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Profile of Critical Thinking Skills in Elementary School Students

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Abstract
This study aims to analyze the profile of critical thinking skills among upper-grade elementary school students by examining three core indicators: question formulation, strategy planning, and decision evaluation. A descriptive quantitative approach was employed, involving 100 fifth and sixth grade students in a Jakarta elementary school. Data were collected using a validated critical thinking test and Likert-scale questionnaires administered to students and teachers. Triangulation techniques were applied by combining test results, questionnaires, and structured classroom observations. The results showed that students performed very well in formulating questions (mean score = 80), moderately in planning strategies (mean score = 65), and poorly in evaluating decisions (mean score = 58). Questionnaire and observation data reinforced these findings, highlighting students' tendency to seek direct answers rather than explore multiple solutions. Teachers were observed to dominate classroom interactions, which limited students' reflective thinking opportunities. This research emphasizes the need for instructional innovations, particularly through the implementation of problem-based learning and reflective discussions, to foster students' ability to critically analyze and evaluate information. Furthermore, the findings provide practical implications for educators and policymakers to design learning environments that encourage autonomy, inquiry, and higher-order thinking skills among elementary students. The study provides comprehensive insights into how critical thinking develops in elementary students and suggests strategies for more effective curriculum implementation.

INTRODUCTION

Critical thinking is one of the core competencies that must be developed in primary education to prepare students for the challenges of the modern era (Malagola et al., 2023). In the educational context, critical thinking enables students to analyze information, evaluate arguments, and make informed decisions (Aziz et al., 2024). Learning processes that foster critical thinking contribute to students' ability to solve problems independently. As the foundational stage of formal education, primary school plays a vital role in shaping students' critical thinking patterns from an early age. Therefore, both the curriculum and teaching practices must be designed to cultivate this essential skill. Teachers are key agents in facilitating students' engagement with reflective and analytical learning. When learning encourages questioning and exploration, it helps develop students' intellectual autonomy. Hence, efforts to integrate critical thinking into early education must be intentional and systematic.

The ability to think critically in learning environments is significantly influenced by the teaching methods and strategies employed by educators (Sarwanto et al., 2021). Interactive and problem-based learning (PBL) approaches have been shown to stimulate deeper cognitive engagement. However, data from the Programme for International Student Assessment (PISA) indicate that instructional practices in many countries, including Indonesia, still rely heavily on rote learning with limited space for critical inquiry (Fitriani et al., 2021). Teachers must transition from being knowledge

transmitters to facilitators of inquiry-based learning. Their role includes guiding students in gathering evidence, analyzing perspectives, and constructing logical arguments (Panggabean, 2024). A classroom environment that supports discussion and reflection can reinforce students' critical thinking skills. Nevertheless, such environments are not yet the norm in many primary schools. Innovation in teaching strategies is therefore essential to enhance the quality of critical thinking development.

In the digital age, access to information is vast and varied, demanding that students acquire the ability to filter, analyze, and assess the validity of online content. Critical thinking enables students to navigate bias, misinformation, and digital content with discernment (Lestari et al., 2021). This highlights the urgency for schools to integrate media literacy and digital evaluation skills into their curricula. Elementary school curricula must embed analytical and evaluative learning objectives that align with technological integration (Suwono et al., 2023). Teachers must also be equipped to guide students in using technology responsibly and critically. Without these competencies, students may become passive recipients of misleading information. Therefore, critical thinking serves not only academic purposes but also civic and personal resilience.

Various instructional approaches have been shown to promote critical thinking when applied effectively in the classroom. These include group discussions, case studies, experimentation, and problem-based inquiry (Jamil et al., 2024). Such strategies allow students to engage with content from multiple perspectives, fostering deeper understanding and intellectual curiosity. Students are not merely passive recipients of knowledge but are encouraged to question assumptions and evaluate evidence. Assessment practices should also reflect critical thinking objectives, focusing on students' abilities to reason, reflect, and articulate arguments (Agustianti et al., 2022). Teachers must take an active role in designing and facilitating these learning experiences. When students engage in analytical thinking, they develop transferable skills applicable across disciplines. This pedagogical shift requires a reevaluation of traditional teaching practices to prioritize student-centered learning.

