



Transformation of Elementary School Students' Mathematics Learning Outcomes using the GASING Method in a Critical Pedagogical Approach

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ABSTRACT

The low mathematics learning outcomes among Indonesian elementary school students remain a significant challenge, particularly due to the dominance of procedural approaches that lack dialogic and reflective dimensions. This condition calls for instructional innovation that not only improves academic achievement but also fosters the transformation of students' understanding and learning awareness. This study aims to systematically examine the transformation of mathematics learning outcomes through the GASING method within a critical pedagogy framework. The research employed a Systematic Literature Review (SLR) guided by PRISMA 2020, analyzing publications from 2015–2025 retrieved from Google Scholar, Sinta, and Garuda databases. Of the initial 130 identified articles, 13 met the inclusion criteria and were analyzed thematically. The synthesis indicates that the GASING method consistently enhances conceptual understanding, learning mastery, and student participation. However, most studies emphasize short-term quantitative indicators. It is concluded that GASING holds transformative potential when implemented dialogically and reflectively within a critical pedagogy framework to promote sustainable mathematics learning.

1. Introduction

Mathematics education in Indonesia still faces serious challenges, particularly related to the low level of learning outcomes and critical thinking skills among elementary school students. Learning approaches that remain teacher-centered often fail to create a dialogic, reflective learning process that focuses on conceptual understanding (Halawa & Harefa, 2024). As a result, mathematics is frequently perceived as a mechanistic activity that emphasizes final answers rather than

reasoning processes. This condition has implications for low numeracy skills as well as learning outcomes that are not yet optimal and sustainable.

These problems are also related to teachers' readiness in managing mathematics learning. Teachers' beliefs, attitudes, and limitations in content knowledge and pedagogical competence can influence the quality of classroom instruction (Pourdavood & Liu, 2019). In addition, low student engagement in learning remains a significant issue. Conventional learning models often fail to utilize innovative strategies and educational technologies to enhance student participation and motivation (Bond et al., 2020). In fact, the integration of more transformative instructional designs can create interactive and meaningful learning experiences that support deeper understanding of mathematical concepts (Amaliyah, Sumardjoko, & Widyasari, 2025).

Several studies indicate that low mathematics learning outcomes are associated with the dominance of lecture-based methods, limited exploratory activities, and a lack of conceptual reflection in learning. Improving learning outcomes cannot be achieved solely through strengthening procedural practice but requires a transformation of learning approaches that promote conceptual understanding and active student participation (Utami et al., 2025; Utami & Louise, 2026; Yuliana et al., 2026). From a critical pedagogy perspective, learning is viewed as a dialogic process that encourages students to develop critical awareness, reflection, and understanding of the social realities around them (Khoiri et al., 2025). This approach also promotes flexibility of thinking and creativity through collaborative strategies that enable students to actively engage in the learning process (Gillies, 2016).

One learning innovation that has developed in the context of mathematics education is the GASING method (Gampang, aSyIk, dan meNyenaNGkan – Easy, Fun, and Enjoyable), developed by Yohanes Surya. This method emphasizes mastery of critical points in learning materials through stages that move from concrete to abstract, helping students understand concepts gradually and intuitively (Siregar et al., 2014). Research findings report that the implementation of the GASING method can improve mathematics learning outcomes among third-grade elementary school students, increasing from 79% to 93% after the implementation of the method (Damopolii, Rorimpandey, & Ester, 2024).

However, most existing studies remain partial and focus primarily on classroom experiments or short-term improvements in learning outcomes. Research on the GASING method generally emphasizes learning effectiveness, while studies on critical pedagogy tend to focus on the dialogic and reflective dimensions of education (Laia, 2020; Wardani, Suarni, & Margunayasa, 2023). In fact, from the perspective of critical pedagogy, mathematics learning does not merely aim to improve procedural mastery but also to develop conceptual understanding, reflective awareness, and the ability to connect mathematical concepts with real-life contexts. This aligns with the idea of liberating education as formulated in Freire's thought. Furthermore, Herlambang (2018) emphasizes that critical pedagogy is a practice of empowerment through the process of conscientization,

which aims to awaken students' critical awareness to realize a more just and democratic life.

Nevertheless, studies that comprehensively integrate the GASING method with a critical pedagogy approach in the context of transforming mathematics learning outcomes among elementary school students remain limited. Existing literature tends to discuss these two approaches separately, thus failing to provide a systematic overview of research findings, learning outcome indicators used, characteristics of instructional implementation, and the strength of empirical evidence supporting them. This limitation indicates the presence of a research gap that requires systematic literature analysis.

