The Effect of Critical Thinking Skills on Social Science Learning Outcomes

Kurnia Habibah, Idam Ragil Widianto Atmojo, Supianto

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

Article History
accepted 1/8/2025 approved 1/9/2025 published 1/10/2025

Abstract

This study aims to analyze the influence of critical thinking skills on the learning outcomes of Natural and Social Sciences (IPAS) of grade IV elementary school students. This study uses a quantitative approach with a correlational research model, because it focuses on the relationship between the variables of critical thinking ability and social studies learning outcomes. The research sample amounted to 64 students taken from a population of 178 grade IV students in Purwantoro District, Wonogiri Regency, using cluster random sampling techniques. The research instrument consisted of a critical thinking ability description test developed based on five indicators (identifying problems, analyzing arguments, stating reasoning, drawing conclusions, and solving problems) and a multiple-choice test of science learning outcomes. The data was analyzed using a simple linear regression test with the help of SPSS software version 25.0. The results showed that there was a positive and significant influence between critical thinking skills on social studies learning outcomes with a significance value of 0.000 < 0.05 and a determination coefficient value (R^2) of 0.791, which means that the contribution of critical thinking skills to learning outcomes reached 79.1%. Thus, critical thinking skills have proven to be an important factor in improving the achievement of IPAS learning outcomes, and need to be developed systematically in the learning process in elementary schools.

Keywords: *Critical Thinking, Learning Outcomes, Social Studies, Elementary School, Linear Regression*

Abstrak

Penelitian ini bertujuan untuk menganalisis pengaruh kemampuan berpikir kritis terhadap hasil belajar Ilmu Pengetahuan Alam dan Sosial (IPAS) siswa kelas IV sekolah dasar. Penelitian ini menggunakan pendekatan kuantitatif dengan model penelitian korelasional, karena berfokus pada hubungan antara variabel kemampuan berpikir kritis dan hasil belajar IPAS. Sampel penelitian berjumlah 64 siswa yang diambil dari populasi sebanyak 178 siswa kelas IV di Kecamatan Purwantoro, Kabupaten Wonogiri, menggunakan teknik cluster random sampling. Instrumen penelitian terdiri dari tes uraian kemampuan berpikir kritis yang dikembangkan berdasarkan lima indikator (mengidentifikasi masalah, menganalisis argumen, menyatakan penalaran, menarik kesimpulan, dan menyelesaikan masalah) dan tes pilihan ganda hasil belajar IPAS. Data dianalisis menggunakan uji regresi linier sederhana dengan bantuan software SPSS versi 25.0. Hasil penelitian menunjukkan bahwa terdapat pengaruh positif dan signifikan antara kemampuan berpikir kritis terhadap hasil belajar IPAS dengan nilai signifikansi 0,000 < 0,05 dan nilai koefisien determinasi (R^2) sebesar 0,791, yang berarti kontribusi kemampuan berpikir kritis terhadap hasil belajar mencapai 79,1%. Dengan demikian, kemampuan berpikir kritis terbukti menjadi faktor penting dalam meningkatkan pencapaian hasil belajar IPAS, dan perlu dikembangkan secara sistematis dalam proses pembelajaran di sekolah dasar.

Kata Kunci: Berpikir Kritis, Hasil Belajar, IPAS, Sekolah Dasar, Regresi Linier

Social, Humanities, and Education Studies (SHEs): Conference Series p-ISSN 2620-9284
https://jurnal.uns.ac.id/shes e-ISSN 2620-9292

INTRODUCTION

The results of PISA (Programme for International Student Assessment) show that the science and mathematics literacy skills of Indonesian students are still relatively low compared to other countries. According to the latest PISA report, Indonesian students' average scores in science and mathematics literacy are significantly below the OECD average, ranking 74th out of 79 participating countries. This condition indicates that Indonesian students struggle to understand, analyze, and apply scientific concepts in their daily lives. This low PISA result shows the weakness of critical thinking skills that are essential for students to face the challenges of the 21st century (OECD, 2024).