Despite its importance, several challenges hinder the development of critical thinking in elementary education. Many teachers still rely on traditional, lecture-based methods that do not foster inquiry or higher-order thinking (Watik et al., 2023). Additionally, heavy curriculum loads often compel teachers to prioritize academic content coverage over skills development. Professional development and targeted training are essential to equip educators with the skills needed for facilitating critical thinking. Institutional support from schools and education authorities is also necessary to sustain these innovations. Curricula that overemphasize memorization and standardized testing limit opportunities for students to think critically. A more flexible and inquiry-based curriculum would provide room for creative exploration. This aligns with contemporary calls for education systems to prepare learners for complex, real-world problem solving (Solihin et al., 2024).

Environmental factors also influence the development of students' critical thinking skills. A supportive learning environment including a positive classroom climate, adequate learning resources, and collaborative teacher-student relationships can significantly enhance students' critical engagement (Rahman et al., 2022). Parental involvement and community support further strengthen the learning ecosystem. When these factors align, students are more likely to become confident thinkers who can articulate their views and empathize with others (Sudiarti et al., 2023). Critical thinking education not only improves academic performance but also fosters emotional intelligence and social awareness. It empowers students to navigate differences in opinion, promote tolerance, and engage in constructive dialogue (Hadi et al., 2020). Regular evaluation of teaching effectiveness in cultivating critical thinking is necessary. Evidence-based refinement of strategies will ensure that primary education remains relevant in an increasingly complex world.

However, previous studies have predominantly focused on secondary and higher education settings, leaving a significant research gap in understanding how critical thinking skills develop at the elementary school level. Specifically, there is limited empirical evidence that examines the critical thinking competencies of upper elementary students in Indonesia. This study adopts a critical thinking framework that categorizes critical thinking into three core dimensions: question formulation, strategy

planning, and decision evaluation. These dimensions serve as the theoretical lens to assess students' critical thinking performance in primary education settings. Therefore, this study aims to (1) analyze the profile of critical thinking skills among upper elementary school students based on key critical thinking indicators; (2) identify areas of strength and weakness in students' critical thinking performance; and (3) provide recommendations for instructional practices to enhance the development of critical thinking skills in elementary classrooms.

METHODS

This study employed a quantitative approach using a descriptive research design. The research was conducted at a public elementary school in Jakarta, involving a sample of 100 students from grades 5 and 6. The instruments used to assess students' critical thinking abilities were a critical thinking test and questionnaires. The test consisted of items designed to evaluate key aspects of critical thinking, including analysis, synthesis, and evaluation of information. Example items from the test included prompts such as "What questions would you ask to better understand this problem?" (question formulation), "Which steps would you take to solve this problem?" (strategy planning), and "How would you decide the best solution among several options?" (decision evaluation). Meanwhile, the questionnaires aimed to explore the factors influencing students' critical thinking, and were administered to both students and teachers.

A purposive sampling technique was adopted to ensure representation across diverse academic levels and learning backgrounds. The critical thinking test was validated and tested for reliability to ensure accurate and consistent measurement. The student questionnaire addressed variables such as learning motivation, instructional strategies, and environmental support in the development of critical thinking skills. The teacher questionnaire, on the other hand, focused on teaching methods employed in the classroom and their perceptions of students' critical thinking progress.

Data collection procedures were carried out in three stages. First, students completed the critical thinking test during classroom sessions under the supervision of the researcher. Second, both students and teachers filled out the questionnaires in a guided session to ensure clarity of instructions. Third, structured classroom observations were conducted over a two-week period to observe classroom interactions, learning activities, and student engagement. The overall data collection process spanned one month, ensuring adequate time for each phase.

Data collected from both instruments were analyzed using descriptive statistics to describe the patterns of critical thinking abilities among students. Furthermore, a correlation analysis was conducted to identify the relationships between influencing factors and students' critical thinking performance. The instruments used consisted of an objective test based on critical thinking indicators and Likert-scale questionnaires. The test included three core indicators: (1) formulating questions (CTI1), (2) planning problem-solving strategies (CTI2), and (3) evaluating decisions (CTI3). Student responses were analyzed using frequency distributions and percentage scores to identify prevailing trends.

To ensure the construct validity of the critical thinking test, expert judgment and factor analysis were applied. The reliability of the questionnaire was assessed using Cronbach's Alpha, ensuring internal consistency of the items. A triangulation technique was employed by comparing the results of the tests, questionnaires, and structured classroom observations to enhance the credibility of the findings. Student performance scores were further processed by determining: (1) the lowest score, (2) the highest score, (3) the median, and (4) the division of the score range into four categories: very high, high, low, and very low. Through this quantitative approach, the study aims to provide an objective overview of the effectiveness of instructional methods in enhancing students' critical thinking. The findings are expected to offer in-depth insights into both the levels of students' critical thinking and the contributing factors affecting its development.

