



THE EFFECTIVENESS OF THE PROJECT-BASED LEARNING MODEL ASSISTED BY POP-UP BOOK MEDIA ON STUDENTS' CRITICAL THINKING SKILLS

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Abstract

This study aims to analyze the effectiveness of the application of the Project-Based Learning (PjBL) model combined with Pop-Up Book media in students' critical thinking skills. This study uses a quantitative approach with a pretest-posttest control group design. The research sample consisted of two groups, namely the experimental group that received PjBL instructions assisted by the Pop-Up Book media and the control group that received conventional learning. The sampling technique used is purposive sampling involving grade IV elementary school students. Data was collected through critical thinking skills tests, observation, and documentation. The results of statistical analysis showed that the average score of students' critical thinking ability in the experimental group increased significantly higher than in the control group, with a significance value of < 0.05 . The findings show that the integration of the PjBL model with the Pop-Up Book media is effective in improving the critical thinking skills of elementary school students.

Keywords: Project-Based Learning, Pop-Up Books, critical thinking skills

INTRODUCTION

The development of education in the modern era requires students not only to master knowledge, but also to have high-level thinking skills, especially critical thinking. This ability plays an important role in helping students understand information in depth, identify problems, and determine the right solutions in various situations (Cahyono et al., 2022; Khusna et al., 2024; Untari & Danik, 2025). Critical thinking skills include the ability to analyze, evaluate, and reflect on the thought process independently, so it needs to be developed since basic education as a foundation in dealing with the development of science and technology (Mustanir et al., 2013).

However, the results of the pretest show that students' critical thinking skills are still not developed optimally. This is influenced by the learning process that tends to be teacher-centered, so that students have limitations in exploring ideas and actively developing their thoughts (Susanti & Eka Danik Prahastiwi, 2025). Learning activities that take place in one direction cause students to memorize more than understand concepts in depth. In addition, the use of less varied learning media also affects the low involvement of students in the learning process. Teachers must use creative learning media, such as making interesting learning media. Monotonous media tends to be unable to arouse students' interest and curiosity, so learning becomes less meaningful (Surono et al., 2022).

To overcome these problems, learning innovations are needed that are able to increase student involvement while developing high-level thinking skills. One alternative that can be applied is the Project-Based Learning (PjBL) model, which is a learning model that emphasizes project-based activities and real experiences. Through this model, students are actively involved in the process of investigation, problem-solving, and collaborative work (Untari & Danik, 2025). In order for its application to be more optimal, the PjBL model needs to be supported by interesting and interactive learning media, one of which is the Pop-Up Book. This media presents three-dimensional visuals that can increase interest in learning and help students understand concepts more concretely, in accordance with the characteristics of students' cognitive development (Saragih, 2025).

Although a number of studies have examined the application of Project-Based Learning and the use of interactive learning media, studies that integrate the PjBL model with Pop-Up Book media in improving students' critical thinking skills are still limited. Several previous studies have shown that

the Project Based Learning (PjBL) model is effective in improving students' critical thinking skills (Ernawati et al., 2025). The implementation of PjBL is able to improve students' analytical and problem-solving skills. In addition, research on the use of Pop-Up Book media also showed positive results on student involvement and understanding in learning. Pop-Up Book media can increase interest in learning and help students understand concepts more concretely. However, previous research still tends to examine the effectiveness of PjBL or Pop-Up Book media separately (Harahap & Sofro, 2025). Research that specifically examines the application of the PjBL model assisted by Pop-Up Book media to students' critical thinking skills is still limited. Therefore, this study was conducted to fill the gap (Aisya et al., 2025).

Therefore, the novelty in this study lies in the integration of the Project-Based Learning model with the Pop-Up Book media as an effort to improve students' critical thinking skills in a more contextual and interactive manner. This study aims to determine the effectiveness of the Pop-Up Book-assisted PjBL model on students' critical thinking skills (Sari et al., 2025).

RESEARCH METHODS

This study uses a quantitative approach with a type of experimental research that aims to determine the effect of treatment on the variables studied objectively. The design used is *Pretest-posttest control group design* which involved two groups, namely the experimental group and the control group. Both groups were first given a *pretest* to identify students' initial abilities. Furthermore, the experimental group was given treatment in the form of learning using *the Project-Based Learning* (PjBL) model assisted by Pop-Up Book media, while the control group followed learning using conventional methods. After the treatment was given, the two groups were given a final test (posttest) to see the difference in learning outcomes obtained.

