Analysis of Critical Thinking Skills Among Elementary School Students in Boyolali Regency

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Abstract
This study aims to analyze the critical thinking skills of elementary school students in Boyolali This study aims to analyze the critical thinking skills of elementary school students in Boyolali Regency through a systematic review of reputable scholarly articles. The research employed a Systematic Literature Review (SLR) method using the PRISMA model, which consisted of identification, selection, eligibility, and inclusion stages. The initial search on Google Scholar covering publications from 2020–2026 identified 2,420 articles, from which 7 articles met the research criteria. The findings revealed that students' critical thinking skills could be enhanced through innovative learning models, such as Problem Based Learning (PBL) and Discovery Learning, the use of technology-based learning media such as Potaki, and external factors including parenting styles. The reviewed studies demonstrated significant improvements in students' critical thinking skills, with mastery percentages ranging from 91.7% to 95% following instructional interventions. The study concludes that the integration of innovative pedagogical approaches and family environmental support plays an essential role in developing 21st-century critical thinking skills among elementary school students.
Keywords: *Boyolali, Critical Thinking, Elementary School*

Abstrak
Penelitian ini bertujuan menganalisis kemampuan berpikir kritis peserta didik sekolah dasar di Kabupaten Boyolali melalui kajian sistematis terhadap artikel-artikel bereputasi. Metode penelitian menggunakan Systematic Literature Review (SLR) dengan model PRISMA yang mencakup tahap identifikasi, seleksi, kelayakan, dan inklusi. Hasil penelusuran pada Google Scholar tahun 2020–2026 menemukan 2.420 artikel, kemudian diseleksi hingga diperoleh 7 artikel yang sesuai dengan kriteria penelitian. Hasil analisis menunjukkan bahwa kemampuan berpikir kritis siswa dapat ditingkatkan melalui penerapan model pembelajaran inovatif, seperti Problem Based Learning (PBL) dan Discovery Learning, pemanfaatan media berbasis teknologi seperti Potaki, serta dukungan faktor eksternal berupa pola asuh orang tua. Berbagai penelitian menunjukkan peningkatan signifikan kemampuan berpikir kritis siswa dengan persentase ketuntasan mencapai 91,7% hingga 95% setelah intervensi pembelajaran diterapkan. Temuan penelitian menegaskan bahwa integrasi pedagogi inovatif dan dukungan lingkungan keluarga berperan penting dalam membangun keterampilan berpikir kritis abad ke-21 pada peserta didik sekolah dasar.
Kata kunci: Boyolali, Berpikir Kritis, Sekolah Dasar

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INTRODUCTION

The Merdeka Curriculum policy implemented in the Indonesian education system emphasizes the importance of developing higher-order thinking skills, including critical thinking as one of the essential competencies that students must master. Critical thinking is a fundamental skill that enables students to analyze information, evaluate arguments, and make sound decisions based on rational and reflective thinking (Facione, 2015). In the context of 21st-century learning, this ability is not only necessary for academic success but also for preparing students to face the complexities of real-world problems. The urgency of developing this skill is increasingly evident given that the 2022 PISA results ranked Indonesia 68th out of 81 countries in reading literacy and critical thinking, far below the OECD average, making systematic and measurable interventions at the elementary school level critically urgent (OECD, 2023).

Elementary school is a crucial stage of education in laying the foundation for students' critical thinking skills. At this stage of development, children begin to develop more complex cognitive abilities and require appropriate stimulation to optimize their thinking potential. However, observations in the field indicate that the critical thinking skills of elementary school students still face various challenges. Various studies indicate that conventional teaching methods, which remain dominant in schools, tend to be teacher-centered and fail to provide sufficient opportunities for students to develop their critical thinking skills (Huda & Abduh, 2021; Inggil Rejeki et al., 2022) National assessment data show that the average level of critical thinking achievement among elementary school students in Indonesia remains in the low category, with less than 40% of students meeting the minimum competency threshold a condition that directly underscores the urgency of this research.

