

Revealing the Best Strategy: A Comparative Study of PBL and PjBL in Enhancing Critical Thinking in Pancasila Education

**Delfiyan Widiyanto¹, Hari Wahyono², Annisa Istiqomah³,
Sulthan Syifana⁴, Khoirunnisa Ayu⁵**

Tidar University, magelang Indonesia^{1,2,4,5}

Yogyakarta State University, Indonesia³

delfiyanwidiyanto@untidar.ac.id; hariwahyono@untidar.ac.id; annisa.istiqomah@uny.ac.id;

sulthan.syifana@students.untidar.ac.id; khoirunnisa.ayu@students.untidar.ac.id

Article History

Received:

09-10-2025

Revised:

10-12-2025

Accepted:

16-12-2025

Available online:

20-12-2025

ABSTRACT

The purpose of this study is to compare the project-based learning and problem-based learning models in improving students' critical thinking skills in the Pancasila Education subject. This study used a quasi-experimental method with a quantitative approach. The research design used was a one-group pretest-posttest design. Through this design, both groups, namely the experimental class and the experimental class, were given an initial test (pre-test) to determine students' initial abilities before treatment, then given different treatments. The experimental class received learning with the Project Based Learning (PjBL) model, while the second experimental class used the Problem Based Learning (PBL) model. The results showed that Problem Based Learning was more effective in improving students' critical thinking skills compared to Project Based Learning. The PBL approach, which emphasizes the process of identifying, analyzing, and solving real problems, can encourage students to think critically and relate concepts to everyday life contexts. Meanwhile, in PjBL, although providing a project-based learning experience.

Keywords: Project Based Learning, Problem Based Learning, Critical Thinking

ABSTRAK

Tujuan dari penelitian ini berupa perbandingan model pembelajaran project-based learning dan problem-based learning dalam meningkatkan kemampuan berfikir kritis siswa pada mata pelajaran Pendidikan Pancasila. Penelitian ini menggunakan metode eksperimen semu (quasi experiment) dengan pendekatan kuantitatif. Desain penelitian yang digunakan adalah one-group pretest-posttest design. Melalui desain ini, kedua kelompok yakni kelas eksperimen dan kelas eksperimen diberikan tes awal (pre-test) untuk mengetahui kemampuan awal siswa sebelum perlakuan, kemudian diberikan perlakuan yang berbeda. Kelas eksperimen mendapatkan pembelajaran dengan model Project Based Learning (PjBL), sedangkan kelas eksperimen kedua menggunakan model Problem Based Learning (PBL). Hasil Penelitian menunjukkan Problem Based Learning lebih efektif dalam meningkatkan hasil belajar siswa dibandingkan dengan Project Based Learning. Pendekatan PBL yang menekankan pada proses identifikasi, analisis, dan

pemecahan masalah nyata dapat mendorong siswa berpikir kritis serta mengaitkan konsep dengan konteks kehidupan sehari-hari. Sementara itu, pada PjBL, meskipun memberikan pengalaman belajar berbasis proyek.

Kata kunci: *Project Based Learning, Problem Based Learning, Berfikir Kritis*

A. INTRODUCTION

The Pancasila Education subject aims to shape the attitudes, behaviors, and critical thinking of young citizens, enabling them to navigate the ever-evolving social, political, and cultural dynamics of the Indonesian nation. Students are expected to adapt to the challenges of globalization, modernity, and technological advancements, enabling them to control themselves and behave in accordance with the values of Pancasila and the 1945 Constitution (Dewi et al., 2021; Santoso et al., 2023; Zulfikar & Dewi, 2021). The goal is to become good and wise young citizens who act and behave in their social, national, and state lives. Critical thinking skills are essential for analyzing national issues, understanding Pancasila values contextually, and making responsible moral decisions (Basri et al., 2019; Fitriani et al., 2019; A. S. Putri et al., 2023; Sari & Prasetyo, 2021). Weaknesses in the subject matter and learning process are still textual and largely rote. Consequently, students are less able to connect Pancasila values to real-life issues.