Critical thinking is an important skill that must be taught from an early age, especially at the elementary school level (Novandi dkk., 2025). According to (Ennis, 1993) defines critical thinking as an organized and directed thought process for evaluating arguments, making logical inferences, and drawing valid conclusions. Indicators of critical thinking include the ability to identify problems, analyze arguments, state reasoning, draw conclusions, and solve problems et alet al(Mustikaningrum dkk., 2021; Supratman dkk., 2023) . In the context of basic education, critical thinking plays an important role in helping students understand the concepts of IPAS (Natural and Social Sciences), evaluate information, and solve problems faced in the surrounding environment (Loyens dkk., 2023; O'Reilly dkk., 2022).

Various previous studies have supported the relationship between critical thinking and student learning outcomes. Research conducted by (Cantona dkk., 2023) shows that the application of the Problem-Based Learning model can improve social studies learning outcomes through improving students' critical thinking skills. Similar findings were also put forward by (Adirahayu & Wulandari, 2018), which found that the guided inquiry model was able to improve students' science learning outcomes because it trained critical thinking skills in analyzing and evaluating the information obtained. In addition, research by (Benayache dkk., 2019) shows that critical thinking skills make a significant contribution of 24.2% to student learning outcomes. Research by (Mustikaningrum dkk., 2021) also strengthens the findings by showing that critical thinking skills play an important role in improving students' understanding of social studies concepts through the process of analysis and reasoning.

However, previous research still tends to focus on the application of certain learning models without delving deeper into the direct relationship between critical thinking skills and social studies learning outcomes. This research offers a novelty with a focus on correlational analysis that quantitatively measures the influence of critical thinking skills on social studies learning outcomes at the elementary school level. The instruments used in this study are compiled based on essential indicators of thinking developed by Ennis, namely identifying problems, analyzing arguments, stating reasoning, drawing conclusions, and solving problems et alet al(Kong & Pek, 2023; Mustikaningrum dkk., 2021; Wandika dkk., 2023). In addition, this study introduces a simple linear regression analysis method to empirically measure the contribution of critical thinking skills to social studies learning outcomes, contrasting with previous studies that employed more experimental or quasi-experimental approaches. With this approach, it is hoped that a clearer and deeper picture of how much critical thinking skills contribute to student learning outcomes.

The purpose of this study is to analyze the influence of critical thinking skills on the learning outcomes of social studies students in grade IV in Purwantoro District, Wonogiri Regency. Critical thinking skills, including identifying problems, analyzing arguments, stating reasoning, drawing conclusions, and solving problems, are expected to significantly contribute to improving IPAS learning outcomes. In addition, this study aims to determine the significance of the relationship between critical thinking skills and social studies learning outcomes of students, in order to find out how much essential

skills of thinking contribute in supporting student learning outcomes at the elementary education level.

METHOD

Research Design

This study is quantitative research with a correlational approach (Sugiyono, 2019)that aims to find out the extent to which the influence of critical thinking skills affects the learning outcomes of Natural and Social Sciences (IPAS) of grade IV elementary school students. Correlation research is used because it focuses on the relationship between variables, in this case between critical thinking scores as an indepe ndent variable and IPAS learning outcomes as a bound variable.

Population and Sample

The population in this study is all grade IV elementary school students in Purwantoro District, Wonogiri Regency, with a total of 178 students. The number of samples was determined using the Slovin formula with an error rate (e) of 10%, so that a sample of 64 students was obtained. The sample was selected in cluster random sampling based on schools that represented the population homogeneously.

Data Collection Instruments and Tools

The data collection instruments in this study consisted of two types of tests, namely:

1. Critical Thinking Ability Test Instrument

This test is structured based on five critical thinking indicators developed from the Ennis framework, namely: identifying problems, analyzing arguments, stating reasoning, drawing conclusions, and solving problems. The questions are in the form of descriptions and adjusted to the context of the daily lives of grade IV students. The instrument grid can be seen in Table 1.