Boyolali Regency was chosen as the focus of this study for good reason. First, a number of independent studies conducted between 2020 and 2025 in various subdistricts within the regency including Teras, Musuk, Klego, Kemusu, Tamansari, and Sambi documented that students' initial critical thinking scores ranged from only 39% to 53%, falling into the "low" category (Huda & Abduh, 2021; Rahmawati, 2021; Rahayu, 2020). Second, although these studies employed diverse interventions such as PBL, Discovery Learning, technology-based media, and parenting style analysis no single study has comprehensively synthesized these findings. Third, the geographical focus on a single district enhances the internal validity of the SLR due to the relatively homogeneous curriculum, socio-economic, and educational infrastructure contexts, making the resulting recommendations more specific and immediately actionable by local policymakers. While numerous global-level studies have been conducted, their results are often too generic to be applied to specific local contexts; district-level studies like this one fill that gap by providing contextual guidance grounded in local evidence. Learning conditions in elementary schools in Boyolali Regency reveal issues similar to those in other regions: a lack of variety in teaching methods, limited learning resources, and a dearth of innovative strategies that could help students think deeply and develop creative solutions.

The importance of a systematic study of elementary school students' critical thinking skills in Boyolali Regency is urgent for several reasons. First, there is a need to comprehensively understand the profile of students' critical thinking skills as a basis for developing more effective learning strategies. Second, various studies that have been conducted in this region need to be integrated to identify patterns, trends, and factors that influence students' critical thinking skills. Third, the results of this study can provide practical recommendations for teachers, schools, and education policymakers in designing appropriate interventions to improve the quality of learning.

Several previous studies have shown that the implementation of innovative learning models such as Problem Based Learning (PBL) and Discovery Learning can significantly improve students' critical thinking skills (Huda & Abduh, 2021; Rahayu,

2020). Additionally, the development of technology-based learning media has also proven effective in facilitating students' critical thinking processes (Fytra et al., 2024). External factors such as parenting styles have also been found to have a strong correlation with children's critical thinking skills (Rahmawati, 2021). However, systematic reviews integrating these various research findings remain limited, thus failing to provide a holistic picture of the state of critical thinking skills among elementary school students in Boyolali Regency.

Based on this background, this study aims to analyze the critical thinking skills of elementary school students in Boyolali Regency through a systematic review of published, reputable articles. The novelty of this study lies in its integrative approach: unlike previous studies that examined interventions separately, this study is the first SLR to synthesize all empirical evidence regarding critical thinking at the elementary school level in Boyolali Regency within a single standardized PRISMA analysis framework. This synthesis enables the identification of cross-study patterns and the formulation of practical recommendations that cannot be obtained from a single study. The research question to be answered is what is the level of critical thinking ability among elementary school students in Boyolali Regency based on a review of leading journal articles published between 2020 and 2026. Through a Systematic Literature Review (SLR) approach, this study is expected to contribute to understanding the profile of students' critical thinking skills, identifying the factors that influence them, and formulating recommendations for more effective learning development in the future.

METHOD

This study employs a qualitative approach using data collection techniques based on reflections on several reputable articles indexed in SINTA, with a focus on the critical thinking skills of elementary school students in Boyolali Regency. The SLR method used by the researcher in this article is the PRISMA model by Page et al. (2021), which the researcher modified to include only four stages: identification, selection, eligibility, and inclusion. According to Festiyed et al. (2024) these stages are sufficient for reviewing the articles targeted by the study, using the Article database as the source for the Literature Review. The articles in question are reputable, SINTA indexed articles. The search keywords consist of three academic components: critical thinking, elementary school, and Boyolali Regency, used both individually and in combination. The initial search topic used was critical thinking skills of elementary school students in boyolali regency. The first stage is identification, which involves searching for articles on Google Scholar, aided by the Mendeley application, using a combination of academic keywords: critical thinking, elementary school, and Boyolali Regency. This search was limited to articles published between 2020 and 2026. In the initial search on Google Scholar 2.420 articles were found in the Google Scholar list that matched the given keywords.

The next stage is selection, in which articles are chosen based on the relevance of their titles, abstracts, and research conclusions. The third stage is feasibility, which involves analyzing the content of the articles to ensure the research questions are relevant to the critical thinking abilities of elementary school students in Boyolali Regency, based on leading SINTA indexed journal articles published between 2020 and 2026. The results of this stage are then organized into a concise framework in the form of a data mapping table to facilitate the analysis process. 7 articles meeting the criteria for SINTA indexed research were identified and proceeded to the inclusion stage.