Learning is essential for developing critical thinking skills in students. Two approaches proven effective in developing higher-order thinking skills are Project-Based Learning (PjBL) and Problem-Based Learning (PBL) (A. K. Amin et al., 2021; Anazifa & Djukri, 2017; Sari & Prasetyo, 2021). Both models are based on constructivism theory, which emphasizes that knowledge is actively constructed by students through experience and interaction with their environment. According to this theory, active learning builds understanding through problem-solving and reflection on learning experiences.

The Problem-Based Learning (PBL) model presents a problem at the beginning of the lesson. The learning stages, including identifying, analyzing, and finding solutions to the problems encountered, encourage students to think critically, logically, and systematically (Gallagher, 2023; Ghani et al., 2021; Hidajat, 2023; Simanjuntak et al., 2021). Problem-based learning can be used as an alternative learning strategy to examine social and moral issues relevant to Pancasila values. Through discussion and collaboration among group members, students can practice presenting arguments, evaluating evidence, and developing reflective thinking. Therefore, PBL fosters critical thinking skills through students' active involvement in scientific thinking and social problem-solving throughout the learning process.

Project-Based Learning (PjBL) provides learning experiences that result in real-life products and applications. The learning stages generally include project planning, implementation, and evaluation. In this learning model, students are expected to apply the conceptual knowledge contained in the developed project. Project-based learning can take the form of social activities, social campaigns, and other innovative projects (Guo et al.,

2020; Lim et al., 2023; Maros et al., 2023). Project-based learning connects theory and practice, which can be used to develop students' critical thinking skills.

Both models, PBL and PjBL, can serve as learning strategies to develop students' critical thinking skills, but they have distinct characteristics. The difference lies in the PBL model's emphasis on problem-solving, while PjBL emphasizes the application of ideas and product creation. Both learning models use a student-centered approach. Based on a constructivist perspective, this approach helps students construct knowledge independently through meaningful learning experiences. Based on the above, researchers compared the effectiveness of Project-Based Learning (PjBL) and Problem-Based Learning (PBL) in developing students' critical thinking skills in Pancasila Education. The novelty of this research is the discovery of differences between Project-Based Learning (PjBL) and Problem-Based Learning (PBL) in developing students' critical thinking skills, thus having a greater impact on their abilities. The results of this study are expected to contribute to the development of innovative and relevant learning strategies to meet the needs of 21st-century learning, while strengthening the role of Pancasila Education in developing good citizens.

B. RESEARCH METHOD

This study uses a quasi-experimental method with a quantitative approach. This approach was chosen because the researcher does not have full control over all variables that influence the learning process, but still attempts to test the effect of treatment on different groups. The research design used is a one-group pretest-posttest design, which involves one group without a control group (Sugiono, 2014). Data collection using pre-test and post-test instruments with indicators of students' critical thinking skills. The population of this study was all class X students at SMA N 1 Mertoyudan consisting of classes X A to X I and the sample of this study used classes X C and X I. Data analysis used Normality Test, Homogeneity Test, Hypothesis Test, and N gain Score test.

Through this design, both groups, the experimental class, and the experimental class, were given a pre-test to determine students' initial abilities before the treatment, then given different treatments. The experimental class received learning using the Project-Based Learning (PjBL) model, while the second experimental class used the Problem-Based Learning (PBL) model. After the treatment was completed, both groups were given a final test (post-test) to measure differences in student learning outcomes. The research design is as follows.

Table 1. Form of Research Design

Group	Pre-test	Treatment	Post-test
Experiment	T ₁	X ₁	T ₂
Experiment	T ₁	X ₂	T ₂

(Arikunto, 2002; Sugiono, 2014)

Information

T₁ = Pre-Test

T₂ = Post-test

X₁ = PjBL

X₂ = PBL

Based on Table 1, this study compares the learning treatments used. The first class used a project-based learning model, and the second class used problem-based learning. The indicator of success was critical thinking skills, based on the results of the pre-test and post-test. The population in this study were 10th-grade students of SMA N 1 Mertoyudan. The 10th-grade study group consisted of 9 classes, ranging from XA to XI, totaling 240 students. The sample for this study was 60 students from XC and XI grade. Sampling used purposive random sampling (Sugiono, 2014;(Subhaktiyasa, 2024).

