THE EFFECTIVENESS OF INTEGRATING GASING AND DEEP LEARNING IN IMPROVING MATHEMATICS LEARNING OUTCOMES FOR ELEMENTARY SCHOOL STUDENTS

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Abstract

This study aims to systematically examine the application of the Gasing method integrated with a Deep Learning approach in elementary school mathematics education, focusing on its impact on students' learning achievement. The Gasing method emphasizes deep conceptual understanding, strengthens connections among mathematical concepts, and promotes students' critical and reflective thinking skills. Beyond improving academic performance, this approach supports meaningful learning and cognitive development throughout the instructional process. This research employs a Systematic Literature Review (SLR) methodology by analyzing 14 relevant academic articles published between 2020 and 2025, sourced from reputable databases, including Google Scholar. The SLR approach was selected for its ability to provide a comprehensive, objective, and evidence-based synthesis of existing research findings. The results indicate that the implementation of the Gasing method in elementary mathematics learning consistently has a positive effect on students' achievement, encompassing both cognitive and affective domains. These findings highlight the significance of integrating the Gasing method with a Deep Learning approach to create engaging, reflective, and meaningful learning experiences. Therefore, this instructional approach demonstrates strong potential for wider application in primary education to enhance the quality of mathematics learning.

Keywords: Deep Learning, Gasing, Learning Outcomes, Mathematics

INTRODUCTION

Mathematics is a universal discipline that plays a fundamental role in the advancement of modern technology (Suandito, 2017). Its significance lies in its function as a foundational science that supports the development of various fields, including engineering, natural sciences, medical sciences, and social sciences such as psychology and economics. This view is reinforced by Ruseffendi (2006) and Rahmah (2013), who describe mathematics as "the queen of sciences." In addition to its scientific role, mathematics contributes substantially to the development of logical thinking, character formation, and intellectual growth from an early age. Therefore, mathematics instruction must be designed in accordance with students' characteristics to ensure that learning is relevant, contextual, and meaningful. Despite its importance, mathematics is often perceived negatively by students. Several studies report that many learners regard mathematics as difficult, boring, and intimidating (Harahap and Syarifah, 2015). Such perceptions frequently hinder students' engagement and understanding of mathematical concepts. Aprilia and Fitriana (2022) argue that students' learning difficulties are not solely caused by the complexity of mathematical content but are also influenced by initial assumptions that mathematics is abstract and lacks practical relevance. Furthermore, students' limited awareness of the application of mathematics in everyday life (Utami in Dyahsih and Ali, 2015) contributes to low motivation and passive participation in classroom activities. One instructional approach considered relevant to addressing these challenges is the Deep Learning approach. In educational discourse, Deep Learning does not merely refer to artificial intelligence, but rather to a pedagogical strategy that emphasizes deep conceptual understanding, meaningful learning, and higher-order thinking skills. This approach encourages students to actively construct knowledge, establish conceptual connections, and engage in critical and reflective thinking. It also promotes dialogue, collaboration, exploration, and reflection, enabling students to transfer their understanding

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to real-life contexts. According to Kamberi (2025), Deep Learning contributes to increased intrinsic motivation, learning persistence, and sustained improvement in learning outcomes.

Within this framework, teachers play a central role not only as facilitators but also as innovators in the learning process. Teachers are expected to design instructional strategies that are engaging, effective, and accessible to students (Pratama, 2019). One instructional method that aligns with these principles is the Gasing method. Gasing is an acronym for *Gampang, Asyik, dan Menyenangkan*, which means Easy, Fun, and Enjoyable. This method is designed to develop students' mathematical understanding in a logical, systematic, and gradual manner. It emphasizes learning from concrete to abstract concepts and prioritizes pattern recognition and visualization before formal symbolization. Surya and Moss (as cited in Prahmana and Suwasti, 2014) assert that all students possess the potential to learn mathematics when supported by appropriate, enjoyable, and confidence-building instructional approaches. Meaningful mathematics learning extends beyond memorization of formulas and procedures, as it requires students to understand concepts and apply them across various real-life contexts. Previous studies indicate that integrating the Deep Learning approach with the Gasing method enhances students' conceptual understanding and learning outcomes (Zayed, 2024). This integration fosters active, collaborative, and reflective learning experiences, enabling students to engage more deeply in problem-solving, discussion, and self-evaluation. As a result, students develop more positive attitudes toward mathematics and greater self-confidence in their learning abilities.