The inclusion phase involved reviewing and analyzing the content of the articles and synthesizing the findings to describe the results related to the research profile on the Critical Thinking Skills of Elementary School Students in Boyolali Regency. The final conclusions of this study were drawn based on an analysis of these 7 articles. The stages outlined above are illustrated in a diagram in Figure 1, the following PRISMA Flow Diagram.

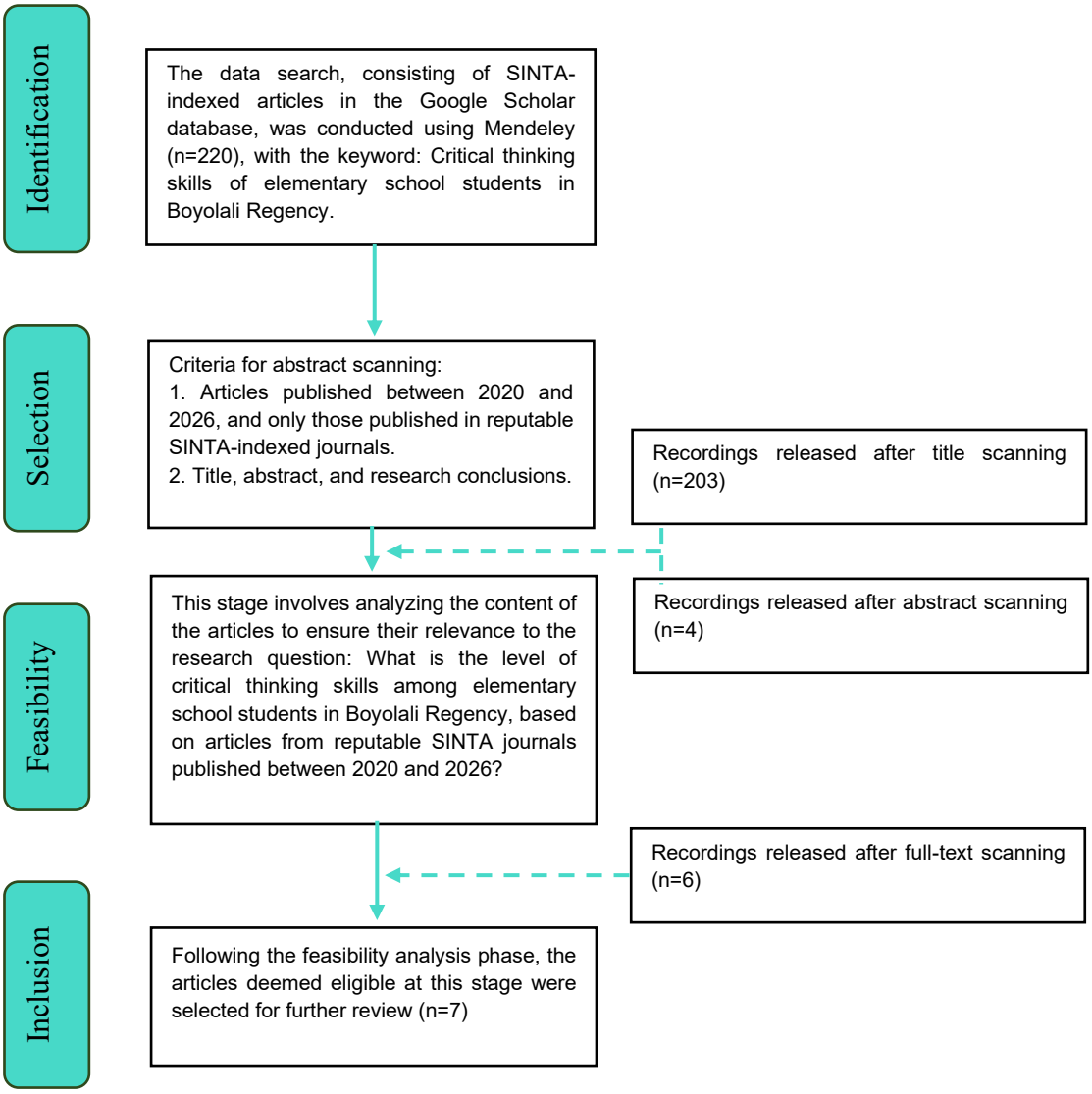

Figure 1. PRISMA Flow Diagram

RESULTS AND DISCUSSION

As research data, seven (7) articles were selected based on criteria established by the researcher. A summary of these articles is presented in Table 1 to highlight their characteristics and contributions. The analysis of these articles was aligned with the research questions focusing on the critical thinking skills of elementary school students in Boyolali Regency, as described in Table 1, which presents a summary of each article's characteristics.