The research variables are divided into 2 types, namely independent and dependent variables (John W. Creswell & J. David Creswell), (2022). The independent variables are project-based learning and problem-based learning methods, while the dependent variable is students' critical thinking skills.

C. RESULTS AND DISCUSSION

Results

1 Description of Research Implementation

This research was conducted at SMA N 1 Mertoyudan from July 2025 to August 2025. This research consisted of two classes, namely experimental class 2 in class X C using the project-based learning model and control class 3 in class X I using the problem-based learning model. Learning was carried out in three meetings. Students involved in this study were 60 students, 30 in class X C and 30 in class X I. In this series of research there were pre-tests and post-tests. The pre-test was conducted before the treatment was carried out and the post-test was conducted after the treatment was carried out. The description of the results of the pre-test and post-test is as follows.

Table 2. Descriptive Data Analysis

	N	Min	Max	Mean	Std. Deviation
Pre-test Project Based Learning	30	34	84	52,96	15,5
Post-test Project Based Learning	30	38	94	60,83	14,18
Pre-test Problem based learning	30	20	78	45,8	16,4
Post-test Problem based learning	30	54	94	76,6	9,43
Valid N (listwise)	30				

Based on Table 2, it shows the results of the pre-test and post-test for each learning model, which will later become data for analysis to compare the results of using the project-based learning and problem-based learning models.

2 Description of Learning Implementation

The implementation of this learning was carried out during the research and observed by an observer. The observer in this study was a Pancasila Education teacher who teaches grade 10 at SMA N 1 Mertoyudan. The observer was tasked with assessing the implementation of planning and learning. (Wahyono et al., 2021; Widiyanto & Istiqomah, 2020, 2023). The results of the assessment of learning implementation are as follows.

Table 3. Results of Project Based Learning and Problem Based Learning Implementation

No	Lesson Plan Assessment	Problem based learning experiment class	Project Based Learning Experimental Class	Average implementation rate
1	The first meeting	100	100	100
2	Second meeting	100	100	100
3	The third meeting	100	100	100

Based on Table 3, the implementation of the learning plan was carried out according to the plan. The learning process proceeded ideally, in accordance with the planning and syntax developed for each model.

3 Results of Descriptive Analysis of Critical Thinking Skills

The dependent variable analyzed descriptively is students' critical thinking skills. Data on critical thinking skills can be obtained using pre-tests and post-tests. The descriptive results of critical thinking skills are as follows.

Table 4. Results of Descriptive Analysis of Critical Thinking Skills

Descriptive Statistics Results	Project based learning experiment class		Problem Based Learning Experimental Class	
	Pre-test	post-test	Pre-test	post-test
	Ideal	100	100	100
Max	84	94	78	94
Min	34	38	20	64
Mean	52,96	60,83	45,8	76,6

Based on Table 4, the project-based learning and problem-based learning models can improve students' critical thinking skills. The project-based learning model can improve by 7.87 points, while the problem-based learning model can improve by 30.8 points.

4 Prerequisite Tests for Analysis

a. Data Analysis Before Treatment

Pre-treatment data analysis aims to examine the characteristics of the data before treatment and determine the statistical tests used on the post-treatment data. The data analysis used included normality tests, homogeneity tests, and hypothesis tests. The data are presented below.

1) Normality Test

A normality test is performed to determine whether the data in the sample taken comes from a normally distributed population. The normality test uses the Kolmogorov-Smirnov test (Quraisy, 2022; Raharjo, 2014). Data is normally distributed if the significance value (sig) is more than > 0.05 (Quraisy, 2022). The results of the normality test are as follows.