Table 1. Critical Thinking Test Instrument Grid

Yes	Indicators	Question
1	Identifying Problems	Dance Name No. – Regional Origin:1. Saman Dance – Aceh2. Gambyong Dance – Sulawesi3. Bungong Jeumpa Dance – Kalimantan4. Kecak Dance – Javanese5. Pendet Dance – North Sumatra6. Tor-Tor Dance – PapuaBased on the table, name the dance pairs and the corresponding regional origins? Then mention and explain the customary customs they have based on your knowledge!
2	Analyzing Arguments	The house is a traditional house in Indonesia. The shape of the stage is a protection against disturbances from below for the families living in it. The house has a characteristic roof like buffalo horns. Based on the picture, what is the name of the house and which area is it from? Explain the culture of the people of the area!
3	Stating Reasoning	Take a look at the following picture! From the picture, the Afshin House is in the form of a traditional house of a certain region. Arfa also likes to play at Afshin's house. There are many friendly native tribes. The house is also known as a stilt house. Based on the pictures and readings, explain the name of the traditional house, the origin of the area and the indigenous tribes of the area!
4	Drawing Conclusions	Table of Traditional Houses – Regional Origin:1. Krong Bade – Aceh2. Gadang – Central Java3. Joglo – South Sulawesi4. Lamin – East KalimantanBased on the table, which is the right pair of traditional houses and regional origins?

Yes	Indicators	Question
5	Troubleshooting	The picture shows a typical regional ceremony in Indonesia. The area is famous for the tourist destination of Kuta Beach. A Hindu cremation ceremony. In the regional language it is called *palebon*. Based on pictures and readings, which region the traditional ceremony comes from, what is the name of the ceremony, and explain the meaning of the ceremony!

2. IPAS Learning Outcome Test Instrument

The learning outcome test is in the form of multiple choice which includes aspects of science knowledge based on the grade IV curriculum, including socio-cultural diversity, role in society, and the surrounding environment. The instrument grid is presented in Table 2.

Table 2. IPAS Learning Outcome Test Grid

Yes	Aspects of Critical Thinking Ability	Critical Thinking Indicators	Question Indicator	Cognitive Level	Stimulus	Question
1	Identify issues	Students are able to identify problems in groups	Students analyze cultural diversity and local wisdom	C4	Table of dance names and regional origin	Based on the table, name the dance pairs and the corresponding regional origins? Then mention and explain the customary customs they have based on your knowledge!
2	Analyze arguments	Students demonstrate the ability to analyze arguments in groups	Students analyze biodiversity	C4	Picture of a traditional house with a buffalo horn roof	What is the name of the house and which area is it from? Explain the culture of the people of the area!
3	Stating reasoning	Skilled learners express reasoning in group discussions	Students categorize community habits in the form of local wisdom in Indonesia	C4	Pictures of stilt houses and narratives	Explain the name of the traditional house, the origin of the region, and the indigenous tribes of the area!
4	Drawing conclusions	Students are able to draw conclusions	Students categorize local wisdom	C5	Table of traditional houses and	Which is the right pair of traditional

Yes	Aspects of Critical Thinking Ability	Critical Thinking Indicators	Question Indicator	Cognitive Level	Stimulus	Question
		clearly and logically	around the environment		regional origin	houses and regional origins?
5	Troubleshoot	Students can solve problems with a variety of alternatives	Students explain the meaning of traditional ceremonies based on pictures and narratives	C5	Portrait of the Wedding Ceremony	Mention the name of the ceremony, which region it is from, and explain the meaning of the ceremony!

Data obtained from the critical thinking ability test and the IPAS learning outcome test were analyzed quantitatively using inferential statistical techniques with the help of SPSS software version 25.0 (Dewi, 2024; Elpridha dkk., 2020). Before a simple linear regression analysis is carried out, a classical assumption test is first carried out to ensure the validity of the analysis model. The classical assumption test used includes the normality test and the linearity test. The normality test was carried out using the Shapiro-Wilk method, which aims to find out whether the data from each variable has a normal distribution. The data is said to be normally distributed if the significance value (p-value) is greater than 0.05.