RESULTS AND DISCUSSION

Findings

To assess students' critical thinking skills, the data were analyzed based on three key indicators: the ability to formulate questions, plan problem-solving strategies, and evaluate decisions. These indicators were measured through a critical thinking test and further validated through triangulation with questionnaire responses and classroom observations. Table 1 presents the average scores of students for each indicator of critical thinking, along with the corresponding category.

Table 1. Average Student Scores by Critical Thinking Indicators

Critical Thinking Indicator	Average Score	Category
Formulating questions (CTI1)	80	Very High
Planning problem-solving strategies (CTI2)	65	Fair
Evaluating decisions (CTI3)	58	Poor
Overall Average	**67.7**	**Fair**

A triangulation technique was applied by comparing results from critical thinking tests, questionnaires, and structured classroom observations. The test results indicated that students' ability in formulating questions (CTI1) reached 80% (very high category), planning problem-solving strategies (CTI2) was at 65% (fair category), and evaluating decisions (CTI3) scored only 58% (poor category). Questionnaire data revealed that 78% of students felt more confident in asking questions, while only 52% believed they were able to effectively assess decisions—indicating ongoing challenges in critically evaluating information. Additionally, 64% of teachers reported that students tended to focus more on finding answers rather than exploring alternative solutions, suggesting that their reflective thinking skills remain limited.

Classroom observations supported these findings. During group discussions, students were generally more active in formulating questions related to the subject matter, especially when presented with real-life problems or case studies. However, when asked to evaluate decisions and consider alternative solutions, only about 40% of students actively provided evidence-based arguments. The remainder often followed their peers' answers without strong justification. Moreover, teachers still predominantly acted as the main source of information, limiting opportunities for students to develop reflective and evaluative thinking skills.

A more nuanced analysis indicates that students' high performance in formulating questions can be attributed to their natural curiosity and the fact that classroom activities frequently encourage question-asking as part of participation. This aligns with the developmental stage of upper elementary students, where inquisitiveness is high. In contrast, the low performance in decision evaluation likely stems from limited exposure to open-ended problem-solving activities, insufficient scaffolding in critical reflection, and minimal emphasis on evaluating multiple alternatives in classroom practice.

The connection between these findings and educational theory is also noteworthy. According to constructivist learning theory, learners construct knowledge actively through exploration and reflection. However, the observed classroom environment reflects a more teacher-centered approach, which may inhibit the full development of higher-order thinking skills such as decision evaluation and reflective analysis.

Based on this triangulated data, it can be concluded that while students demonstrate strong question-formulation skills, they still require substantial support in evaluating decisions and engaging in reflective thinking. To address these gaps, specific pedagogical strategies are recommended, including: (1) structured reflective discussions where students justify their answers with evidence; (2) regular use of problem-based learning (PBL) scenarios to foster strategy planning and decision-making processes; (3) case analysis activities that require evaluation of multiple viewpoints before reaching conclusions; and (4) the application of dialogic teaching approaches that emphasize reasoning and argumentation in classroom interactions.

A more interactive and exploration-based approach is expected to enhance students' capacity to critically assess different perspectives before arriving at conclusions. These findings indicate that students tend to excel more in posing critical questions than in evaluating decisions. A high ability to formulate questions reflects curiosity and strong analytical skills in understanding a problem. However, the weakness in evaluating decisions suggests that students struggle to weigh various options before reaching logical conclusions. This is exacerbated by a lack of metacognitive training, where students are not consistently taught to reflect on the reasoning behind their choices or to critically evaluate the quality of their own thinking.

Furthermore, the study shows that the ability to plan problem-solving strategies falls within the fair category. This indicates that while students are able to organize systematic steps to resolve problems, there is still room for improvement. One contributing factor may be the instructional methods used at the school, where problem-solving and creative thinking approaches may not yet be fully or effectively implemented. Therefore, there is a need for teaching strategies that emphasize real-world application of concepts to build students' confidence in designing effective solutions.