Table 5. Pre-test Normality Test Results

Group	Kolmogorov-smirnov		
	Statistic	df	sig.
Project Based Learning	.150	30	.085
Problem Based Learning	.129	30	.200

Based on Table 5, the project-based learning data is 0.85 and problem-based learning is 0.200. When compared with the significance table, it shows $0.085 > 0.05$ and $0.200 > 0.05$. It can be concluded that the research data is normally distributed.

2) Homogeneity Test

The homogeneity test aims to determine data homogeneity. Pre-test data testing used one-way ANOVA (Raharjo, 2014; Usmani, 2020). The results of the homogeneity test are as follows.

Table 6. Pre-test Homogeneity Test Results

Levene Statistic	df-1	df-2	Sig.
.005	1	58	.942

Based on Table 6, the significance of 0.942 is greater than 0.05. The conclusion from the data is that both data are homogeneous.

3) Hypothesis Testing

The hypothesis testing in this study was conducted using pre-test data on students' critical thinking skills. The testing was conducted using statistical group data and a t-test using a paired sample t-test (Advernesia, 2021; CMHC, 2023; Politanikoe, 2015). Data presentation is as follows.

Table 7. Data Group Statistic

Result	N	Mean	Std. Deviation	Std. Error Mean
Pre-test Project Based Learning	30	52.96	15.52	2.8339
Pre-test Problem based learning	30	45.83	16.44	3.0015

Table 8. Paired Sample Test

		Paired Differences				t	df	Sig. (2-tailed)	
		Mean	Std. Deviation	Std. Error Mean	95 % Confidence Interval of the Difference				
					Lower	Upper			
Project Based Learning-	Problem based learning	7.133	-0,92	-0,16	7,48	6,79	1.728	.58	.089
							8		

Based on the results of the Paired Sample Test analysis between the Project-Based Learning (PjBL) and Problem-Based Learning (PBL) models, the average difference was 7.133, with a t-value of 1.728 and a degree of freedom (df) of 58. The significance value (Sig. 2-tailed) was 0.089, which is greater than the 0.05 level of significance.

b. Data Analysis After Treatment

Post-treatment data analysis aims to examine the characteristics of the data after treatment and determine the statistical tests used on the post-treatment data. The data

analysis methods used are normality tests, homogeneity tests, and hypothesis tests. The data are presented below.

1) Normality Test

A normality test is performed to determine whether the sample data comes from a normally distributed population. The Kolmogorov-Smirnov test is used to test normality (Anwar, 2022; Quraisy, 2022; Raharjo, 2014). Data are normally distributed if the significance value (sig) is greater than 0.05. The results of the normality test are as follows.

Table 9. Post-test Normality Test Results

Group	Kolmogorov-smirnov		
	Statistic	df	sig.
Project Based Learning	.146	30	.103
Problem Based Learning	.109	30	.200

Based on Table 9, the project-based learning data is 0.103 and problem-based learning is 0.200. When compared with the significance table, it shows $0.103 > 0.05$ and $0.200 > 0.05$. It can be concluded that the research data is normally distributed.

2) Homogeneity Test

Hasil pengujian homogenitas sebagai berikut. The homogeneity test aims to determine data homogeneity. The pre-test data was tested using one-way ANOVA (Usmedi, 2020). The results of the homogeneity test are as follows.

Table 10. Results of the Post-test Homogeneity Test

Levene Statistic	df-1	df-2	Sig.
3.965	1	58	.051

Based on table 10, the significance of 0.051 is greater than 0.05. The conclusion from the data is that both data are homogeneous.

3) Hypothesis Testing

The hypothesis testing in this study was conducted using pre-test data on students' critical thinking skills. The testing was conducted using statistical group data and a t-test using a paired sample t-test (Advernesia, 2021; CMHC, 2023; Politanikoe, 2015). Data presentation as follows

Table 11. Data Group Statistic

Result	N	Mean	Std.	Std. Error
			Deviation	Mean
Pre-test Project Based Learning	30	60.83	14.18	2.59
Pre-test Problem based learning	30	76.6	9.43	1.723

Table 12. Paired Sample Test

	Paired Differences				t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error	95 % Confidence Interval of the Mean Difference			
				Lower Upper			
Project Based Learning- Problem based learning	-15.7	4.748	0.867	-17.54 -14,05	-5.068	58	.000