Furthermore, the linearity test was carried out by analyzing Pearson correlations and visualization through scatter plot regression to ensure that there is a linear relationship between the independent variable (critical thinking ability) and the bound variable (IPAS learning outcomes). After the data met the assumptions of normality and linearity, the analysis was followed by a simple linear regression test to determine the influence of critical thinking skills on students' social studies learning outcomes. The test results are declared significant if the significance value (p-value) is less than 0.05, which means that there is a statistically significant influence between the two variables analyzed.

RESULTS AND DISCUSSION

Before a simple linear regression analysis is performed, the first step that must be fulfilled is a classical assumption test to ensure the validity of the model. The two main tests carried out were the normality test and the linearity test. The normality test aims to test whether the data on the free variable (critical thinking score) and the bound variable (IPAS learning outcomes) are distributed normally. This test was performed using the Shapiro-Wilk method. Meanwhile, to find out if there is a linear relationship between the two variables, a linearity test was carried out using Pearson correlation. The results of the normality test are shown in Table 3 below.

Table 3. Normality Test Results (Shapiro-Wilk)

Variable	W	p-value	Interpretation
Critical Thinking Score	0.9806	0.3276	Normal (p > 0.05)

Variable	W	p-value	Interpretation
IPAS Learning Outcome Score	0.9789	0.2593	Normal (p > 0.05)

Based on Table 3, it is known that the two variables, namely critical thinking scores and IPAS learning outcomes, have normal data distribution due *to* the p> value of 0.05 in the Shapiro-Wilk test. This shows that the data meets the assumption of normality and is feasible to proceed to the stage of linear regression analysis. Furthermore, to ensure that the relationship between critical thinking scores and social studies learning outcomes is linear, a Pearson correlation test was performed. The results of the linearity test are presented in Table 4. Next:

Table 4. Results of the Linearity Test (Pearson Correlations)

Correlation Coefficient (r)	p-value	Interpretation
0.9433	0.0000	The correlation was very strong and significant (p < 0.05)

From the results of Table 4, a correlation coefficient of 0.9433 was obtained with a significance value of p < 0.05. This means that there is a very strong and significant linear relationship between critical thinking scores and social studies learning outcomes. Therefore, the assumption of linearity is fulfilled and a simple linear regression analysis can be performed validly. As a complement to the analysis, the following is a visualization of the linearity test that illustrates the relationship between critical thinking scores and IPAS learning outcomes. The red line shows a linear regression line representing the tendency of the positive relationship between the two variables, can be seen in Figure 1. Next.

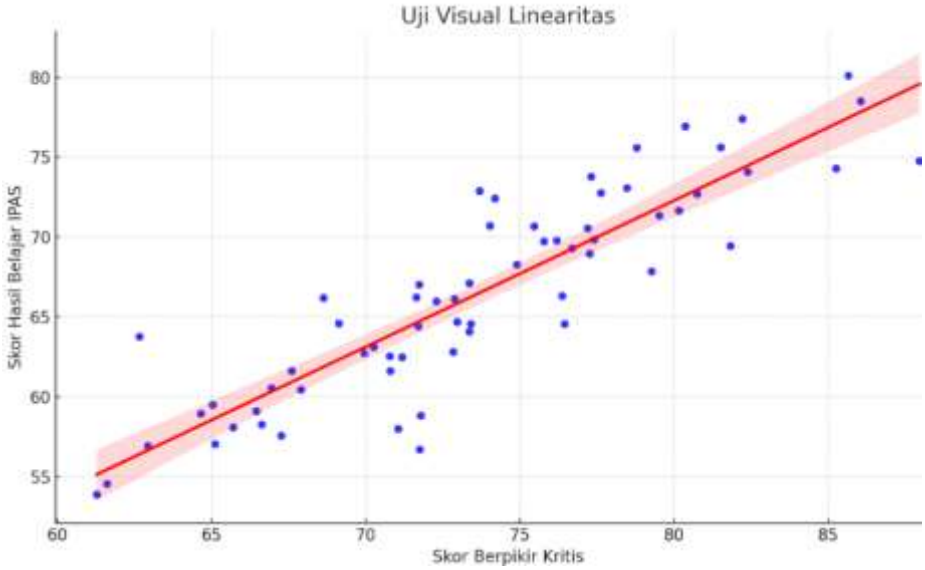

Figure 1. Visualization of Linearity

Figure 1. Showing that the visualization of the data spread follows a clear linear pattern around the regression line, reinforces the results of Pearson's test that the relationships between variables are linear and significant. With the fulfillment of these two classical assumptions, the linear regression model that will be used can be said to