Overall, the results of this study emphasize the importance of a more comprehensive approach to developing students' critical thinking skills. Improvements in decision evaluation can be achieved through learning methods involving case studies, group discussions, and reflection on alternative solutions. Additionally, schools and teachers should take a more active role in encouraging students not only to ask meaningful questions but also to consider the implications of the decisions they make. Implementing reflective and inquiry-based teaching strategies, along with regular metacognitive practices, can foster deeper learning and critical engagement among students. This comprehensive approach will better prepare students to navigate academic challenges and real-life situations with stronger critical thinking capabilities.

Discussions

The results of this study revealed that students in upper elementary school have a high ability in formulating questions, with an average score of 80 categorized as very high. This finding suggests that students are able to identify problems and articulate their thoughts through inquiry. The ability to ask questions is an essential part of critical thinking, as it drives exploration and deeper understanding of content (Arisoy & Aybek, 2021). However, this strength does not necessarily indicate a comprehensive mastery of all critical thinking components. According to research by Gonzalez-Mohino et al. (2023), formulating questions is often the initial step in critical thinking, which must be followed by strategic planning and logical evaluation. While students show curiosity and engagement in asking questions, their capacity to proceed to deeper levels of reasoning is still limited. This highlights the need for integrated teaching strategies that link questioning with reflective and evaluative skills. Teachers should scaffold students' thinking processes so they can progress from curiosity to critical analysis.

In contrast, students' performance in planning problem-solving strategies was rated at a moderate level, with an average score of 65. This indicates that while students can follow logical steps, their solutions are often procedural rather than innovative. Planning requires both analytical thinking and the ability to anticipate potential outcomes (Indah et al., 2022). The study supports previous research that found students often rely on teacher-led instructions rather than developing independent strategies. This may be attributed to the predominant use of traditional teaching models that emphasize memorization over problem-solving. As a result, students are less accustomed to designing their own paths to solution when faced with open-ended questions. The lack of contextual and meaningful learning experiences could also contribute to this outcome. Implementing student-centered approaches such as Project-Based Learning (PjBL) may enhance their ability to construct effective problem-solving plans (Lay et al., 2024).

The lowest score among the three indicators was in evaluating decisions, with an average of 58 categorized as poor. This result points to a significant weakness in students' ability to reflect, assess,

and justify choices. Evaluation is a higher-order thinking skill that involves analyzing arguments and weighing alternatives before reaching conclusions (Hasanah & Rusnilawati, 2023). According to the questionnaires, only 52% of students felt confident in assessing decisions, showing a gap between their performance and self-perception. Classroom observations also supported this finding, as only 40% of students actively justified their responses using logical reasoning. This suggests that while students may understand basic concepts, they struggle with justification and evidence-based argumentation. The role of the teacher remains central in this area, as students often follow model answers rather than developing personal reasoning (Samadun & Dwikoranto, 2022). Therefore, evaluation skills must be nurtured through intentional activities that promote reflection and metacognition.

Triangulated data from tests, questionnaires, and classroom observations provide a comprehensive understanding of students' critical thinking profiles. The consistency between high scores in questioning and positive student responses on confidence suggests a reliable link between self-awareness and performance. However, the divergence in evaluating decisions shows that students may not yet possess the meta-cognitive skills needed for deep critical analysis (Caviola et al., 2021). This mismatch may be due to limited opportunities to engage in evaluative tasks in everyday learning. Teachers reported that classroom instruction still heavily relies on convergent questions that have a single correct answer. Consequently, students are rarely encouraged to think divergently or explore alternative viewpoints (Liang, 2023). To address this gap, it is necessary to redesign learning activities that embed critical thinking into each subject area. This alignment can foster a learning environment where students question, reflect, and evaluate continuously.

Another important finding is the impact of learning methods on students' critical thinking abilities. The study affirms that interactive, problem-based approaches such as Problem-Based Learning (PBL) and case analysis promote student engagement and critical dialogue. These approaches allow learners to consider multiple perspectives and refine their reasoning in social contexts (Alvira et al., 2022). Unfortunately, many classrooms still implement conventional practices that restrict critical engagement. Teachers often act as the sole source of knowledge, limiting students' opportunities to express independent thought (Putri et al., 2023). To improve this situation, schools must invest in professional development that equips teachers with skills to facilitate critical thinking. Additionally, the curriculum should prioritize inquiry and authentic tasks over rote learning. This shift requires systemic change supported by educational policies and leadership. If implemented consistently, such strategies could significantly enhance the critical thinking culture in schools.