Based on the results of data analysis using the Paired Sample Test, the mean difference (mean difference) was -15.7 with a standard deviation of 4.748 and a standard error of 0.867. The 95% confidence interval for the difference indicated a lower limit of -17.54 and an upper limit of -14.05. The calculated t-value was -5.068 with 58 degrees of freedom (df) and a 2-tailed significance level of 0.000.

c. N-gain Score Test

The N-gain score test showed an increase in students' critical thinking skills after the treatment given by the teacher in the experimental class. The following are the results of the N-gain score calculation.

Table 13. Results of N-gain Score Calculation for Project Based Learning & Problem Based Learning Classes

Information	Learning Classes	
	Project Based Learning	Problem based learning
	N-gain Score	N-gain Score
Mean	6.14	51,93
Min	-210	-25
Max	84,85	51,29

Based on the N-gain score calculation (Sesmiyanti et al., 2019), it was found that the class using the Project-Based Learning (PjBL) model had an average (mean) score of 6.14, with a minimum score of -210 and a maximum score of 84.85. Meanwhile, the class using the Problem-Based Learning (PBL) model showed an average (mean) score of 51.93, with a minimum score of -25 and a maximum score of 51.29.

Discussion

Analysis before treatment based on the results of the Paired Sample Test analysis between the Project-Based Learning (PjBL) and Problem-Based Learning (PBL) models, the average difference was 7.133, with a t-value of 1.728 and a degree of freedom (df) of 58. The significance value (Sig. 2-tailed) was 0.089, which is greater than the 0.05 level of significance.

These results indicate that there is no statistically significant difference between learning outcomes using the Project-Based Learning and Problem-Based Learning models.

However, the higher average value for the Project-Based Learning method indicates that descriptively, the implementation of PjBL provides better learning outcomes than PBL.

Analysis before treatment Based on the results of data analysis using the Paired Sample Test, the mean difference (mean difference) was -15.7 with a standard deviation of 4.748 and a standard error of 0.867. The 95% confidence interval for the difference indicated a lower limit of -17.54 and an upper limit of -14.05. The calculated t-value was -5.068 with 58 degrees of freedom (df) and a 2-tailed significance level of 0.000.

A significance level lower than 0.05 ($p < 0.05$) indicates a significant difference between learning outcomes using the Project-Based Learning (PjBL) and Problem-Based Learning (PBL) models. A negative mean difference indicates that the average student learning outcomes in problem-based learning (PBL) are higher than those in project-based learning (PjBL).

Thus, the results of this statistical test indicate that the implementation of Problem-Based Learning is more effective in improving student learning outcomes than Project-Based Learning (S. Amin et al., 2020; Anggraeni et al., 2023; Shandy Narmaditya et al., 2018; Suárez Cretton & Castro Méndez, 2022). This may be because the Problem-Based Learning approach emphasizes students' ability to analyze real-world problems, find solutions, and develop critical and collaborative thinking skills throughout the learning process.

These findings support constructivism theory, which emphasizes that knowledge is built through active learning experiences. Through Problem-Based Learning, students are directly exposed to contextual problem situations, encouraging them to explore, understand, and apply concepts independently (Anazifa & Djukri, 2017; Yew & Goh, 2016). Therefore, the learning outcomes achieved by students are more meaningful and profound than those achieved with a project-based approach (Dias-Oliveira et al., 2024; Isnani, 2023; A. P. Putri et al., 2023), which places greater emphasis on the final product.

A comparison of these two results shows that students' critical thinking skills improved significantly in classes implementing the Problem-Based Learning model compared to classes using Project-Based Learning. The average N-gain score in the PBL class, which reached 51.93, indicates a moderate to high increase in students' critical thinking skills, while the average score in the PjBL class, which reached 6.14, indicated a relatively low increase.

