The Effect of Project-Based Learning Model Assisted by Chromebook Media on Students' Critical Thinking Skills in IPAS Lessons

Yuningsih, Sri Yamtinah, Idam Ragil Widianto Atmojo

Universitas Sebelas Maret
yuningsih@student.uns.ac.id

Abstract

IPAS learning required a learning model that could help improve students' critical thinking skills in the teaching and learning process. This study aims to determine the effect of project-based learning model assisted by chromebook media on students' critical thinking skills in IPAS learning in Girimarto District. This study included quantitative research. The research sample was 102 fifth grade elementary school students. Data collection techniques through tests. Data analysis was conducted using simple linear regression analysis techniques. The results showed the correlation value (R) = 0.507, meaning that there was a positive linear relationship between the variables; the coefficient of determination R Square = 0.421, meaning that the Project-Based Learning model variable assisted by chromebook media had an influence of 42.1% on critical thinking skills; and with a significance level of 0.05, a significant value of 0.010 < 0.05 was obtained and a t value of 2.157 > t table 1.660, meaning that the alternative hypothesis was accepted. The conclusion of the study is that there is a significant influence between the Project-Based Learning model assisted by chromebook media on critical thinking skills as evidenced by the t value greater than t table.

Keywords: Project Based Learning model, chromebook media, critical thinking.

Abstrak

Pembelajaran IPAS membutuhkan model pembelajaran yang dapat membantu meningkatkan keterampilan berpikir kritis peserta didik dalam proses belajar mengajar. Penelitian ini bertujuan untuk mengetahui pengaruh model pembelajaran berbasis proyek yang dibantu media chromebook terhadap keterampilan berpikir kritis peserta didik dalam pembelajaran IPAS di Kecamatan Girimarto. Penelitian ini termasuk penelitian kuantitatif. Sampel penelitian adalah 102 peserta didik kelas V Sekolah Dasar. Teknik pengumpulan data melalui tes. Analisis data dilakukan dengan menggunakan teknik analisis regresi linier sederhana. Hasil penelitian menunjukkan nilai korelasi (R) = 0,507, artinya terdapat hubungan linier positif antara variabel; koefisien determinasi R Square = 0,421, artinya variabel model Pembelajaran Berbasis Proyek yang dibantu media chromebook memiliki pengaruh sebesar 42,1% terhadap keterampilan berpikir kritis; dan dengan tingkat signifikansi 0,05, diperoleh nilai signifikan 0,010 < 0,05 dan nilai t sebesar 2,157 > t tabel 1,660, artinya hipotesis alternatif diterima. Kesimpulan penelitian adalah adanya pengaruh yang signifikan antara model Pembelajaran Berbasis Proyek yang dibantu media chromebook terhadap keterampilan berpikir kritis dibuktikan dengan nilai t hitung lebih besar dari t table.

Kata Kunci: Model Pembelajaran Berbasis Proyek, media chromebook, berpikir kritis

INTRODUCTION

21st century learning emphasizes the development of critical thinking skills so that students are able to deal with the development of science and technology (IPTEK). The 21st century is often called the era of fast-paced and easily accessible information, both positive information to information that is negative or detrimental, so that a critical thinking ability is needed to be able to sort out information that has a good impact on students in the future. This is in accordance with the opinion of Humam and Hanif (2025) which states that in the era of fast-paced information, critical thinking skills are key for students to be able to choose and utilize information wisely. One way for students to foster this ability is through learning at school. To achieve this, teachers need to be creative in choosing and determining learning models. One of the learning models that focuses on students and processes is project-based learning (PjBL). This is because, through PjBL, students can do explorative learning.

Project Based Learning (PjBL) is a model whose learning is centered on students through providing projects that can direct students to experience the inquiry process (investigating and seeking information) so that students are free to explore and express ideas and find the final conclusion in the form of learning outcomes (Anggelia et al., 2022). Through the use of PjBL learning, students can build concepts through the process of problem solving and produce products as a result of the students' ability to solve these problems, so that students are actively involved in learning which can be seen from the quality of the process and learning outcomes of students (Sari & Angreni, 2018). This PjBL learning model will be very synergized if it is combined with a differentiated learning strategy, thus enabling students to learn to develop students' critical thinking skills based on their critical thinking skills.

The Project Based Learning (PJBL) learning model involves students in working on complex problem-based tasks from learning materials and connected to the surrounding context. Students are given the opportunity to observe, survey, or analyze problems in groups. In this learning process, students are encouraged to be more active and play an active role in asking, investigating, explaining, and interacting with the problems given. Furthermore, the results of the investigations carried out by students will be produced in the form of products which will then be presented (Oktaya, 2022).