Table 1. Article Information

No	Author	Journal & Index	Article Title	Summary
1	Rahmawati (2021)	Joyful Learning Journal/ SINTA 5	Hubungan Pola Asuh Orang Tua Dengan Kemampuan Berfikir Kritis Siswa	This study investigates the positive and significant correlation between parenting styles and the critical

No	Author	Journal & Index	Article Title	Summary
				thinking skills of third-grade students at an elementary school in Teras District, Boyolali Regency. Using a quantitative correlational approach, this study involved 128 students selected through purposive sampling from a total population of 190 students. Data were collected through questionnaires, tests, interviews, and documentation, then analyzed using descriptive statistics, hypothesis testing, and the coefficient of determination. The results indicate a strong positive and significant correlation, as evidenced by a correlation coefficient of 0.775 with a significance level of 0.00. This finding indicates that parenting style accounts for 60% of the variation in students' critical thinking skills, while the remaining 40% is influenced by other factors. In conclusion, higher quality of parental parenting style is closely associated with better critical thinking skills in students.
2	Huda & Abduh (2021)	Jurnal basicedu/ SINTA 5	Peningkatan Keterampilan Berpikir Kritis Siswa Melalui Model Problem Based Learning Pada Siswa Sekolah Dasar	This research article focuses on improving elementary school students' critical thinking skills through the Problem-Based

No	Author	Journal & Index	Article Title	Summary
				Learning model. It highlights the effectiveness of this approach in enhancing students' analytical abilities, as evidenced by improved test scores and increased engagement in learning activities.
3	Fytra et al. (2024)	Dikoda/ SINTA 5	Development of Potaki Media for Critical Reasoning in Science Learning for Grade IV Elementary School Students	This research article focuses on the development of the Potaki platform to enhance critical thinking skills among fourth-grade students. It highlights the effectiveness of multimedia learning, with validation scores indicating that the platform is well-suited for educational purposes, ultimately increasing student engagement and understanding of the material.
4	Inggil Rejeki et al. (2022)	Journal of Primary Education/ SINTA 3	The effectiveness of online problem-based learning in improving critical thinking skills and digital literacy of elementary school students	This study investigates the positive and significant correlation between parenting styles and the critical thinking skills of third-grade students at an elementary school in Teras District, Boyolali Regency. Using a quantitative correlational approach, this study involved a sample of 128 students selected through purposive sampling from a total population of 190 students. Data collection utilized questionnaires, tests, interviews, and

No	Author	Journal & Index	Article Title	Summary
				documentation, with analysis involving descriptive statistics, hypothesis testing, and the coefficient of determination. The findings revealed a strong positive and significant correlation, indicated by a correlation coefficient of 0.775 and a significance value of 0.00. This implies that parenting style accounts for 60% of the variation in students' critical thinking skills, with the remaining 40% attributed to other factors. The conclusion drawn is that higher quality of parental parenting style is associated with better critical thinking skills in students
5	SUSANDRA et al. (2025)	SHEs: Conference Series/ SINTA 4	Analysis of The Implementation of Problem-Based Learning Model Integrated with Ethnoscience in Enhancing Critical Thinking Skills in Elementary Science Education	This article discusses the importance of critical thinking skills in education, particularly in the natural sciences and social studies, and highlights the application of Problem-Based Learning (PBL) integrated with ethnoscience to enhance these skills among students. This approach connects learning to real-life experiences, thereby increasing student engagement and academic outcomes.
6	Purnomo & Astuti (2025)	JURNAL MathEdu (Mathematic Education	PENERAPAN MODEL PBL BERBANTUAN PUZZLE UNTUK MENINGKATKAN	The research article discusses the evaluation of critical thinking skills and

No	Author	Journal & Index	Article Title	Summary
		Journal)/ SINTA 5	KETERAMPILAN BERPIKIR KRITIS DAN HASIL BELAJAR MATEMATIKA SISWA SDN 1 JEMOWO	learning outcomes through posttest essays and observations over two cycles of action research. It highlights improvements in teacher engagement and student performance in mathematics, indicating that active participation in discussions enhances learning outcomes.
7	Rahayu (2020)	SHEs: Conference Series 3/ SINTA 4	Application of Discovery Learning Model to Improve Critical Thinking Ability of Class 5 IPA	The research article shows that the Discovery Learning model effectively improves critical thinking skills among fifth-grade students. The study, conducted over three cycles, revealed a significant increase in the percentage of students meeting the minimum competency standards, rising from 41% in the pre-cycle to 95% in the final cycle.

