13] C Tosun and E Senocak, "The Effects of Project-Based Learning on Students' Scientific Literacy and Attitudes toward Science," *International Journal of Science Education* 42, no. 18 (2020), https://doi.org/10.1080/09500693.2020.1839392.

(*pretest* and *posttest*) was also prepared which refers to science literacy indicators, including the ability to understand concepts, interpret data, and apply science knowledge in the context of daily life. Before the instrument is used in research, the validity and reliability of the instrument are empirically tested using SPSS. Validity is tested by item-total correlation, while reliability is tested by *Cronbach*'s alpha coefficient to ensure *the internal consistency of the instrument.*[14]

Before learning starts at the implementation stage, both classes are given a *pre-test* to find out the students' initial abilities. The experimental group participated in learning using PjBL-based LKPD-Lapbook which included stages: asking spark questions, project planning, collecting information, making lapbooks, and product presentations. Meanwhile, the control group used conventional learning without LKPD-Lapbook and the PjBL stage. However, the main data of the study was concentrated on the pretest and posttest. At the end of the learning activity, students were also given a questionnaire to obtain supporting response data on the implementation of project-based learning with LKPD-Lapbook media.

The evaluation stage is carried out by analyzing *pretest* and *posttest data* quantitatively. To ensure that the data meets statistical assumptions, the analysis begins with a normality and homogeneity test. Furthermore, to find out whether the increase in science literacy in the experimental class was significantly different from the control class, a comparative test, namely *the t-test* or ANCOVA, was carried out. The results of the analysis showed that the experimental class that received LKPD-Lapbook treatment with PjBL experienced a higher and significant increase in science literacy than the control class that learned without treatment. Thus, the implementation of PjBL-based LKPD-Lapbook has proven to contribute positively to improving the science literacy of elementary school students. These findings are in line with the results of previous research which stated that the use of project-based media is able to gradually and meaningfully improve students' science literacy skills.[15]

By focusing on *pre-test* and *post-test data*, this study can objectively assess the effect of the implementation of PJBL-based LKPD-Lapbook on improving the science literacy of grade V elementary school students. This research is expected to provide valid and reliable empirical evidence regarding the effect of the implementation of project-based LKPD-Lapbook on improving the science literacy of grade V elementary school students.

[14] Joseph Hair et al., *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM) (3rd Ed.)* (Sage Publications, 2021).

[15] Irdalisa Irdalisa et al., "Effectiveness of Project-Based Learning on STEAM-Based Student's Worksheet Analysis With Ecoprint Technique," *International Journal of Educational Methodology* volume 10 2024, no. volume 10 issue 1 february 2024 (2024), https://doi.org/10.12973/ijem.10.1.923.

## RESULTS AND DISCUSSION

### Analysis of Students' Science Literacy Results

1. Descriptive Statistics of Pretest and Posttest

In the implementation of the research, the science literacy test was given as a *pretest* to measure students' initial abilities in the experimental class and the control class. *The pretest* will be held on Thursday, December 11, 2025, with a time allocation of 30 minutes. The *pretest instrument* consists of 25 question items which include multiple-choice, multiple-choice, true-wrong, matchmaking, and description.

The results of the science literacy test conducted by students after the implementation of LKPD-Lapbook based *on Project Based Learning* (PjBL) in experimental classes and learning without special treatment in the control class are shown in Table 2 below.

**Table 2**. Descriptive Statistics of Science Literacy Pretest and Posttest

| Kelas | N | Mean | SD | Skor Min | Skor Mak |
|---|---|---|---|---|---|
| **X1** | 21 | 40,10 | 4,35 | 32 | 48 |
| **X2** | 21 | 36,05 | 4,10 | 28 | 44 |

**Description:** X1 = Experiment Class, X2 = Control Class

Based on Table 2, the average pretest score of the experimental class was 36.05, while the control class was 36.10, indicating that the initial ability of the students was relatively equivalent. After the learning series is completed, the science literacy test is again given as a posttest to determine the improvement of students' abilities. The average posttest score of the experimental class was 40.10, while the control class was only 37.15. This shows a greater improvement in the experimental class than in the controls. The standard deviation of the posttest of the experimental class of 2.15 was lower than the pretest of 2.85, indicating that the students' scores were more concentrated on higher abilities. In contrast, the control class showed a relatively stable standard deviation.

2. Normality Test

Before conducting further analysis of the improvement of students' science literacy test results, it is necessary to conduct a statistical prerequisite test to ensure the validity of the analysis used. One of the important prerequisite tests is the normality test, which aims to find out whether the data gain of learning outcomes in the experimental class and the control class is normally distributed.

**Table 3**. Shapiro-Wilk Normality Test *Pretest* and *Posttest* Science Literacy

| Kelas | Statistik Shapiro-Wilk | Sig. |
|---|---|---|
| $X_1$ | 0,957 | 0,234 |
| $X_2$ | 0,963 | 0,276 |

According to the Shapiro-Wilk normality test, the pretest and posttest Sig. values for the experimental class were 0.234 and for the control class were 0.276, each greater than 0.05. This signifies that the data is distributed normally, thus meeting the assumptions for subsequent inferential analysis. [16] In other words, changes in science literacy scores in both groups can be analyzed using *the Independent Sample T-Test* to find out whether the improvement in the experimental class is more significant than in the control class.