PjBL is explained by Tasci (2015) as a learner-centered learning approach by providing more opportunities for students to actively build knowledge concepts and learn new soft skills such as collaboration, communication and negotiation. Susanto (2018) also explained that project-based learning can be interpreted as a learning model that can encourage students to be active, creative and productive to improve student learning outcomes optimally. Williams (2017) and Chu, et al., (2017) state that project-based learning is constructivism and is based on real-life problems to create knowledge and resolution, and provides freedom to work with a specified time. Project Based Learning (PjBL) has several principles, namely Nuryanto, et al., (2024): 1)

According to Ilmudinulloh & Bustomi, (2022) and Rindiantika, (2021), the characteristics of the Project Based Learning (PjBL) learning model are, learning that develops students' skills or abilities to work with their groupmates in terms of working on projects that have been assigned by the teacher at school through the help of certain learning media. Project-based learning (PjBL) model learning has several characteristics. According to the Ministry of Education and Culture (2013), the characteristics of the project-based learning model include (1) Students create a framework, (2) Provide challenges or problems to students, (3) Students plan solutions to problems given, (4) Students in groups are responsible for accessing and managing information to solve problems, (5) The evaluation process is carried out continuously, (6) Students reflect regularly on the activities that have been carried out, (7) Products are evaluated qualitatively, and (8) Learning conditions tolerate changes and errors.

The process-focused PjBL learning model needs to use media assistance. This is

because 21st century learning needs to collaborate with electronic media, such as Chromebooks. Weakly, teachers utilize electronic media as well as inhibit the development of students' existence. Why does this happen? The utilization of electronic media according to Bruner's learning theory, this theory provides stages of learning starting from concrete, semi, and abstract. Understanding these stages, emphasizes that learning by utilizing electronic media supports learning focused on the process.

Chromebook is a new type of learning media which is very interesting for students. Chromebooks, which can be used for education, are closer to smartphones but with the working capabilities of laptops (Astuti, et al., 2023). Chromebook refers to a laptop that runs Google Chrome OS (Operation System). Chrome OS is a Google product derived from modifying Chromium OS, an open source project available for anyone to access, modify, and build (Indriani, et al., 2024). Based on the above understanding, it can be synthesized that chromebook is a technology-based learning media that has a variety of supporting features in providing diverse learning materials and can be used to optimize learning and teaching activities by teachers and students. This is what some elementary school teachers do not realize with the use of electronic media.

Learning that uses technological media has a significant effect on learning. The higher the level of educational technology, the higher the media needed, so that students will be more stimulated and motivated to learn better (Sola, et al., 2022). According to Purnomo, et al. (2023) and Indriani, et al. (2024), Chromebook media has several advantages, namely (1) it has minimalist hardware specifications and a lightweight operating system, thereby increasing system speed, (2) it does not need to use the latest processors, (3) it can store available cloud-based data, (4) user access only needs to be done by opening and logging into a google account, (5) longer battery life and durability, and (6) free of large software that burdens operating system performance. Meanwhile, the disadvantages of Chromebooks are (Purnomo, et al. (2023) and Indriani, et al. (2024)): not suitable for accessing or operating heavy tasks, such as 3D modeling and high-definition film production.

Critical thinking skills are analyzing arguments through aspects of finding basic similarities and differences in the material or learning topics studied (Erlistiani, et al., 2020). Critical thinking skills are the ability to correctly conclude a problem, review and thoroughly examine the decisions taken (Larasati & Syamsurizal, 2022). Critical thinking skills are needed to analyze a problem to the stage of finding a solution to solve the problem (Al Fanny & Roesdiana, 2020). According to Sudiarta, et al. (2021) and Ariadila, et al. (2023), the importance of critical thinking skills is to stimulate the way individuals think in order to optimize the potential ideas in their minds so that they can be well honed to solve certain problems.

Based on the description above, this study can formulate the problem formulation, namely: does the Project Based Learning learning model assisted by Chromebook media affect the critical thinking skills of students in IPAS lessons? This study aims to determine the effect of project-based learning model assisted by chromebook media on students' critical thinking skills in IPAS learning in Girimarto sub-district.