The sample in this study is students who are divided into two groups. Sampling techniques are adjusted to field conditions, such as cluster random sampling if the class has been formed naturally, or purposive sampling by considering certain characteristics of students (Haki et al., 2024). Data collection is carried out through tests, observations, and documentation. The test is used to measure students' critical thinking skills before and after treatment. Observation is used to observe student activities during the learning process, while documentation serves as research supporting data. All instruments are first tested for validity and reliability to ensure their feasibility as a measuring tool. Data were analyzed using descriptive and inferential statistical techniques. Before the hypothesis test is carried out, a prerequisite test in the form of a normality test and a homogeneity test is carried out. Furthermore, hypothesis testing was carried out using an independent sample t-test with a significance level of 0.05 (Ribut et al., 2024).

The subjects of this study were students who were divided into two groups, namely the experimental group and the control group. Sample determination is carried out by sampling techniques that are adjusted to school conditions, such as cluster random sampling if class divisions have been formed naturally, or purposive sampling based on certain characteristics of students. The number of samples is adjusted to the number of students in one or more classes, so that the data obtained can accurately represent the research population (Prahastiwi et al., 2024).

The data collection techniques in this study include tests, observations, and documentation. The test instrument was used to measure students' critical thinking skills before and after the treatment. The test is arranged in the form of multiple choice and/or description that refers to critical thinking indicators, such as analyzing, evaluating, and drawing conclusions. Observations were carried out to observe student activities during the learning process, especially when applying the PjBL model. Meanwhile, documentation is used to complete research data, such as photos of activities, attendance lists, and other supporting documents. Before use, all instruments are tested for validity and reliability to ensure that they are suitable for use as a data collection tool.

The data obtained were analyzed using descriptive and inferential statistics. Descriptive statistics are used to describe research data, such as mean values, medians, and standard deviations. Before the hypothesis test is carried out, an analysis prerequisite test is first carried out which includes a normality test and a homogeneity test. The normality test aims to determine the distribution of data, while the homogeneity test is used to determine the similarity of variance between the experimental and control groups. Furthermore, hypothesis testing was carried out using an independent sample t-test with a

significance level of 0.05. If the significance value (Sig.) < 0.05, then there is a significant difference between the two groups. Thus, it can be concluded that the Project-Based Learning (PJBL) model assisted by Pop-Up Book media is effective in improving students' critical thinking skills.

RESULTS AND FINDINGS

Based on the results of the research that has been conducted, data on students' critical thinking ability was obtained from the results of the pretest and posttest in the experimental class and the control class. In the early stages, the results of the pretest showed that the initial abilities of the two groups were in a relatively equal category, so that the two classes could be said to have comparable initial conditions. Furthermore, to see the distribution of students' critical thinking skills in more detail, data is presented in the form of frequency distribution as follows.

Table 1. Frequency Distribution of Pretest and Posttest Scores of Experimental Classes

Grade Categories	Prates (f)	Prates (%)	Postcards (f)	Post-test (%)
Very High	2	18,18%	5	45,45%
Height	7	63,64%	6	54,55%
Medium	2	18,18%	0	0,00%
Low	0	0,00%	0	0,00%
Very Low	0	0,00%	0	0,00%
Quantity	11	100%	11	100%

Based on the table, most students at the time of the pretest were in the high category (63.64%), while after learning in the posttest, there was an increase in the number of students in the very high category from 18.18% to 45.45%. In addition, there were no more students who were in the medium, low, or very low categories at the time of the posttest, which showed an increase in student learning outcomes after the treatment was given.

Table 2. Frequency Distribution of Control Class Pretest and Posttest Scores

Grade Categories	Prates (f)	Prates (%)	Postcards (f)	Post-test (%)
Very High	4	36,36%	6	54,55%
Height	2	18,18%	2	18,18%
Medium	1	9,09%	3	27,27%
Low	3	27,27%	0	0,00%
Very Low	1	9,09%	0	0,00%
Quantity	11	100%	11	100%

Before learning (pretest), most students were in the Very High (36.36%) category, but there were still students in the Low (27.27%) and Very Low (9.09%) categories. After learning (posttest), the majority of students were in the Very High category (54.55%), and there were no more students who were in the Low or Very Low categories, indicating an increase in learning outcomes. Based on the results of the research that has been conducted, data on students' critical thinking ability was obtained from the results of the pretest and posttest in the experimental class and the control class. In the early stages, the results of the pretest showed that the initial abilities of the two groups were in a relatively equal category, so that the two classes could be said to have comparable initial conditions.