The results of the analysis of 7 articles in this Systematic Literature Review indicate a significant trend in developing elementary school students' critical thinking skills through various learning approaches. Huda & Abduh (2021) and Inggil Rejeki et al. (2022) demonstrated that the Problem Based Learning (PBL) model, whether in-person or online, resulted in a statistically significant improvement, with mastery rates rising from 39% to 91.7% and average scores increasing from 59.83 to 75.67. Rahayu (2020) and SUSANDRA et al. (2025) reinforced these findings through Discovery Learning, noting an increase from 41% to 95% over three action cycles. Fytra et al. (2024) added a technological dimension by demonstrating that the multimedia-based Potaki platform improved critical reasoning scores to 86.8%. Meanwhile, Rahmawati (2021) uniquely identified an external factor parental upbringing as a significant predictor of critical thinking ability ($r = 0.775$), contributing 60% to the variance in scores a finding rarely encountered in previous local literature. Compared to previous studies outside Boyolali, the effectiveness of PBL in this study aligns with Hmelo-Silver (2004) meta-analysis, which concluded that PBL consistently enhances higher-order thinking skills, and with the findings of Dochy et al. (2003), which showed that PBL improves the application of knowledge compared to expository methods. Similarly, the findings regarding Discovery Learning are consistent with Bruner (1961) theory that learning through discovery fosters

a deeper internalization of concepts. The majority of the analyzed articles focused on the application of innovative learning strategies, such as Problem Based Learning (PBL), Discovery Learning, and the development of technology-based media, which have been proven to enhance students' analytical skills and engagement in the learning process. Additionally, external factors such as parenting styles were found to significantly contribute to the development of children's critical thinking skills.

The implementation of these various learning models is not only intended to enrich teaching methods but also aims to provide contextual learning, foster students' motivation to learn, and bridge the gap between scientific concepts and real-life experiences relevant to their lives. This signifies a paradigm shift in elementary education, which no longer focuses solely on the theoretical delivery of content but also on the development of critical thinking skills to prepare students to face the challenges of the modern era.

From a methodological perspective, most of the studies reviewed employed a quantitative correlational approach or a research and development (R&D) approach, using models such as Borg & Gall, ADDIE, or classroom action research. The validation process by experts and limited pilot tests indicated that the instruments and media developed demonstrated high levels of practicality and effectiveness. Taken together, these findings demonstrate that the implementation of innovative learning models and technology-based media positively contributes to the creation of learning that is more contextual, meaningful, and aligned with national educational goals in building students' character and critical thinking skills.

Based on research findings, it is evident that efforts to develop critical thinking skills in elementary schools still face a number of limitations. Although the potential of learning strategies such as PBL, Discovery Learning, and the integration of ethnoscience has been widely recognized, their implementation in the form of teaching modules and learning media remains uneven. In particular, research linking external factors such as parenting styles to critical thinking skills remains relatively scarce, even though this aspect has a significant influence on children's development. The scarcity of research in this field indicates a gap in the scientific literature and serves as a basis for arguing the importance of further development to enrich learning strategies that support elementary students' critical thinking skills.

Table 2. Article Analysis Results

No	Author	Method	Critical Thinking	Research Location	Analysis Technique	Conclusion
1	Rahmawati (2021)	korelasi kuantitatif	There is a positive and significant correlation between parenting styles and the critical thinking skills of third-grade students at elementary schools in Teras Subdistrict, Boyolali Regency, with a correlation coefficient of 0.775, a p-value of 0.00, and an	Teras Boyolali	Regresi	This study established a strong, positive, and significant correlation between parenting styles and critical thinking skills among elementary school students, utilizing a quantitative correlational approach with various