METHODS

The type of research used is a quantitative approach using the True Experimental method. Quantitative research is an investigation of social problems based on testing a theory consisting of variables, measured by numbers, and analyzed by statistical procedures to determine whether the predictive generalizations of the theory are true (Creswell, 2022). The true experimental method is a research method that allows researchers to actively manipulate independent variables and measure their effects on dependent variables, with the aim of rigorously testing cause-and-effect relationships (Gribbons and Herman, 2019). This research was conducted from April 2024 to April 2025. The population of this study were all fifth grade elementary school students in

Girimarto District. The sampling technique used Random Sampling technique with a total sample size of 102 fifth grade elementary school students in Girimarto District. The data collection technique was carried out using a test technique that had been tested for validity, reliability, difficulty level, and distinguishing power. While data analysis uses simple linear regression analysis techniques and Independent Sample t-test hypothesis testing. Simple linear regression analysis is a statistical method used to measure the strength and direction of a linear relationship between two numerical variables (Kurniawan, 2016). Independent hypothesis test is a statistical procedure used to compare two independent groups of data (not related to each other) to test whether there is a significant difference between the two groups (Rapingah et al., 2022).

RESULTS AND DISCUSSION

Research Results

The data obtained in the field are processed according to the needs of the problem formulation that needs to be proven. For this reason, the incoming data is processed with the help of SPSS version 26, as follows:

Validity Test

To test the validity of each description test item, it is done by comparing r count with r table. where if r count> r table then it can be said that a statement item is declared valid. vice versa if if r count < r table then a statement item is declared invalid. In this study, the number of respondents was 102 respondents. So to find r table, namely with the formula df = n - k = 102 - 2 = 100. Thus, the resulting number in the r table is 0.1638.

Table 1. Validity Test Results of the Descriptive Test

X	r count	r table	Sig.	N	Information
P1	0,561	0,1638	0,010	100	Valid
P2	0,670	0,1638	0,010	100	Valid
P3	0,892	0,1638	0,010	100	Valid
P4	0,673	0,1638	0,010	100	Valid
P5	0,237	0,1638	0,010	100	Valid

Based on table 1, the data obtained can be interpreted that all the description test materials are declared valid because r count> r table (0.1638). For this reason, the test material can continue its testing to the reliability stage.

Reliability Test

The reliability test is used to ensure that the measurement instrument provides consistent results if used repeatedly under the same conditions. Reliable measurement results are more reliable and are used as a basis for making decisions. The credibility of a questionnaire can be seen from the Cronbach's Alpha value, where if the Cronbach's Alpha value> 0.60 then the questionnaire can be said to be reliable, but if the Cronbach's Alpha value <0.60 then the questionnaire is considered unreliable.

Table 2. Results of Test Reliability Test Description

Cronbach's Alpha	N of Items
0,781	5

Based on the results of SPSS testing in Table 2. Shows the Cronbach's Alpha value of 0.781> 0.60. So that each question of the Description Test is declared reliable.

Test Level of Difficulty

The level of difficulty test is useful in helping to determine questions that are too easy, too difficult or according to the ability level of students. The level of difficulty of the question can help in presenting test results more accurately. Based on the difficulty level

test on the description test material, there are 3 items in the medium category, 1 item in the easy category, and 1 item in the difficult category.

Distinguishing Power Test

The differentiating power test is used to show how well a question can distinguish between students who have high and low abilities. Questions with high differentiating power can be used to select students who have different abilities. Based on this research, there is a composition of description test material consisting of 1 easy question, 3 medium questions, and 1 difficult question.

Simple Linear Regression Test

Based on the results of the SPSS output, it is known that the correlation value (r) between the independent variable of the Project Based Learning model assisted by Chromebook media on the dependent variable of students' critical thinking skills in IPAS lessons is 0.507. This can be interpreted that the Project Based Learning learning model assisted by Chromebook media has a positive relationship with students' critical thinking skills in IPAS lessons. If the value of the independent variable increases, it is likely that the value of the dependent variable will also increase. In addition, this study has a coefficient of determination R Square = 0.421, meaning that the Project Based Learning model variable assisted by chromebook media has an influence of 42.1% on critical thinking skills.

Prerequisite Test t test

Normality Test

The main purpose of the normality test is to validate the assumptions underlying various statistical analysis techniques. If the data is not normally distributed, then the analysis results obtained may be inaccurate or biased. Based on the results of the normality test using SPSS, it is known that the significance value is 0.087> 0.05, it can be concluded that the sample comes from a normally distributed population.

Homogeneity Test

Homogeneity test is a statistical procedure used to test whether two or more groups of data have the same variance. The purpose of the homogeneity test is to determine whether the data comes from a population that has the same characteristics or not. Based on the homogeneity test, it can be seen that the statistical value of the homogeneity test in this study is $x2count$ (0.654) < $x2tabel$ (3.841). The results of the homogeneity test calculation can be concluded that the sample population is homogeneous.

Balance Test

The Balance Test is a statistical procedure used to compare two or more groups of data at the beginning of the study. The goal is to ensure that the groups have the same characteristics before being given treatment. Based on the balance test that has been carried out using the t test, it can be seen that the tcount is 2.157, while the critical area is t> - 1.660 or t < 1.660. It can be concluded that the experimental group and control group do not have significant differences in the variables tested.