be valid and reliable to explain the influence of critical thinking skills on social studies learning outcomes. After knowing all the normalities and linearity, a simple linear regression test was carried out to determine the influence of critical thinking skills on the learning outcomes of grade IV students in Purwantoro District, Wonogiri. This test is part of an inferential data analysis technique with the aim of seeing the relationship and contribution of independent variables (critical thinking) to bound variables (IPAS learning outcomes). It can be seen in Table 5. Next.

Table 5. Simple Linear Regression Test Results

Variable	Coefficient (B)	Std. Error	T-Count	Sig. (p-value)	Interpretation
Constant (intercede)	-1.01757	4.460	-0.230	0.819	Insignificant
Critical Thinking Score	0.91626	0.060	15.331	0.000	Significant, positive effect
R-squared (R^2)	0.791	-	-	-	Strong, contribution of 79.1%
F-statistical probability	9.11e-23	-	-	< 0.05	Overall significant regression model

In Table 5. Showing the results of simple linear regression analysis, a determination coefficient value (R^2) of 0.791 was obtained which showed that critical thinking skills could explain 79.1% of the variation in learning outcomes in IPAS. In comparison, the remaining 20.9% was explained by other variables outside the model.

The value of the regression coefficient for the critical thinking score variable was 0.9162 with a significance value (p-value) of 0.000 ($p < 0.05$) which means that the influence is statistically significant. Thus, every increase in one unit of critical thinking score will increase the IPAS learning outcome score by 0.9162 points. This suggests that the higher the critical thinking skills students possess, the better their social studies learning outcomes will be. The resulting model also has high prediction accuracy, as can be seen from the R^2 value of 0.791.

Discussion

Based on the results of simple linear regression analysis, a regression coefficient of 0.9162 and a significance value (p-value) of 0.000 were obtained, which means that critical thinking skills have a positive and significant influence on the learning outcomes of social studies of grade IV students. The value of the determination coefficient (R^2) of 0.791 indicates that the critical thinking ability score can explain 79.1% of the variation in the IPAS learning outcome score. This confirms that the higher the student's critical thinking ability, the higher their learning outcomes.

Each indicator of critical thinking has an important contribution. For example, the ability to identify problems helps students recognize key issues in the context of IPAS. The ability to analyze arguments and state reasoning supports students in evaluating information objectively. Furthermore, skills in drawing conclusions and solving problems allow students to apply the concept of IPAS in real life appropriately. These findings are reinforced by research et al(Sitanggang & Haryanto, 2023; Sunarti dkk., 2023) which s,tates that critical thinking contributes to understanding complex material and better decision-making among students.

Other studies (Nilyani dkk., 2023; Sunarti dkk., 2023) It also states that students who have high critical thinking skills tend to show better academic performance because they are able to formulate logical arguments and solve analysis-based problems. This is in line with the results of this study, which shows a very strong correlation (r = 0.9433) between critical thinking skills and IPAS learning outcomes. Even (Anwar dkk., 2023; Farida dkk., 2023; Sitanggang & Haryanto, 2023) states that high-level thinking skills, especially critical thinking, should be the main target of independent curriculum-based learning.

However, this study has some limitations. First, the number of samples used was only 64 students from one sub-district, so the results could not be generalized to other regions with different characteristics. Second, the relatively short duration of research can limit a comprehensive understanding of the dynamics of longitudinal critical thinking skills. Therefore, it is recommended in future research to expand the scope of the sample in several different areas and consider longitudinal design in order to obtain a more complete picture of the development of students' critical thinking.

In addition, further research can also explore the relationship between certain critical thinking indicators and aspects of IPAS learning outcomes, such as environmental problem-solving skills or social participation. The use of digital instruments based on automatic assessment rubrics can also be considered to increase the objectivity of students' critical thinking skills assessment.