Environmental factors also play a key role in shaping students' critical thinking. A supportive classroom climate that values dialogue and reflection contributes positively to students' development (Ramdani & Susilo, 2022). The presence of diverse learning resources and inclusive interactions among students and teachers create a fertile ground for critical inquiry. However, many students in this study reported limited access to varied learning materials and insufficient feedback from teachers. Parental involvement was also found to be relatively low in fostering reflective discussion at home. According to previous research, critical thinking thrives in environments that encourage questioning and collaborative problem-solving. Therefore, educational stakeholders must recognize the value of external support systems, including family and community engagement. Enhancing communication between school and home may help reinforce critical thinking practices outside the classroom (Wahyuningtyas et al., 2023). This holistic approach can bridge the gap between academic learning and real-world application.

From a pedagogical perspective, the study demonstrates the importance of continuous assessment to monitor critical thinking growth. Using both quantitative and qualitative tools enables educators to identify strengths and weaknesses in students' thinking processes (Azis et al., 2024). The categorization of students' scores into levels offers actionable insights for targeted instruction. For example, students who are strong in questioning but weak in evaluation may benefit from guided reflection tasks. Likewise, performance data can be used to design differentiated instruction that

meets diverse learner needs. Regular monitoring also helps schools to evaluate the impact of instructional interventions over time (Suyuti et al., 2023). Future research could explore how longitudinal exposure to critical thinking curricula affects students' cognitive development. Overall, the use of data-driven strategies is key to advancing critical thinking education in primary schools.

In conclusion, this study contributes to the growing body of research on critical thinking by providing a detailed profile of elementary students' cognitive skills. It confirms that while students are relatively strong in asking questions, they need substantial support in evaluating and reflecting on decisions. The findings underscore the need for integrated teaching strategies, curriculum reforms, and supportive environments to nurture these higher-order skills (Artika & Nurmaliah, 2023). Moreover, professional development for teachers and increased parental involvement are crucial in sustaining a critical thinking culture. Policymakers should consider embedding reflective learning into national education frameworks to prepare students for complex problem-solving in the 21st century (Hanipah, 2023). With consistent implementation and stakeholder collaboration, critical thinking can become a core competency developed from an early age. The study highlights that developing critical thinkers is not only a pedagogical goal but a societal necessity. Therefore, this research offers a foundation for future efforts aimed at elevating the quality of basic education.

CONCLUSION

This study concludes that the critical thinking abilities of elementary school students in Jakarta vary across different indicators. Students demonstrate strong skills in formulating questions, reflecting a high level of curiosity and analytical thinking. However, their ability to plan problem-solving strategies is moderate, and their performance in evaluating decisions is relatively weak. These findings suggest that while students are capable of initiating critical thought, they require further support in developing deeper levels of reflection and judgment. The data triangulation process, involving tests, questionnaires, and classroom observations, confirms a consistent pattern: students are more comfortable generating inquiries than critically assessing outcomes. Factors such as teacher-centered instruction, limited exposure to reflective learning activities, and lack of engagement with real-world problem-solving contribute to these challenges.

This study is limited by its focus on a single school with a relatively small sample size, which may affect the generalizability of the findings to broader educational contexts. Additionally, the research design primarily employed quantitative methods, and future studies could benefit from incorporating qualitative data, such as in-depth interviews, to gain richer insights into students' thought processes. Future research should explore longitudinal studies to track the development of critical thinking skills over time and across different grade levels. It is also recommended to examine the effectiveness of specific instructional interventions, such as sustained problem-based learning programs or structured reflective exercises, in improving decision evaluation skills among elementary students. Comparative studies across different regions or educational systems would provide a more comprehensive understanding of contextual factors influencing critical thinking development. Therefore, it is essential to implement learning strategies such as problem-based learning, case analysis, and reflective discussions to enhance students' ability to evaluate information and make informed decisions. A comprehensive approach involving teachers, curriculum designers, and families is necessary to foster a culture of critical thinking from an early age. Tanya ChatGPT

REFERENCES

Agustianti, R., Abyadati, S., Nussifera, L., & Irvani, A. (2022). *Asesmen dan Evaluasi Pembelajaran*. https://books.google.com/books?hl=id&lr=&id=3dSUEAAAQBAJ&oi=fnd&pg=PA1&dq=Asesmen+Dan+Evaluasi+Pembelajaran&ots=REvxdbgeoi&sig=uCQFrImfQOiXyKbNlrHahwE2Pus

Alvira, L. D., Ahyaningsih, F., & Minarni, A. (2022). Pengembangan Perangkat Pembelajaran Berbasis Pendekatan CTL untuk Meningkatkan Kemampuan Berpikir Kritis Matematis dan Resiliensi Matematis Siswa SMP Gajah Mada Medan. *Jurnal Cendekia: Jurnal Pendidikan Matematika*, *6*(2), 2253–2269.