Furthermore, the minimum score in the PjBL class, which reached -210, indicates that some students experienced a decline in critical thinking skills after implementing the model. In contrast, the minimum score in the PBL class was only -25, indicating a relatively smaller variation in learning outcomes. This confirms that problem-based learning is more consistent in improving students' skills than project-based learning.

Overall, the results of this N-gain score analysis indicate that Problem-Based Learning is more effective in improving students' critical thinking skills than Project-Based Learning. The PBL approach, which emphasizes the process of identifying, analyzing, and solving real-life problems, encourages students to think critically and connect concepts to everyday contexts (Fatin et al., 2023; Shandy Narmaditya et al., 2018; Suhirman &

Khotimah, 2020; Sweeney & Callahan, 2024). Meanwhile, in PjBL, despite providing project-based learning experiences (Ramadhani Asiri et al., 2024; Wang, 2022), learning outcomes have not shown optimal improvement.

D. CONCLUSION

Based on the research results, the Problem Based Learning (PBL) learning model has been proven to be more effective in improving student learning outcomes compared to Project Based Learning (PBL). The PBL approach, which emphasizes the process of identifying, analyzing, and solving real problems, can encourage students to think critically and connect concepts to the context of everyday life. Meanwhile, in PBL, although it provides a project-based learning experience. Based on the results of the N-gain score calculation, it is known that the class using the Project Based Learning (PBL) model has an average (mean) score of 6.14 with a minimum score of -210 and a maximum score of 84.85. Meanwhile, the class using the Problem Based Learning (PBL) model shows an average (mean) score of 51.93 with a minimum score of -25 and a maximum score of 51.29. The comparison of the two results shows that the increase in students' critical thinking skills in the class with the implementation of the Problem Based Learning model is much higher than the class using Project Based Learning.

E. REFERENCES

- Advernesia. (2021). Cara Uji Paired Sample T Test dengan SPSS dan Contohnya. In *Advernesia.com*.
- Amin, A. K., Degeng, N. S., Setyosari, P., & Djatmika, E. T. (2021). The Effectiveness of Mobile Blended Problem Based Learning on Mathematical Problem Solving. *International Journal of Interactive Mobile Technologies*, 15(1). <https://doi.org/10.3991/IJIM.V15I01.17437>
- Amin, S., Utaya, S., Bachri, S., Sumarmi, & Susilo, S. (2020). Effect of problem-based learning on critical thinking skills and environmental attitude. *Journal for the Education of Gifted Young Scientists*, 8(2). <https://doi.org/10.17478/jegys.650344>
- Anazifa, R. D., & Djukri. (2017). Project- based learning and problem- based learning: Are they effective to improve student's thinking skills? *Jurnal Pendidikan IPA Indonesia*, 6(2). <https://doi.org/10.15294/jpii.v6i2.11100>
- Anggraeni, D. M., Prahani, B. K., Suprpto, N., Shofiyah, N., & Jatmiko, B. (2023). Systematic review of problem based learning research in fostering critical thinking skills. *Thinking Skills and Creativity*, 49. <https://doi.org/10.1016/j.tsc.2023.101334>
- Anwar, H. (2022). Uji Normalitas dan Metode Perhitungan (Penjelasan Lengkap). *Statistikian*.
- Arikunto, S. (2002). Metodologi Penelitian Suatu Pendekatan Proposal. 2017.
- Basri, H., Purwanto, As'ari, A. R., & Sisworo. (2019). Investigating critical thinking skill of junior high school in solving mathematical problem. *International Journal of Instruction*, 12(3). <https://doi.org/10.29333/iji.2019.12345a>
- CMHC. (2023). Uji T (T-Test) Dengan SPSS. *HM*.
- Dewi, R. R., Suresman, E., & Suabuana, C. (2021). Pendidikan Kewarganegaraan Sebagai Pendidikan Karakter di Persekolahan. *ASANKA: Journal of Social Science And Education*, 2(1). <https://doi.org/10.21154/asanka.v2i1.2465>