3. Homogeneity Test

The homogeneity test was carried out to determine the similarity of data variance between the experimental class and the control class as one of the conditions for the use of parametric statistics. This homogeneity test was carried out on *the pretest* and *posttest* score data of students' science literacy ability in the experimental class and the control class. This test aims to ensure that the differences in learning outcomes analyzed are actually due to the learning treatment given, not because of differences in data diversity between groups. The results of the Homogeneity Test can be seen in table 4.

**Table 4**. Variance Homogeneity Test Pretest and Posttest Science Literacy

| Variabel | Levene Statistic | df1 | df2 | Sig. |
|---|---|---|---|---|
| **Pretest** | 0,128 | 1 | 48 | 0,723 |
| **Posttest** | 0,237 | 1 | 48 | 0,628 |

***Remarks:*** The data is said to be homogeneous if the Sig. > value is 0.05

The results of the Levene test showed a pretest Sig. value of 0.723 and Sig. *0.628 posttests*, each greater than 0.05, as shown in Table 3. This shows that the science literacy scores in the experimental class and the control class are the same; in other words, the variation in scores in the two groups was comparable, which showed that the homogeneity assumption was met, and the data was ready to be analyzed using *the Independent Sample T-Test* to test the effect of the implementation of LKPD-Lapbook based on *Project Based Learning* on students' science literacy.

[16] Andy Field, *Field, A. (2025). Discovering Statistics Using IBM SPSS Statistics (6th Ed.).* (Sage Publications, 2025).

The results of the homogeneity test are very important because they ensure that the difference in posttest scores is the result of the treatment performed on the experimental class rather than the unbalanced variation of the data between the two groups. Therefore, further analysis can make credible conclusions about how effectively the learning model is used.

Overall, these descriptive findings and normality tests provide an empirical basis for further inferential analysis. The increase in students' science literacy in the experimental class showed that the implementation of PjBL-based LKPD-Lapbook was effective. This is in accordance with the purpose of the research to determine the influence of this learning model on the science literacy skills of students in grade V of elementary school.

4. Uji *Independent Sample T-Test*

To determine the difference in learning outcomes between the control class and the experimental class after being given different learning treatments, statistical analysis was carried out using *the Independent Samples t-Test.* This analysis aims to compare the average student learning outcomes in both classes and determine whether the application of LKPD-Lapbook with *the Project Based Learning model* has an effect on improving science literacy in science learning in grade V elementary school. The results of the statistical analysis are presented in Table 5.

**Table 5** Results *of Independent Sample T-Test* Posttest Science Literacy

***Independent Samples Test***

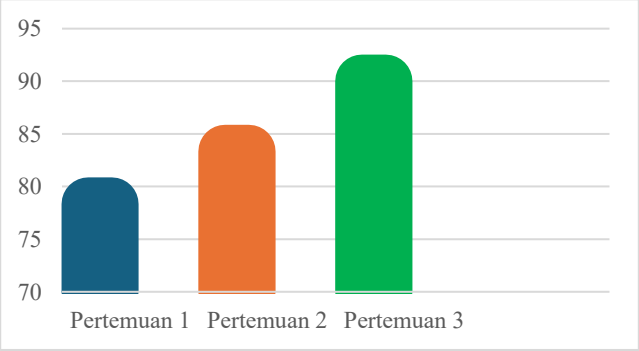
| | | *Levene's Test for Equality of Variances* | | *t-test for Equality of Means* | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | *Significance* | | *Mean* | *Std. Error* | 95% Confidence Interval of the Difference | |
| | | F | Sig. | t | df | *One-Sided p* | *Two-Sided p* | *Difference* | *Difference* | Lower | Upper |
| Hasil | *Equal variances assumed* | 1.744 | .194 | -3.945 | 40 | <,001 | <,001 | -8.952 | 2.269 | -13.539 | -4.366 |
| | *Equal variances not assumed* | | | -3.945 | 36.448 | <,001 | <,001 | -8.952 | 2.269 | -13.553 | -4.352 |

The results of the independent sample test showed that the average science literacy of students in the experimental class was 40.10, while in the control class it was 36.05. With a degree of freedom of 40, the value of t is -3.945, and the value of two-way significance *(P(T ≤ t) two-tail)* is 0.001, lower than α = 0.05. This shows that students' science literacy abilities in the experimental class and the control class after treatment differ significantly.

Students who learn to use project-based LKPD-Lapbook (PjBL) are actively involved in every stage of PjBL, starting from determining the triggering questions, planning the project, gathering information, compiling the lapbook, and presenting the final product. The results of the experiment showed that using project-based LKPD-Lapbook improved students' abilities. This activity encourages students to think critically, understand concepts in depth, and make connections between scientific knowledge and everyday life.