Arisoy, B., & Aybek, B. (2021). The Effects of Subject-Based Critical Thinking Education in Mathematics on Students' Critical Thinking Skills and Virtues. *Eurasian Journal of Educational Research*, *92*, 99–119.

Artika, W., & Nurmaliah, C. (2023). Improving Critical Thinking Skills Through Higher Order Thinking Skills (HOTS)-Based Science. *International Journal of Instruction*, *16*(4). https://doi.org/https://doi.org/10.29333/iji.2023.16417a

Azis, H. S., Ganesha, U. P., & Tegal, B. (2024). Development of an Environmentally-Based Project-Based Learning (PjBL) Model as an Effort to Enhance Critical Thinking Skills in Elementary School Students. *Adi Widya: Jurnal Pendidikan Dasar*, *9*(2), 86–93.

Aziz, M. T., Hasan, L. M. U., & Rido'i, M. (2024). Analisis Kurikulum Bahasa Arab Berbasis 4C (Critical Thinking, Communication, Collaboration, Creativity) untuk Pengembangan Kompetensi Abad 21 pada Siswa. *DAARUS TSAQOFAH Jurnal Pendidikan Pascasarjana Universitas Qomaruddin*, *2*(1), 216–222.

Caviola, S., Toffalini, E., Giofrè, D., Ruiz, J., Szűcs, D., & Mammarella, I. (2021). Math Performance and Academic Anxiety Forms, from Sociodemographic to Cognitive Aspects: a Meta-analysis on 906,311 Participants. *Educational Psychology Review*, *34*, 363–399. https://doi.org/10.1007/s10648-021-09618-5

Fitriani, W., Suwarjo, S., & Wangid, M. N. (2021). Berpikir Kritis dan Komputasi: Analisis Kebutuhan Media Pembelajaran di Sekolah Dasar. *Jurnal Pendidikan Sains Indonesia*, *9*(2), 234–242. https://doi.org/10.24815/jpsi.v9i2.19040

Gonzalez-Mohino, M., Rodriguez-Domenech, M. Á., Callejas-Albiñana, A. I., & Castillo-Canalejo, A. (2023). Empowering critical thinking: The role of digital tools in citizen participation. *Journal of New Approaches in Educational Research*, *12*(2), 258–275. https://doi.org/10.3390/jintelligence9020022

Hadi, M. S., Izzah, L., & Maharani, A. (2020). A Learning Analysis of EFL Students' Debate Activity by Using British Parliamentary for Enhancing Speaking Ability and Critical Thinking. *Alsuna: Journal of Arabic and English Language*, *4*(1), 1– 17. https://doi.org/10.31538/alsuna.v4i1.1307

Hanipah, S. (2023). Analisis kurikulum merdeka belajar dalam memfasilitasi pembelajaran abad ke-21 pada siswa menengah atas. *Jurnal Bintang Pendidikan Indonesia*, *1*(2), 264–275. https://ejurnal.stie-trianandra.ac.id/index.php/JUBPI/article/view/1860

Hasanah, I., & Rusnilawati, R. (2023). Discovery Learning Model with Flipbook-interactive Media on Critical Thinking Ability and Desire to Know. *Numerical: Jurnal Matematika dan Pendidikan Matematika*. https://doi.org/10.25217/numerical.v7i2.3356

Indah, R. N., Budhiningrum, A. S., & Afifi, N. (2022). The research competence, critical thinking skills and digital literacy of Indonesian EFL students. *Journal of Language Teaching and Research*, *13*(2), 315–324.

Jamil, M., Bokhari, T. B., & Rafiq, M. (2024). Critical thinking skills development for 21st century: An analysis of Biology curriculum (2006). *Voyage Journal of Educational Studies*, *4*(1), 127–138. https://doi.org/doi.org/10.58622/vjes.v4i1.132

Lay, S., Mendrofa, K., & Mendrofa, P. F. W. (2024). *enerapan Metode Pembelajaran Problem Solving Dalam Meningkatkan Minat Belajar Siswa Di SMP N.1 Hiliserangkai - Nias Sergius*. *1*.