			average critical thinking score of 85%, which is very good. These findings confirm that a higher level of parenting contributes to better critical thinking skills in students. Conversely, insufficient parental attention to a child's learning process can result in low critical thinking skills, making the quality of parenting a crucial factor in supporting the development of analytical and problem-solving abilities in children.			statistical analyses to support its findings.
2	Huda & Abduh (2021)	Korelasi Kuantitatif	Fifth-grade students at SD Negeri 3 Pandean demonstrated low critical thinking skills in social studies, influenced by a lack of variety in teaching methods, limited resources during the pandemic, and the predominant use of textbooks without adequate explanations, resulting in only 11 out of 28 students (39%) meeting the minimum competency standard (KKM) with a pre-cycle	Teras Boyolali	Kuantitatif	This study clearly demonstrates that the Problem-Based Learning model is an effective pedagogical approach for enhancing critical thinking skills among elementary school students, as evidenced by a significant improvement in student performance across the two

			average score of 53.7, categorized as "Not Critical." After implementing the Problem-Based Learning (PBL), critical thinking skills improved significantly, as evidenced by an average score of 68.96 in Cycle I, which fell into the "Moderately Critical" category with a mastery rate of 77.7%, and further increased to 85.36 in Cycle II, placing students in the "Highly Critical" category with a mastery rate of 91.7%. This progressive improvement confirms the effectiveness of PBL in developing critical thinking skills while also enhancing student learning outcomes in a sustainable manner.			intervention cycles.
3	Fytra et al. (2024)	RnD	The results of the study indicate that, initially, fourth-grade students at an elementary school in Boyolali demonstrated low critical thinking skills, characterized by a tendency toward passivity and a lack of	Musuk Boyolali	Kualitatif dan kuantitatif	This study successfully developed and validated the Potaki medium, demonstrating its high feasibility and significant effectiveness in improving critical

			focus in learning due to the use of conventional methods and limited teaching materials, as well as an inability to complete project-based tasks, particularly in the IPAS (Science) subject. After an intervention using the Potaki media, students' critical reasoning skills improved significantly, reaching a score of 86.8%, which falls into the "highly critical" category. This improvement indicates that the Potaki media is effective in facilitating students to think more deeply, question, and analyze information during the learning process.			thinking skills among fourth-grade students at IPAS. The study employed a robust R&D methodology with both quantitative and qualitative analyses to support these findings.
4	Inggil Rejeki et al. (2022)	kuasi-eksperimental kuantitatif	The experimental class showed a significant improvement in critical thinking skills, with an average pretest score of 59.83 increasing to 75.67 on the posttest. This improvement was substantial, with 76% of students reaching the intermediate category and 7%	Klego Boyolali	Uji T dan N-Gain	The study found that implementing an online problem-based learning model significantly improved elementary school students' critical thinking and digital literacy skills, outperforming traditional expository methods. This

			reaching the high category in critical thinking skills. Meanwhile, the control class also showed improvement, from an average pre-test score of 52.96 to 64.07 on the post-test; however, their average N-Gain was lower (0.24, low criterion) compared to the experimental class (0.40, moderate criterion). The results of the significance test with a Sig. (2-tailed) value of 0.000 confirm that the online problem-based learning model has a significant effect on improving students' critical thinking skills.			conclusion is supported by a quantitative analysis of pre- and post-test scores, showing a clear and statistically significant improvement in the experimental group.
5	SUSANDRA et al. (2025)	Kualitatif deskriptif	The research findings indicate that prior to the intervention, only 41% of students were able to demonstrate critical thinking skills across various categories, reflecting a low baseline. After implementing the Discovery Learning model, there was a substantial increase: in Cycle I, the percentage of students with critical thinking	Kemusu Boyolali	Kualitatif dan kuantitatif	This study shows that the Discovery Learning model successfully improved critical thinking skills and overall engagement in science among fifth-grade students. This conclusion was drawn from a mixed-methods analysis, combining qualitative observations of classroom activities with

			skills rose to 68%, then increased further in Cycle II to 86%, and finally reached 95% in Cycle III. This progressive increase confirms the effectiveness of the Discovery Learning model in continuously developing students' critical thinking skills.			quantitative assessments of critical thinking proficiency.
6	Purnomo & Astuti (2025)	PTK	The average critical thinking score of students on the pretest in the first cycle was only 50.67 and was categorized as low, with only 26.31% of students meeting the minimum criteria (≥65). Following the intervention in Cycle I, there was a significant improvement, with the average critical thinking skill score rising to 70.61 on the posttest, and the percentage of students meeting the criteria increasing to 57.90%. This improvement continued in Cycle II, with a pretest	Tamansari Boyolali	Kualitatif dan kuantitatif deskriptif	This study demonstrates that the puzzle-assisted Problem-Based Learning model is an effective pedagogical approach for enhancing critical thinking and academic performance in mathematics, as evidenced by a clear improvement in students' scores and completion rates across the two intervention cycles.