Based on this condition, research using a Systematic Literature Review (SLR) approach becomes important to comprehensively map existing research findings related to the implementation of the GASING method within the perspective of critical pedagogy. Through this SLR approach, the present study aims to identify patterns of improvement in elementary school students' mathematics learning outcomes, characteristics of instructional implementation, and forms of integration of dialogic and reflective principles in classroom practice. Theoretically, this study is expected to enrich the discourse on the transformation of mathematics learning from an integrative perspective. Practically, the findings of this study may serve as a reference for teachers and policymakers in designing mathematics learning that not only improves academic achievement but also strengthens students' conceptual understanding and critical thinking skills in a sustainable manner.

2. Methodology

This study uses a Systematic Literature Review (SLR) approach with the PRISMA 2020 guidelines to analyze the transformation of elementary school students' mathematics learning outcomes through the GASING method in a critical pedagogical approach. This approach allows for a systematic synthesis of research findings, providing a comprehensive overview of the effectiveness of the GASING method and its integration with critical pedagogical principles in improving learning outcomes (Siddaway, Wood, & Hedges, 2019). The literature search was conducted through the databases Google Scholar, Sinta, and Garuda to obtain articles relevant to the research topic.

The search process employed a combination of keywords in both Indonesian and English to broaden the scope of the literature. The keywords used included "GASING method" or "Matematika GASING", "hasil belajar matematika" or "mathematics learning outcomes", "sekolah dasar" or "elementary school", and "pedagogik kritis" or "critical pedagogy". These keywords were combined using Boolean operators such as AND and OR to connect the main concepts of the study. An example of the search combination used is: ("GASING method" OR "Matematika GASING") AND ("hasil belajar matematika" OR "mathematics learning outcomes") AND ("sekolah dasar" OR "elementary school") AND

(“pedagogik kritis” OR “critical pedagogy”). The publication period was limited to 2015–2025 to ensure the relevance and recency of the literature analyzed.

Article selection followed the PRISMA steps: identification, screening of titles and abstracts, assessment of eligibility through reading the full text, and final inclusion (Sari et al., 2025; Thooyibah et al., 2026). The included articles are empirical studies at the elementary school level that explicitly measure mathematics learning outcomes and discuss the GASING method and/or critical pedagogy. Non-empirical, irrelevant, or articles not available in full text were excluded from the analysis. The quality of the articles was assessed based on the clarity of the research objectives, the appropriateness of the design, the characteristics of the subjects, the validity of the instruments, and the consistency of the analysis and conclusions. The data were then analyzed thematically to identify patterns of improvement in learning outcomes, the integration of dialogic and reflective principles, and the forms of learning transformation that occurred. Thus, this study produced a structured synthesis of the contribution of the GASING method within the critical pedagogy framework to the transformation of elementary school students' mathematics learning outcomes.