5. Observation Results

The results of the observation of the implementation of learning showed that each meeting in the experimental class showed an improvement in the quality of implementation. On the first examination of the material of the digestive system, the score increased to fifty percent from sixty, or 78.33%. This shows that learning has been going well, although there needs to be an improvement in time management and equitable distribution of student participation. On the second examination of the nutritional material for the body, the score increased to fifty percent, or 83.33%. This shows that students have become more accustomed to using LKPD-Lapbook and are more involved in group work. On the third examination, subjects related to digestive problems, the score again increased to 54 from 60, or 90 percent. To see the improvement of student learning with LKPD-Lapbook with the learning model in Graph 1.




**Graph 1**. Observation of the Experiment class

These results show that learning is going very well; Students become more independent and can talk about the results of the project with confidence, while teachers help. Overall, graph 1 shows an increase in the implementation of learning from the first to the third meeting. This

shows that the implementation of project-based LKPD Lapbooks can gradually and continuously improve the quality of the IPAS learning process.

These results are in line with previous findings that project-based learning models and the use of interactive media such as lapbooks can help students understand science by actively engaging them, working together, and organizing ideas visually and *manipulatively*. [17] In addition, better results for the experimental class than the control class suggest that conventional approaches have not been able to improve conceptual understanding and scientific thinking skills.

On the other hand, control classes that received treatment-free learning had lower learning outcomes because students only followed the passive learning process, i.e. written exercises and lectures, and did not engage in projects or use interactive media. These results are in line with previous research that showed that the use of lapbooks and other interactive media within the framework of PjBL can improve science literacy, student engagement, and concept comprehension.[18]

6. Questionnaire

To obtain a more comprehensive picture of students' responses to learning using LKPD-Lapbook, the researcher gave a questionnaire to students in the experimental class after the learning activities were completed. This questionnaire aims to find out students' feelings during learning, understanding of the material, as well as students' experiences and reflections on the learning activities that have been carried out (Appendix 13). The results of the questionnaire in this study can be seen in Table 6:

[17] Muttaqien and Nurul Apriani Sa'adah, "Lapbook Learning Media."

[18] Fitri Nur Aini et al., "Improving Literacy Skills in Students through Lapbook Media in Science Subjects Class V Elementary School," *Afeksi: Journal of Educational Research and Evaluation* 6, no. 3 (2025), https://doi.org/10.59698/afeksi.v6i3.462.

**Table 6**. Results of Student Questionnaire for Experimental Class

| Aspects | Key Findings | Conclusion |
|---|---|---|
| Feelings During Study | Dominant score of 3 (happy) on all indicators | The students' affective response is very positive |
| Material Understanding | The majority of students understand the functions, sequences, and disorders of the digestive system | Understanding of the material is in the good category |
| The Most Helpful Lapbook Parts | Figures, diagrams, tables, and information folds | Lapbooks are effective as a visual medium |
| Student Difficulties | Memorize terms, digestive sequences, and summarise material | Need reinforcement and guidance |
| Learning Experience | Students enjoy drawing, coloring, and discussing | Learning is active and fun |
| Student Suggestions | Add images, times, and examples | Need to improve design and timing |

Based on the table, in the aspect of feelings during learning, most students showed a very positive response. This is shown by the dominance of the highest scores on almost all indicators, which reflects that students feel happy, interested, actively involved in group work, and motivated to follow learning with the same method at the next opportunity. This positive affective response shows that the use of LKPD-lapbook is able to create a pleasant learning atmosphere and increase student involvement.

In terms of understanding the material, the results of the questionnaire show that the majority of students have understood the basic concepts of the digestive system, including the function and sequence of digestive organs, the process of digesting food, as well as disorders in the digestive system and how to prevent it. LKPD-Lapbook, especially the pictures, tables, and information folds, are considered very helpful for students in understanding the material visually and contextually. However, there are still some students who have difficulty memorizing terms, remembering the complete order of digestion, and summarizing the material in their own words.

Furthermore, in the aspect of learning experience, students stated that the activity of completing LKPD-Lapbook was a fun learning experience because it involved drawing, coloring, cutting, pasting, and discussing activities with friends. The obstacles experienced by students are generally related to the limited time of work and difficulties in writing a summary or conclusion. The suggestions given by the students include adding pictures, simplifying writing, giving examples, and adding time so that learning activities can take place more optimally.

Overall, the questionnaire conclusion table shows that learning using LKPD-Lapbook received a positive response from students and was considered effective in supporting the learning process. However, the results of the questionnaire also provide constructive input for teachers to make improvements and improvements in the implementation of further learning.

Thus, the implementation of PjBL-based LKPD-Lapbook can be used as an effective strategy to improve the science literacy of grade V elementary school students, while supporting the development of 21st century skills, such as critical thinking, creativity, collaboration, and communication.

## CONCLUSION

Referring to the results of the pretest and posttest data analysis, as well as *the Independent Sample T-Test*, it can be concluded that the project-based LKPD-Lapbook (PjBL) has a significant influence on improving the science literacy of students in grade V of elementary school. Students who study using LKPD-Lapbook show an increase in science literacy skills over students who follow conventional learning. This shows that project-based learning and interactive media are effective in improving understanding of scientific concepts, critical thinking skills, and the relationship between science and everyday life.

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