			average of 56.21 that subsequently increased to 75.66 on the posttest, and learning completeness showed more optimal results with 94.74% of students meeting the critical thinking skills criteria. These findings confirm the effectiveness of the intervention in progressively improving students' critical thinking skills.			
7	Rahayu (2020)	PTK	In the pre-cycle, only 41% of students were able to demonstrate critical thinking skills in the categories of excellent, good, adequate, or poor, reflecting a still-low baseline level prior to the intervention. After implementing the Discovery Learning model, there was a significant progressive increase: in Cycle I, the percentage of students demonstrating critical thinking skills rose to 68%, then increased	Sambi Boyolali	Kualitatif dan kuantitatif	This study successfully demonstrated that implementing the Discovery Learning model significantly improved fifth-grade students' critical thinking skills in science, as evidenced by a clear upward trend in the percentage of critical thinking across the three cycles. The analysis relied on qualitative observations and quantitative test results to

	further in Cycle II to 86%, and finally reached 95% in Cycle III. This gradual improvement confirms the effectiveness of the Discovery Learning model in sustainably developing elementary school students' critical thinking skills.		draw these conclusions.

Table 2 reveals several significant analytical patterns. First, in terms of geographic coverage, all studies were concentrated in only six of the 22 subdistricts in Boyolali Regency namely Teras, Musuk, Klego, Kemusu, Tamansari, and Sambi meaning that 73% of the regency's territory remains empirically unrepresented, thus severely limiting the generalizability of the current findings. Second, regarding baseline conditions, all studies measuring pre-intervention scores found critical thinking skills to be in the "low" category (39%-53.7%), indicating that this deficit is systemic across various sub districts, not isolated to a single school. Third, regarding intervention effectiveness, three studies using PBL (Huda & Abduh, 2021; Inggil Rejeki et al., 2022; Purnomo & Astuti, 2025) showed an average post-intervention achievement rate of around 88%, slightly lower than the two Discovery Learning studies (Rahayu, 2020; SUSANDRA et al., 2025), which reached an average of 90.5%. However, the study by Inggil Rejeki et al. (2022) which utilized a control group, provides the strongest causal evidence among all the studies reviewed. Fourth, only one study Rahmawati (2021) examined non pedagogical factors, resulting in a significant gap in our understanding of the role of family and environmental factors in critical thinking. Each study was indeed conducted with a different focus, ranging from the relationship between parenting styles and critical thinking skills, the application of the Problem Based Learning (PBL) model, the development of Potaki media, to the implementation of Discovery Learning. The concentration of research in the Boyolali region underscores that studies on enhancing elementary students' critical thinking skills remain focused on local contexts, with variations in methodological approaches employed to strengthen students' learning outcomes and analytical skills.

Rahmawati (2021) study found a positive and significant correlation between parenting styles and the critical thinking skills of third grade students in Teras Subdistrict ($r = 0.775$; $p = 0.00$), with an average score of 85%, which is classified as very good. This finding aligns with VYGOTSKY (1978) sociocultural theory that the immediate social environment, including the family, plays a key role in children's higher order cognitive development. A comparison with international research demonstrates the consistency of these findings: Aunola et al. (2013) in the finnish context, also found that authoritative parenting styles positively correlated with children's metacognitive abilities. What distinguishes Rahmawati's findings is the magnitude of parenting style's contribution (60% of the variance), which is higher than the average in international studies (40-50%), likely reflecting the strong influence of the Javanese family's collective culture on children's educational orientation. This reaffirms that the quality of parenting significantly contributes to children's analytical and problem-solving abilities. Meanwhile, research by Huda & Abduh (2021) shows that fifth grade students at SD Negeri 3 Pandean initially had low critical thinking skills; however, after implementing the Problem-Based Learning

(PBL) model, there was a significant improvement from the “Not Critical” category to “Very Critical,” with a mastery rate reaching 91.7% in the second cycle, confirming the effectiveness of PBL in improving learning outcomes.