T-test

The t-test statistical test is used to determine how much influence the Project Based Learning model variable assisted by Chromebook media has on the critical thinking ability variable of students in IPAS lessons. In this study the sample used was 100 samples. t table = t (a/2; n-k-1) = (0.025; 100) = 1.660. The basis for decision making is as follows: First, if the significance value> 0.05 or t count < t table, it can be concluded that H0 is accepted, and Ha is rejected or there is no effect of the Project Based Learning model variable assisted by Chromebook media on the critical thinking ability variable of students in IPAS lessons. Second, if the significance value is <0.05 or t count> t table, it can be concluded that H0 is rejected, and Ha is accepted or there is an effect of the Project Based Learning model variable assisted by Chromebook media on the critical thinking ability variable of students in IPAS lessons.

Table 3. The results of the t test

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	10.604	1.899	.355	5.584	.000
	Chromebook media-assisted PBL model	.317	.118		2.157	.010

Based on Table 3, it is known that the significant value for the effect of the Project Based Learning model variable assisted by Chromebook media on the critical thinking ability variable of students in IPAS lessons is 0.010 <0.05 and the t value is 2.157> t table 1.660, so it can be concluded that Ha is accepted and H0 is rejected, which means that there is an effect of the Project Based Learning model variable assisted by Chromebook media on the critical thinking ability variable of students in IPAS lessons.

Discussion

Based on the results of the statistical analysis above, it shows that there is a moderate positive linear relationship between the application of the PjBL model assisted by Chromebook media and students' critical thinking skills in the IPAS course. The correlation value (r) of 0.507 shows that the higher the application of this learning model, the higher the students' critical thinking skills. In addition, the coefficient of determination (R-squared) value of 0.421 shows that about 42.1% of the variance in students' critical thinking skills can be explained by the application of the PjBL model assisted by Chromebook media. This means that this learning model makes a significant contribution in improving students' critical thinking skills. In accordance with the opinion of Rahmaningrum et al., (2024) which explains that the Chromebook-assisted PjBL model encourages students to collaborate in solving problems, thus improving their ability to think critically and communicate effectively.

The t-test results showed that the effect of the PjBL model assisted by Chromebook media on students' critical thinking skills was significant at the 5% significance level. The calculated t value (2.157) is greater than the t table value (1.660), and the significance value (0.010) is smaller than 0.05. This means that we can reject the null hypothesis and accept the alternative hypothesis, namely that there is a significant influence between the application of the PjBL model assisted by Chromebook media on improving students' critical thinking skills. As in the research of Pramasdyahsari et al., (2023), which explains that "The comparison of the t value and t table proves that the PjBL method with Chromebook is effective in improving students' critical thinking skills.", this can be interpreted that the calculated t value which is greater than the t table indicates strong empirical evidence that the Chromebook-assisted PjBL model contributes significantly to improving students' ability to analyze information, evaluate arguments, and solve problems. The results of this study provide empirical support for the effectiveness of the PjBL model assisted by Chromebook media in improving students' critical thinking skills in IPAS subjects. The use of Chromebook media in learning projects allows students to be actively involved in the learning process, explore, and solve problems independently.

This is in line with the opinion of Astri, et al. (2022) which states that PjBL can stimulate students to think critically, creatively, and collaboratively. According to Purnomo, et al. (2023) and Indriani, et al. (2024), Chromebook media has several advantages, namely (1) it has minimalist hardware specifications and a lightweight operating system, thereby increasing system speed, (2) it does not need to use the latest

processors, (3) it can store data that is available cloud-based, (4) user access is enough to open and log into a google account, (5) longer battery life and durability, and (6) free of large software that burdens the performance of the operating system. The use of Chromebooks in the PjBL model offers a number of significant advantages to both learners and teachers. By integrating modern technology into the learning process, PjBL can become more effective in developing learners' critical thinking skills.

CONCLUSIONS

This study proves that the PjBL model assisted by chromebook media has a significant effect on students' critical thinking skills in IPAS lessons. PjBL model assisted by chromebook media. Therefore, it can be concluded that the application of the chromebook media-assisted PjBL model effectively improves learners' critical thinking skills in the context of this study. This finding reinforces that innovative and interactive teaching models such as PjBL can be a useful learning strategy in developing learners' critical thinking skills. For future research, it is recommended to expand the scope of the study by involving more students and schools to increase the generalizability of the research results. In addition, researchers can further explore other factors that can affect the improvement of students' critical thinking skills, such as learning motivation, students' learning styles, and teacher competence in implementing PjBL.

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