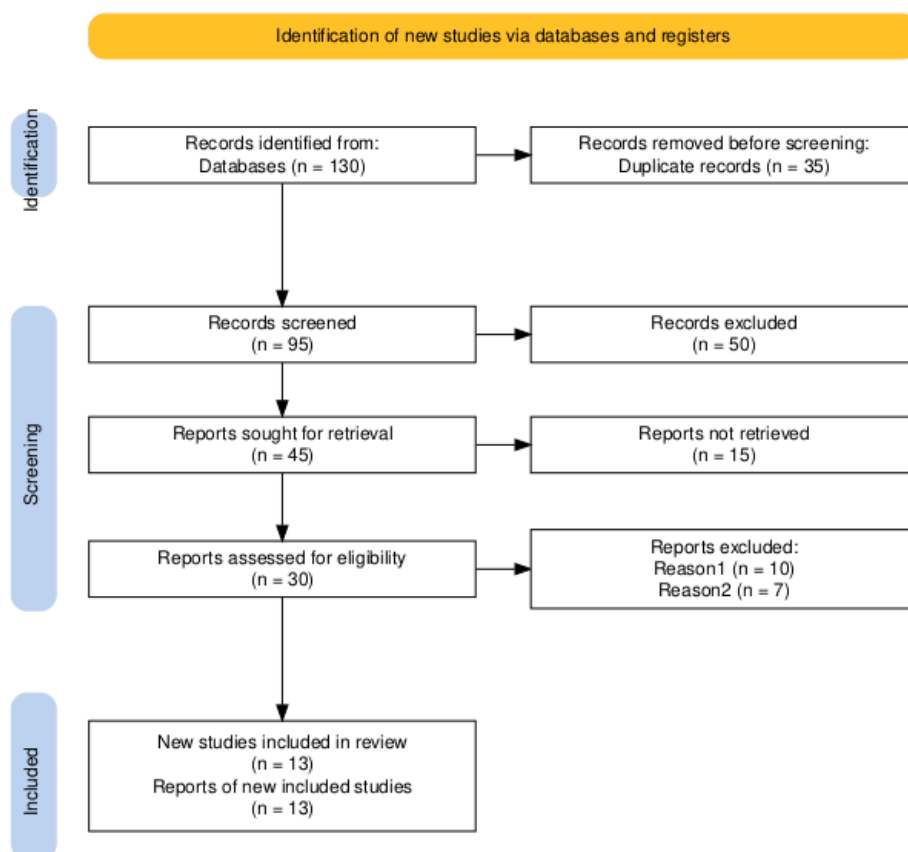


Figure 1. PRISMA Diagram

The study selection process flow is presented systematically in Figure 1 below. In the initial identification stage, 130 articles were obtained from various databases relevant to the research topic. After removing 35 duplicate articles, 95 articles

remained to enter the screening stage based on title and abstract. A total of 50 articles were eliminated because they did not meet the relevance criteria, leaving 45 articles to proceed to the full-text search stage. Of these, 15 articles were inaccessible. Next, 30 articles were assessed for their overall suitability, and 17 of them were excluded because they did not meet the predetermined inclusion criteria. Thus, 13 articles were selected as the final studies to be analyzed and discussed in this review.

3. Results and Discussion

A total of 13 articles analyzed in this study were sourced from accredited national journals and institutional repositories with a publication range of 2015–2025. All studies focused on the application of the GASING method in elementary school mathematics learning and its impact on transforming student learning outcomes within a critical pedagogical framework. The synthesis results show that the GASING method contributes to improving students' conceptual understanding, learning completeness, and active participation. The study by Munawaroh and Nurtamam (2024) shows that this approach encourages students to actively discuss, ask questions, and construct their understanding of numbers independently. These findings are in line with the principles of critical pedagogy, which place students as the subjects of learning and encourage a dialogical relationship between teachers and students. Overall, the integration of the GASING method with the critical pedagogical approach shows a transformation in the mathematics learning outcomes of elementary school students, both in cognitive and affective aspects.

Table 1 presents a summary of the characteristics and main findings of the 13 studies that met the inclusion criteria in this review. The table systematically maps the research focus, objectives, and empirical contributions of each study related to the implementation of the GASING method in elementary mathematics learning. This presentation enables the identification of methodological trends and substantive findings that have developed over the past decade. Therefore, the table serves not only as an inventory of previous research but also as a foundation for synthesis to examine patterns of effectiveness, theoretical relevance, and potential directions for further development of the integration of the GASING method within a critical pedagogy framework in a more comprehensive and sustainable manner.

Table 1. Characteristics and Synthesis of Findings from 13 Studies

Author and Year	Research Objective	Results and Findings	Relevance to Topic
Devi (2024)	Analyzing the application of the GASING method based on traditional games in numeracy learning.	The integration of traditional games with the GASING method not only improves numeracy understanding but also creates a culturally meaningful learning experience. Students demonstrate higher emotional and social engagement, making the learning process	This shows that GASING can be combined contextually and culturally in encouraging learning outcome transformation.

		contextual, participatory, and building a more reflective learning awareness.	
Alianti, Febrianty, and Kowiyah (2024)	Explaining the effect of the GASING method on addition learning outcomes	A significant increase in post-test scores shows that GASING strengthens conceptual understanding, not just procedural memorization. Students were able to explain their thought processes, indicating the development of logical understanding, confidence, and courage in expressing mathematical ideas.	This proves that GASING improves students' motivation and understanding both cognitively and affectively.
Manurung et al. (2025)	Improving learning outcomes in flat shape perimeter.	The increase in the average score from 71.68 to 80.22 and the completion rate from 72.72% to 90.90% reflects that the GASING approach creates adaptive, step-by-step learning. Students showed consistent improvement in problem solving and stability in conceptual understanding.	This confirms the effectiveness of GASING in improving learning outcomes in a sustainable manner.
Lestari and Hardini (2022)	Testing the effectiveness of the GASING method on the concept of multiplication.	Significant differences between the experimental and control classes indicate that GASING reinforces the construction of basic multiplication concepts. Students are better able to connect operations with concrete and visual representations, resulting in a deeper and less mechanical understanding.	Strengthening evidence of the superiority of GASING in basic mathematical concepts in elementary school.
Efendi, Muhtar, and Herlambang (2023)	Examining the relationship between the Merdeka Curriculum and Ki Hadjar Dewantara's philosophy.	The analysis shows that liberating learning places students as active subjects in the learning process. This framework is in line with the philosophy of dialogical and humanistic learning, which is the foundation of critical pedagogy.	Providing a philosophical basis for participatory pedagogy and liberating learning.
Nurwanci, Rahmatullah, and Latif (2025)	Examining the democratization of education in the Merdeka Curriculum.	The Merdeka Curriculum opens up space for student participation, creativity, and learning autonomy. These findings emphasize the importance of non-authoritarian learning and giving students a voice in knowledge building.	Supporting critical pedagogical values in learning transformation.
Kusuma, Jampel, and Bayu (2018)	Testing the effect of the GASING method on mathematics learning outcomes.	The GASING method helps students overcome critical points of understanding through logical and systematic stages. Students demonstrate a transition from confusion to stable and structured conceptual understanding.	Supporting systematic learning innovations that transform student understanding.
Diah and Siregar (2023)	Understanding the impact of the modified	The increase in scores from 56.84 to 80.00 shows that combining GASING with the cooperative model strengthens social interaction,	Reinforcing an innovative and participatory