- Dias-Oliveira, E., Pasion, R., Vieira da Cunha, R., & Lima Coelho, S. (2024). The development of critical thinking, team working, and communication skills in a business school—A project-based learning approach. *Thinking Skills and Creativity*, 54. <https://doi.org/10.1016/j.tsc.2024.101680>
- Fatin, N. N., Subroto, T., & Rahmat, A. (2023). Implementasi Model Problem-Based Learning terhadap Peningkatan Critical Thinking dalam Pendidikan Jasmani. *Gelombang Olahraga: Jurnal Pendidikan Jasmani Dan Olahraga (JPJO)*, 7(1). <https://doi.org/10.31539/jpjo.v7i1.8060>
- Fitriani, H., Asy'ari, M., Zubaidah, S., & Mahanal, S. (2019). Exploring the prospective teachers' critical thinking and critical analysis skills. *Jurnal Pendidikan IPA Indonesia*, 8(3). <https://doi.org/10.15294/jpii.v8i3.19434>
- Gallagher, S. A. (2023). Problem-Based Learning. In *Systems and Models for Developing Programs for the Gifted and Talented, Second Edition*. <https://doi.org/10.4324/9781003419426-8>
- Ghani, A. S. A., Rahim, A. F. A., Yusoff, M. S. B., & Hadie, S. N. H. (2021). Effective Learning Behavior in Problem-Based Learning: a Scoping Review. In *Medical Science Educator* (Vol. 31, Issue 3). <https://doi.org/10.1007/s40670-021-01292-0>
- Hidajat, F. A. (2023). A comparison between problem-based conventional learning and creative problem-based learning on self-regulation skills: Experimental study. *Heliyon*, 9(9). <https://doi.org/10.1016/j.heliyon.2023.e19512>
- Isnani, T. (2023). Implementation of Project-Based Learning Approach in Improving Critical Thinking Skills of Elementary School Students. *Jurnal Ar Ro'is Mandalika (Armada)*, 3(1). <https://doi.org/10.59613/armada.v3i1.2844>
- John W. Creswell & J. David Creswell. (2022). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. SAGE.
- Politanikoe. (2015). Uji T-Test (Pengantar Statistik Lanjut). *Dasar-Dasar Statistik Penelitian*.
- Putri, A. P., Rachmadiarti, F., & Kuntjoro, S. (2023). Implementation of Project Based Learning (PjBL) Model with Differentiation Approach to Improve Critical Thinking Ability. *International Journal of Current Educational Research*, 2(2). <https://doi.org/10.53621/ijocer.v2i2.250>
- Putri, A. S., Prasetyo, Z. K., Purwastuti, L. A., Prodjosantoso, A. K., & Putranta, H. (2023). Effectiveness of STEAM-based blended learning on students' critical and creative thinking skills. *International Journal of Evaluation and Research in Education*, 12(1). <https://doi.org/10.11591/ijere.v12i1.22506>
- Quraisy, A. (2022). Normalitas Data Menggunakan Uji Kolmogorov-Smirnov dan Saphiro-Wilk. *J-HEST Journal of Health Education Economics Science and Technology*, 3(1). <https://doi.org/10.36339/jhest.v3i1.42>
- Raharjo, S. (2014). Cara Melakukan Uji Normalitas Kolmogorov-Smirnov dengan SPSS. *Spss Indonesia*.
- Ramadhani Asiri, F., Simarmata, R., Barella, Y., Jl Profesor Dokter H Hadari Nawawi, J. H., Laut, B., Pontianak Tenggara, K., Pontianak, K., & Barat, K. (2024). Strategi Belajar Mengajar (Project Based Learning). *Jurnal Pendidikan Sosial Humaniora*, 3(2).
- Santoso, G., Karim, A. A., Maftuh, B., Sapriya, & Murod, M. (2023). Pengantar Pendidikan Kewarganegaraan di Perguruan Tinggi melalui Kajian Filosofis Pembukaan UUD 1945 Indonesia Abad 21. *Jurnal Pendidikan Transformatif (JUPETRA)*, 2(1).