Lestari, T., Supardi, Z. A. I., & Jatmiko, B. (2021). Virtual Classroom Critical Thinking as an Alternative Teaching Model to Improve Students' Critical Thinking Skills in Pandemic Coronavirus Disease Era. *European Journal of Educational Research*, *10*(4), 2003–2015. https://doi.org/10.12973/eu-jer.10.4.2003

Liang, W. (2023). Towards a set of design principles for technology-assisted critical-thinking cultivation: A synthesis of research in English language education. *Thinking Skills and Creativity*, *47*, 101203. https://doi.org/10.1016/j.tsc.2022.101203

Malagola, Y., Atmojo, S. E., & Senen, A. (2023). Analysis of Critical Thinking Ability and Understanding of Basic Science Concepts in Primary School Teacher Education Students. *Jurnal Penelitian*

Pendidikan IPA, *9*(12), 10619–10624. https://doi.org/10.29303/jppipa.v9i12.4149

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. *Int J Eval & Res Educ ISSN*, *2252*(8822), 8822.

Rahman, A., Masitoh, S., & Mariono, A. (2022). Collaborative Learning to Improve Creative and Critical Thinking Skills: From Research Design to Data Analysis. *International Journal of Educational Review*, *4*(1), 79–96. https://doi.org/10.33369/ijer.v4i1.22016

Ramdani, D., & Susilo, H. (2022). The Effectiveness of Collaborative Learning on Critical Thinking, Creative Thinking, and Metacognitive Skill Ability: Meta-Analysis on Biological Learning. *European Journal of Educational Research*, *11*(3), 1607–1628. https://doi.org/10.12973/eu-jer.11.3.1607

Samadun, S., & Dwikoranto, D. (2022). Improvement of student's critical thinking ability sin physics materials through the application of problem-based learning. *IJORER: International Journal of Recent Educational Research*, *3*(5), 534–545. https://doi.org/10.46245/ijorer.v3i5.247

Sarwanto, S., Fajari, L. E. W., & Chumdari, C. (2021). Critical thinking skills and their impacts on elementary school students. *Malaysian Journal of Learning and Instruction*, *18*(2), 161. https://doi.org/10.32890/mjli2021.18.2.6

Solihin, A., Habibie, R. K., & Rahmawati, I. (2024). Computational Thinking with the Guided-Discovery-Learning Model Using Ethnomathematics-Based LKPD. EDM in Elementary School. *DIDAKTIKA: Jurnal Pendidikan Sekolah Dasar*, *7*(1), 80–93. https://doi.org/10.21831/didaktika.v7i1.75845

Sudiarti, D., Ashilah, N., & Nurjanah, U. (2023). Implementation of flipped learning with flipbook media assistance on learning outcomes and critical thinking abilities. *Jurnal Inovasi Teknologi Pendidikan*. https://doi.org/10.21831/jitp.v10i4.58191

Suwono, H., Rofi'Ah, N. L., Saefi, M., & Fachrunnisa, R. (2023). Interactive socio-scientific inquiry for promoting scientific literacy, enhancing biological knowledge, and developing critical thinking. *Journal of Biological Education*, *57*(5), 944–959. https://doi.org/10.1080/00219266.2021.2006270

Suyuti, S., Ekasari Wahyuningrum, P. M., Jamil, M. A., Nawawi, M. L., Aditia, D., & Ayu Lia Rusmayani, N. G. (2023). Analisis Efektivitas Penggunaan Teknologi dalam Pendidikan Terhadap Peningkatan Hasil Belajar. *Journal on Education*, *6*(1), 1–11. https://doi.org/10.31004/joe.v6i1.2908

Wahyuningtyas, D., Rohmanurmeta, F., & Widyastuti, S. (2023). *Improving the Critical Thinking Ability Science through Problem-Based Learning Model Assisted Student Worksheet Ethnoscience*. https://doi.org/10.18592/ptk.v9i1.9002

Watik, Y. S., Nasution, & Jacky, M. (2023). Penerapan Model Pembelajaran Berbasis HOTS terhadap Hasil Belajar IPS Sekolah Dasar. *Journal of Education Research*, *4*(2), 864–872.