Atikah et al. (2023)	GASING TGT model. Describing learning from a critical pedagogy perspective.	intrinsic motivation, and active student engagement in learning. Collaborative project learning fosters critical awareness, dialogue, reflection, and student independence. Students are positioned as active participants who consciously reflect on their learning experiences.	approach based on dialogue. Examples of critical pedagogy application in learning.
Baharizqi et al. (2023)	Exploring pedagogical competencies in the Society 5.0 era.	Critical pedagogy is seen as an important strategy for shaping reflective, adaptive, and responsive learning in response to technological developments and social dynamics.	Relevant for strengthening students' critical and reflective thinking.
Damopolii, Rorimpandey, and Ester (2024)	Optimizing learning outcomes using the GASING method.	The increase from 79% to 93% demonstrates the success of consistent, gradual intervention. Students showed steady progress in understanding arithmetic operations and increased confidence in solving problems.	This confirms the success of the GASING practice in transforming learning outcomes.
Nuari, Prahmana, and Fatmawati (2019)	Assessing the abilities of students with special needs in division operations.	GASING's step-by-step learning helps students with special needs build confidence and cognitive abilities through a systematic, simple, and structured approach.	Supporting GASING-based inclusive learning.
Astuti and Wiyanti (2024)	Improving students' numeracy literacy.	The literature shows that GASING strengthens numeracy literacy through simple, gradual, and meaningful learning, so that students gain a deeper understanding of basic concepts.	Affirming GASING as an effective and transformative numeracy strategy.

Based on a synthesis of 13 articles, the GASING method consistently demonstrates a positive impact on elementary students' mathematics learning outcomes, particularly on quantitative indicators. According to Manurung et al. (2025), the average score increased from 71.68 to 80.22, accompanied by a rise in mastery levels from 72.72% to 90.90%. Similarly, the percentage of learning success improved from 79% to 93%, indicating a significant intervention effect (Damopolii, Rorimpandey, & Ester, 2024). Even within a modified cooperative learning model, scores increased from 56.84 to 80.00 (Diah & Siregar, 2023). Empirically, these figures suggest that the GASING approach is effective in strengthening conceptual understanding and procedural accuracy.

However, when examined more critically, the transformation reported in most studies remains largely confined to measurable improvements in academic performance. Success is predominantly defined as an increase in post-test scores rather than as a shift in students' epistemological orientation toward mathematics itself. Within the framework of critical pedagogy, learning transformation extends beyond cognitive achievement; it also encompasses changes in learners' consciousness, their positioning as active subjects in the learning process, and the power relations that shape interactions within the classroom.

Several studies have begun to move toward this broader dimension. The strengthening of concept construction through concrete and visual representations, along with students' ability to explain their reasoning processes logically, reflects a shift from procedural memorization to conceptual understanding (Alianti, Febrianty, & Kowiyah, 2024; Lestari & Hardini, 2022). Furthermore, the integration of traditional games into numeracy instruction expands the meaning of learning, making it more contextual and culturally meaningful. These findings suggest that GASING holds transformative potential when implemented within dialogic learning spaces that are closely connected to students' lived experiences (Devi, 2024).