- Sari, D. M. M., & Prasetyo, Y. (2021). Project-based-learning on critical reading course to enhance critical thinking skills. *Studies in English Language and Education*, 8(2). <https://doi.org/10.24815/siele.v8i2.18407>
- Sesmiyanti, S., Antika, R., & Suharni, S. (2019). *N-Gain Algorithm for Analysis of Basic Reading*. <https://doi.org/10.4108/eai.19-7-2019.2289527>
- Shandy Narmaditya, B., Wulandari, D., & Binti Sakarji, S. R. (2018). Does problem-based learning improve critical thinking skills? *Cakrawala Pendidikan*, 37(3). <https://doi.org/10.21831/cp.v38i3.21548>
- Simanjuntak, M. P., Hutahaean, J., Marpaung, N., & Ramadhani, D. (2021). Effectiveness of problem-based learning combined with computer simulation on students' problem-solving and creative thinking skills. *International Journal of Instruction*, 14(3). <https://doi.org/10.29333/iji.2021.14330a>
- Suárez Cretton, X., & Castro Méndez, N. (2022). Contribution of problem-based learning in Critical Thinking. *Revista Interuniversitaria de Formacion Del Profesorado*, 97(36.3). <https://doi.org/10.47553/rifop.v97i36.3.96182>
- Subhaktiyasa, P. G. (2024). Menentukan Populasi dan Sampel: Pendekatan Metodologi Penelitian Kuantitatif dan Kualitatif. *Jurnal Ilmiah Profesi Pendidikan*, 9(4). <https://doi.org/10.29303/jipp.v9i4.2657>
- Sugiono, P. D. (2014). Metode penelitian pendidikan pendekatan kuantitatif.pdf. In *Metode Penelitian Pendidikan Pendekatan Kuantitatif, Kualitatif Dan R&D*.
- Suhirman, S., & Khotimah, H. (2020). The Effects of Problem-Based Learning on Critical Thinking Skills and Student Science Literacy. *Lensa: Jurnal Kependidikan Fisika*, 8(1). <https://doi.org/10.33394/j-lkf.v8i1.2794>
- Sweeney, A., & Callahan, B. (2024). Problem-Based Learning and Critical Thinking in Higher Education. *Journal of Educational Strategies*, 29(1).
- Usmadi, U. (2020). PENGUJIAN PERSYARATAN ANALISIS (UJI HOMOGENITAS DAN UJI NORMALITAS). *Inovasi Pendidikan*, 7(1). <https://doi.org/10.31869/ip.v7i1.2281>
- Wahyono, H., Cahyani, D. D., & Widiyanto, D. (2021). The Analysis of Learning Plan conditions for General Courses (MKU) at Tidar University Based on E-Learning. *JETL (Journal of Education, Teaching and Learning)*, 6(2). <https://doi.org/10.26737/jetl.v6i2.2647>
- Wang, S. (2022). Critical Thinking Development Through Project-Based Learning. *Journal of Language Teaching and Research*, 13(5). <https://doi.org/10.17507/jltr.1305.13>
- Widiyanto, D., & Istiqomah, A. (2020). EVALUASI PENILAIAN PROSES DAN HASIL BELAJAR MATA PELAJARAN PPKn. *Citizenship Jurnal Pancasila Dan Kewarganegaraan*, 8.
- Widiyanto, D., & Istiqomah, A. (2023). Evaluation of Citizenship Education Learning Process Assessment. *Daengku: Journal of Humanities and Social Sciences Innovation*, 3(6). <https://doi.org/10.35877/454ri.daengku2119>
- Yew, E. H. J., & Goh, K. (2016). Problem-Based Learning: An Overview of its Process and Impact on Learning. In *Health Professions Education* (Vol. 2, Issue 2). <https://doi.org/10.1016/j.hpe.2016.01.004>
- Zulfikar, M. F., & Dewi, D. A. (2021). PENTINGNYA PENDIDIKAN KEWARGANEGARAAN UNTUK MEMBANGUN KARAKTER BANGSA. *JURNAL PEKAN : Jurnal Pendidikan Kewarganegaraan*, 6(1). <https://doi.org/10.31932/jpk.v6i1.1171>