Practically, the findings of this study provide important implications for the learning of social studies in elementary schools. Teachers need to design explicit learning activities to train students in identifying problems, analyzing, and summarizing information. A problem-based or inquiry-based approach can be an effective strategy to facilitate the development of critical thinking skills. In line with that, learning that emphasizes collaboration, data exploration, and reflection on the thinking process can also improve the quality of student understanding. By strengthening critical thinking skills, the learning outcomes of IPAS are not only increased quantitatively, but also qualitatively in terms of understanding and application of concepts**.**

CONCLUSION

Research on the influence of critical thinking skills on social studies learning outcomes at the elementary school level is still relatively limited, especially those that use description instruments based on the context of students' daily lives. Therefore, this research makes a new contribution in strengthening the theoretical relationship between the development of cognitive processes and the achievement of learning outcomes, especially in the subject of Natural and Social Sciences (IPAS) at the elementary school level.

The results of this study show that critical thinking skills have a significant influence on the learning outcomes of social studies students. Regression analysis showed a strong positive influence with a determination coefficient value (R^2) of 0.791, which means that students' critical thinking skills can explain 79.1% of the variation in social studies learning outcomes. Each indicator of critical thinking such as identifying problems, analyzing arguments, stating reasoning, drawing conclusions, and solving problems has an essential role in helping students understand concepts in depth and apply them contextually. The more trained students are, the higher their ability to achieve IPAS learning goals.

Thus, critical thinking needs to be positioned not only as a learning outcome but also as a strategic learning process that needs to be integrated into IPAS learning. Teachers need to design learning that encourages critical thinking skills through contextual assignments, real-world problem-solving, and reflective assessment so that

the learning process becomes more meaningful, analytical, and applicative in students' daily lives.

REFERENCE

Adirahayu, M., & Wulandari, F. (2018). Model pembelajaran inkuiri terbimbing dan pengaruhya terhadap keterampilan proses sains siswa. *SEJ (Science Education Journal)*, *Query date: 2024-08-23 09:35:18*. https://sej.umsida.ac.id/index.php/sej/article/view/1593

Anwar, P. I., Usmeldi, -, & Asrizal, -. (2023). Effects of STEM Integration in Science Learning on Critical Thinking and Creative Thinking Skills: A Meta-Analysis. *Jurnal Penelitian Pembelajaran Fisika*, *9*(2), 231. https://doi.org/10.24036/jppf.v9i2.122493

Benayache, A., Bilami, A., Barkat, S., Lorenz, P., & Taleb, H. (2019). MsM: A microservice middleware for smart WSN-based IoT application. *Journal of Network and Computer Applications*, *144*, 138–154. https://doi.org/10.1016/j.jnca.2019.06.015

Cantona, I. G. E., Suastra, I. W., & Ardana, I. M. (2023). HOTS Oriented Problem-Based Learning Model: Improving Critical Thinking Skills and Learning Outcomes of Fifth Grade Students in Science Learning. *Thinking Skills and Creativity Journal*, *6*(1), 19–26. https://doi.org/10.23887/tscj.v6i1.61654

Dewi, N. L. K. A. A. (2024). PENGARUH MODEL PEMBELAJARAN MIND MAPPING BERBANTUAN MEDIA AUDIO VISUAL TERHADAP KEMAMPUAN BERPIKIR KRITIS SISWA SEKOLAH DASAR. *Prima Magistra: Jurnal Ilmiah Kependidikan*. https://doi.org/10.37478/jpm.v5i3.4356

Elpridha, S., Supriati, Y., & Bagaskorowati, R. (2020). Effect of method of learning and the ability to think of critical of learning outcomes IPA (Experiment Student Class V SDN Limbangan Central III District of Bl Limbangan Garut 2017). *Technium Social Sciences Journal*. https://doi.org/10.47577/tssj.v9i1.1050

Ennis, R. H. (1993). Critical thinking assessment. *Theory Into Practice*. https://doi.org/10.1080/00405849309543594