Nevertheless, a conceptual tension emerges within the literature. Studies on the Merdeka Curriculum and the educational philosophy of Ki Hadjar Dewantara emphasize emancipatory and dialogic learning, positioning students as active subjects in the construction of knowledge (Efendi, Muhtar, & Herlambang, 2023; Nurwanci, Rahmatullah, & Latif, 2025). However, most investigations of the GASING method have not explicitly examined how it reshapes pedagogical relationships between teachers and students. It remains unclear whether teachers genuinely shift from an authoritative role toward that of a dialogic facilitator, or whether classroom authority structures largely remain intact. Likewise, limited attention has been given to whether students are provided with meaningful opportunities to problematize mathematical concepts within real-life contexts. These critical questions have yet to be explored in substantial depth.

The methodological limitations of existing studies also require attention. Most studies employ short-term experimental designs and focus on specific mathematics topics, such as addition, multiplication, perimeter of plane figures, or division. The long-term impact of instruction on the development of numeracy literacy and critical thinking skills has rarely been examined through longitudinal studies. Nevertheless, several studies have reported positive findings in inclusive learning contexts, such as increased self-confidence among students with special needs, as reported by Nuari, Prahmana, and Fatmawati (2019). Theoretically, the GASING method is structured in a gradual and logical sequence that aligns with constructivist principles and elements of critical pedagogy. Its systematic stages guide students through critical points of understanding toward stable conceptual mastery (Kusuma, Jampel, & Bayu, 2018). However, structural compatibility does not automatically result in critical transformation. When implementation focuses primarily on conceptual efficiency and score improvement, GASING risks being reduced to an effective instructional technique rather than serving as a genuinely emancipatory pedagogical practice.

From a theoretical standpoint, these findings call for a more critical reading of the position of the GASING method within the broader landscape of learning theories. Although it aligns with constructivism through its gradual stages and the use of concrete representations, such structural effectiveness does not automatically ensure a transformation of consciousness. Within the framework of critical pedagogy, a systematic structure can serve a dual function. On the one hand, it may facilitate the construction of knowledge by guiding learners through coherent

conceptual progressions. On the other hand, it may inadvertently preserve epistemic control in the hands of the teacher if it is not accompanied by genuine spaces for negotiating meaning. Therefore, the theoretical contribution of the GASING method should not be confined to its role as a cognitive-procedural model. Rather, it needs to be situated as a pedagogical practice that opens possibilities for redistributing epistemic authority in the classroom, allowing students to participate more actively in shaping mathematical understanding.

Furthermore, the dominance of quantitative indicators in the literature suggests that prevailing evaluation frameworks remain largely grounded in a positivistic paradigm. This orientation highlights the need to expand the theoretical lens toward a transformative approach one that not only measures outcomes but also examines shifts in students' dispositions, agency, and the ways they construct meaning in mathematics. Without broadening these indicators, transformation risks being narrowly interpreted as improved performance rather than as an epistemological shift. The GASING method is characterized by a tightly sequenced structure designed to ensure conceptual mastery. From a critical perspective, this structure should be interpreted dialectically. It can function as a foundation for emancipation when employed as adaptive scaffolding that responds to learners' needs. Conversely, it may operate as a mechanism of reproduction if implemented rigidly and uniformly. Therefore, future theoretical development of GASING implementation should incorporate dimensions such as teacher reflexivity, students' socio-cultural contexts, and the dynamics of power relations within the classroom. Integrating these elements would allow the method to move beyond procedural effectiveness toward a more genuinely transformative pedagogical practice.

4. Conclusion

Based on the synthesis of the literature, the GASING method demonstrates a consistent contribution to improving elementary students' mathematics achievement, particularly in strengthening conceptual understanding and learning participation. Theoretically, these findings indicate that the gradual and logical structure of GASING is compatible with constructivist principles and elements of critical pedagogy, especially in fostering active engagement and shifting learning from procedural routines toward more reflective understanding. However, existing studies also suggest that emancipatory dimensions such as the transformation of critical consciousness and changes in pedagogical relationships have not yet been thoroughly explored. From a practical standpoint, GASING holds significant potential when its implementation extends beyond the pursuit of academic achievement and is designed within dialogic, contextual, and student-centered learning environments. Teachers should position the method not merely as a score-improvement strategy, but as a pedagogical framework that creates space for reflection and problematization. Integrating principles of critical pedagogy is essential to ensure that mathematics learning evolves beyond procedural accuracy into a medium for cultivating logical reasoning and contextual awareness. Nevertheless, the reviewed literature reveals several limitations, including a narrow

focus on specific content areas, short-term research designs, and limited examination of students' critical consciousness. Future research should therefore prioritize longitudinal investigations and deeper exploration of reflective and emancipatory dimensions, enabling a more comprehensive and context-sensitive understanding of transformation in mathematics learning outcomes.

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