The study by Fytra et al. (2024) focused on the development of the Potaki learning material using an R&D methodology, which proved effective in improving the critical thinking skills of fourth grade students in Musuk, resulting in a score of 86.8% in the “highly critical” category. This material facilitates students in thinking more deeply and analyzing information contextually. Furthermore, the study by Inggil Rejeki et al. (2022) using a quantitative quasi-experimental design, showed that the experimental class using an online problem-based learning model experienced an increase in average scores from 59.83 to 75.67, with an N-Gain of 0.40 (moderate category), higher than the control class, which only achieved an N-Gain of 0.24 (low category). T-test and N-Gain analyses confirmed the significant effect of this model on students’ critical thinking skills and digital literacy.

The article by SUSANDRA et al. (2025) confirms the effectiveness of the Discovery Learning model in improving the critical thinking skills of fifth-grade students in Kemusu. The percentage of students meeting the criteria for critical thinking increased from 41% in the pre-cycle to 95% in the third cycle, indicating significant progress. Research by Purnomo & Astuti (2025) in Tamansari also supports these findings, with the implementation of puzzle assisted PBL increasing the average critical thinking score from 50.67 in the pre-cycle to 75.66 in the second cycle posttest, and mastery reaching 94.74%. This model has proven effective in improving critical thinking skills as well as mathematics learning outcomes.

Rahayu (2020) study in Sambi showed that the consistent application of Discovery Learning improved fifth-grade students’ critical thinking skills in science learning. The percentage of students meeting the criteria increased from 41% in the pre-cycle to 95% in the third cycle, confirming the effectiveness of this model in developing critical thinking skills over time. Overall, the results of this review indicate that both external factors such as parenting styles and innovative learning strategies like PBL, Potaki media, and Discovery Learning play a significant role in enhancing the critical thinking skills of elementary school students in Boyolali. Compared to international meta-analyses such as Higgins & Green (2009) which places PBL within an effect size range of d = 0.15 to 0.68 depending on the implementation design, the results of the study in Boyolali indicate a large effect size (an increase of more than 50 percentage points), indicating that the local adaptation of these global models is highly effective in the context of Indonesian elementary education. However, there is a critical limitation: none of the 7 studies employed a multifactorial design that simultaneously examined pedagogical interventions and family factors; therefore, it remains unclear whether these two factors act synergistically or independently in shaping critical thinking skills. Further research using a mixed-methods design and a representative sample from all subdistricts in Boyolali is urgently needed to address this gap.

CONCLUSION

The conclusions of this Systematic Literature Review directly answer the research question: the critical thinking skills of elementary school students in Boyolali Regency were consistently in the low category at baseline (39-53%), but could be significantly improved through the implementation of innovative learning models such as Problem-Based Learning (PBL) and Discovery Learning, the development of technology-based learning media, and the support of quality parenting practices. Various studies reviewed indicate an improvement in students’ critical thinking skills from an initial low level (39-41%) to an excellent level (91.7-95%) following the implementation of learning interventions, with a strong positive correlation between the quality of parenting and critical thinking skills (r = 0.775). Nevertheless, the reviewed research remains limited to

several subdistricts such as Teras, Musuk, Klego, Kemusu, Tamansari, and Sambi, so the research coverage is not yet uniform across the entire Boyolali Regency. From 2020 to 2024, based on the researchers' review, no publications have been found that comprehensively integrate various internal and external factors influencing critical thinking skills simultaneously within a single integrated study. Therefore, further, more comprehensive research is needed. Implications: For teachers, these findings confirm that the consistent application of PBL and Discovery Learning is effective and should be prioritized in instructional planning; for schools, parent engagement programs need to be developed given the significant contribution of parenting styles (60% of the variance); for policymakers in Boyolali Regency, professional development programs should be allocated to target the 16 sub districts not yet represented in the study. Recommendations: Future research is recommended to use a representative sample from all 22 sub districts in Boyolali Regency, employ a mixed-methods design integrating classroom observations with family interviews, and simultaneously examine the influence of pedagogical and family factors within a single integrated research model. Limitations: This review is limited to SINTA indexed articles focusing on Boyolali Regency from 2020 to 2026, thus its generalizability to other regions is limited. Only 7 articles met the inclusion criteria, and the heterogeneity of measurement instruments across studies limits meta-analytic comparisons. The absence of studies that simultaneously integrate internal and external factors represents the most significant gap that needs to be prioritized in future research agendas.

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