Farida, R., Suroyo, S., & Sekarwinahyu, M. (2023). THE INFLUENCE OF STRATEGY RELATING, EXPERIENCING, APPLYING, COOPERATING, TRANSFERRING (REACT) ON SCIENCE LEARNING OUTCOMES OF FIFTH GRADE ELEMENTARY STUDENTS VIEWED FROM CRITICAL THINKING ABILITY. *Jurnal Penelitian Pendidikan IPA*, *8*(1), 1–10. https://doi.org/10.26740/jppipa.v8n1.p1-10

Kong, M. J., & Pek, L. S. (2023). IMPACT OF CRITICAL THINKING SKILLS ON LEARNING OUTCOME: A REVIEW OF RESEARCHERS' FINDINGS. *Quantum Journal of Social Sciences and Humanities*, *4*(6), 28–36. https://doi.org/10.55197/qjssh.v4i6.297

Loyens, S. M. M., Meerten, J. E. van, Schaap, L., & Wijnia, L. (2023). Situating Higher-Order, Critical, and Critical-Analytic Thinking in Problem- and Project-Based Learning Environments: A Systematic Review. *Educational Psychology Review*, *35*, 1–44. https://doi.org/10.1007/s10648-023-09757-x

Mustikaningrum, G., Widiyanto, W., & Mediatati, N. (2021). Application of The Discovery Learning Model Assisted by Google Meet to Improve Students' Critical Thinking Skills and Science Learning Outcomes. *International Journal of Elementary Education*, *5*(1), 30. https://doi.org/10.23887/ijee.v5i1.34344

Nilyani, K., Asrizal, A., & Usmeldi, U. (2023). Effect of STEM Integrated Science Learning on Scientific Literacy and Critical Thinking Skills of Students: A Meta-Analysis.

Jurnal Penelitian Pendidikan IPA, *9*(6), 65–72. https://doi.org/10.29303/jppipa.v9i6.2614

Novandi, M., Serani, G., Djudin, T., & Suratman, D. (2025). KETERAMPILAN BERPIKIR KRITIS DAN PENGAJARANNYA DI SEKOLAH DASAR. *JURNAL PENDIDIKAN DASAR PERKHASA: Jurnal Penelitian Pendidikan Dasar*. https://doi.org/10.31932/jpdp.v11i1.4509

OECD. (2024). *PISA 2022 Results: What Students Know and Can Do*. OECD Publishing.

O'Reilly, C., Devitt, A., & Hayes, N. (2022). Critical Thinking in the Preschool Classroom—A systematic literature review. *Thinking Skills and Creativity*. https://doi.org/10.1016/j.tsc.2022.101110

Sitanggang, R. P., & Haryanto, H. (2023). The Influence of Project-Based Learning Models on Critical Thinking Ability and Basic Science Learning Outcomes. *Proceedings Series on Social Sciences & Humanities*, *12*, 436–444. https://doi.org/10.30595/pssh.v12i.831

Sugiyono. (2019). *Metode Penelitian Kuantitatif, Kualitatif dan R&D*. Alfabeta.

Sunarti, Nurlina, & Maaruf. (2023). The Influence Of Guided Inquiry Learning Models On Students' Critical Thinking Skills And Science Learning Outcomes At Primary School Level. *Improvement: Jurnal Ilmiah Untuk Peningkatan Mutu Manajemen Pendidikan*, *10*(2), 95–103. https://doi.org/10.21009/improvement.v10i2.37407

Supratman, S., Zubaidah, S., Tarigan, M. R. M., & Azis, S. (2023). Contribution of critical thinking, science process skills towards learning outcomes based on gender. *International Journal of Evaluation and Research in Education (IJERE)*, *12*(4), 1985. https://doi.org/10.11591/ijere.v12i4.24927

Wandika, W., Asrizal, -, & Usmeldi, -. (2023). The Effect of STEM-Based Learning Approaches on Critical Thinking Abilities and Student Learning Outcomes: Meta-Analysis. *Jurnal Penelitian Pembelajaran Fisika*, *9*(2), 194. https://doi.org/10.24036/jppf.v9i2.122602