After being given treatment, there was an increase in critical thinking skills in both groups. However, the improvement in the experimental class using the Project-Based Learning (PJBL) model assisted by Pop-Up Book media was seen to be higher than the control class using conventional learning. Furthermore, to see the distribution of the frequency of pretest and posttest results in both groups, the following data is presented.

Table 1. Frequency Distribution of Pretest and Posttest Scores of Experimental Classes

Grade Categories	Prates (f)	Prates (%)	Postcards (f)	Post-test (%)
Very High	4	36,36%	9	81,82%
Height	5	45,45%	2	18,18%
Medium	2	18,18%	0	0,00%
Low	0	0,00%	0	0,00%
Very Low	0	0,00%	0	0,00%
Quantity	11	100%	11	100%

There was a significant increase from pretest to posttest, marked by an increase in the number of students in the Very High category from 36.36% to 81.82%, as well as the loss of the Medium category to below in the posttest results.

Table 2. Frequency Distribution of Control Class Pretest and Posttest Scores

Grade Categories	Prates (f)	Prates (%)	Postcards (f)	Post-test (%)
Very High	4	36,36%	5	45,45%
Height	4	36,36%	6	54,55%
Medium	3	27,27%	0	0,00%
Low	0	0,00%	0	0,00%
Very Low	0	0,00%	0	0,00%
Quantity	11	100%	11	100%

There was an increase in learning outcomes from pretest to posttest, characterized by a decrease in the medium category and an increase in the number of students in the very high category and high in the posttest results.

Based on the results of the posttest, it can be seen that there is an increase in the average score of students compared to the results of the pretest. This is shown by the increase in the number of students in the high and very high categories and the decrease in the medium category. Thus, it can be stated that there is an increase in students' critical thinking skills after the implementation of learning

RESULTS AND DISCUSSION

The improvement of critical thinking skills in the experimental class showed that the Project-Based Learning (PJBL) model was able to encourage students to be more active in the learning process. Through project-based activities, students not only receive information, but are also involved in the process of analysis, evaluation, and problem-solving independently or in groups.

In addition, the use of Pop-Up Book media also contributes to improving learning outcomes. This media presents interactive and attractive visuals, so that it can increase students' attention and involvement in learning. This condition helps students understand the material more concretely, not only verbally, but also through more meaningful visual experiences.

On the other hand, conventional learning in the control class tends to make students more passive because the learning process is still dominated by teachers. This causes students' involvement in higher-level thinking activities to be more limited, so that the improvement of critical thinking skills is not optimally developed.

The results of this study are in line with the theory that learning that provides hands-on experience and actively engages student activities can improve high-level thinking skills, including critical thinking. Therefore, the integration of the Project-Based Learning (PJBL) model with Pop-Up Book media can be one of the effective learning alternatives in . The results of this study show that the implementation of PJBL assisted by Pop-Up Book is able to improve students' critical thinking skills because students are actively involved in the learning process, starting from observing, discussing, solving problems, to conveying project results. These findings are in line with previous research that states that the PJBL model is effective in improving students' critical thinking skills, creativity, and activeness through student-centered learning activities. In addition, the use of Pop-Up Book media has also been proven to help students understand the material in a more concrete and interesting way so as to increase learning motivation and student participation during learning. However, this study has a difference from previous research because it combines the PJBL model with Pop-Up Book media in social studies learning, thus providing a more interactive and contextual learning experience for students.

CONCLUSIONS AND SUGGESTIONS

Based on the results of the research and discussion, it can be concluded that the application of the Project-Based Learning (PJBL) model assisted by Pop-Up Book media is effective in improving students' critical thinking skills. This is shown by the significant difference between the results of the experimental class posttest and the control class, where the experimental class obtained a higher average score. Thus, the combination of the PJBL model and Pop-Up Book media can be used as an innovative and effective learning alternative to improve students' critical thinking skills.

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