The integration of Deep Learning and the Gasing method offers a learning model that is responsive to contemporary educational demands by emphasizing not only learning outcomes but also learning processes, deep cognitive engagement, and the development of critical, creative, and collaborative skills. However, empirical evidence suggests that the implementation of this integrated approach in elementary schools remains limited. Several factors contribute to this condition, including insufficient teacher understanding, limited professional training, time constraints, and inadequate instructional facilities (Mutmainah et al., 2025). Consequently, mathematics instruction in many classrooms continues to be teacher-centered and less interactive. Given these challenges, a systematic examination of existing empirical studies is necessary to evaluate the effectiveness of integrating the Gasing method with the Deep Learning approach in elementary mathematics education. Therefore, this study aims to conduct a Systematic Literature Review to synthesize research findings on the implementation of this integrated approach and to assess its contribution to improving students' mathematics learning outcomes. Through a comprehensive analysis of previous studies, this research is expected to provide both theoretical insights for the development of innovative instructional strategies and practical recommendations for educators and policymakers in enhancing the quality of elementary mathematics learning.

METHOD

This study employs the Systematic Literature Review (SLR) approach as a method to explore and synthesize various literature sources related to the Gasing method and its association with Deep Learning in efforts to improve learning outcomes. This approach was selected to ensure a comprehensive and objective analysis of relevant references (Peters et al., 2021). Through the SLR method, this study constructs a comprehensive mapping of the implementation of Gasing-based instructional strategies and the Deep Learning approach within the context of elementary education, particularly in enhancing students' learning achievement. The collected literature was analyzed using a thematic approach to obtain valid findings that support the formulation of both practical and theoretical recommendations. All research stages were conducted in accordance with the PRISMA 2020 (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines, which provide the most recent reporting standards for systematic reviews (Page et al., 2021). These guidelines were applied to ensure that the literature review process was carried out systematically and transparently, particularly in educational research. The literature search strategy involved five major academic databases, namely Google Scholar, Garuda, Sinta, Scopus, and ERIC. During the search process, combinations of keywords reflecting the research focus were used, such as "Gasing Method," "Mathematics Education," "Deep Learning in Education," "AI and Pedagogy," and "Educational Technology." The search strategy also applied Boolean operators such as "Gasing" AND "Deep Learning" OR "AI" AND "mathematics education" to filter relevant publications. The selected articles were limited to those published between 2020 and 2025 and included only peer-reviewed documents written in English or Indonesian. Meanwhile, excluded articles consisted of non-peer-reviewed publications, studies that focused solely on technical aspects of artificial intelligence without educational relevance, and articles that were not available in full-text form. The selection process began with the identification of a total of 823 articles. After removing 140 duplicate records, 720 articles were

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screened based on their titles and abstracts. Subsequently, 182 articles were selected for full-text review. From these, 14 articles met the inclusion criteria and were deemed relevant for in-depth analysis. All stages of this process were visualized using a PRISMA flow diagram to demonstrate transparency in the selection procedure.

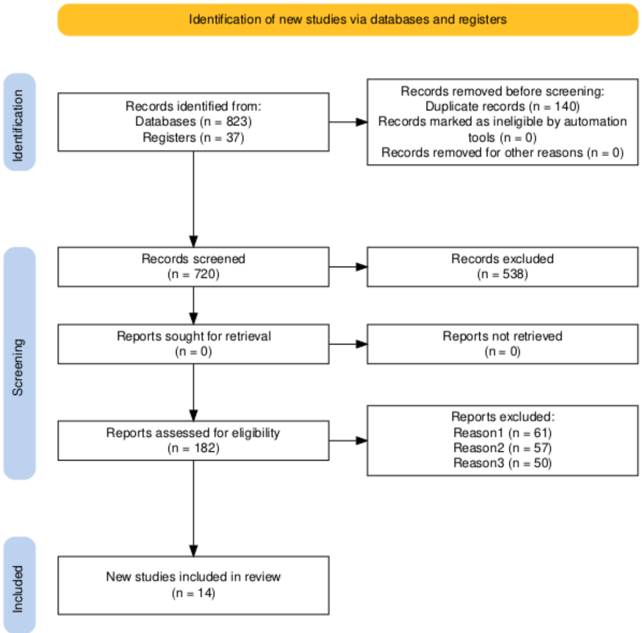

Figure 01. PRISMA Flowchart

RESULTS AND DISCUSSION

Deep Learning is a pedagogical approach that has gained widespread attention over the past decade. This concept was first introduced by Marton and Säljö (1976) as a learning approach that emphasizes deep understanding of meaning and the interconnections among concepts. This approach highlights the importance of holistic learning experiences, in which students are actively engaged not only at the cognitive level but also at the affective and metacognitive levels. When students experience learning holistically, they tend to develop meaningful understanding that is retained over a longer period of time. Emphasizing the importance of this approach, Hattie (2020) states that Deep Learning places primary emphasis on strong conceptual understanding and the ability to apply knowledge across various contextual situations. Based on previous meta-analyses, Hattie (2012) found that this approach has an effect size of 0.69, indicating a significant impact on students' learning achievement. This finding demonstrates that instructional strategies focusing on conceptual depth and application yield more meaningful outcomes than surface learning approaches that primarily emphasize memorization. Furthermore, Darling-Hammond (2017) asserts that Deep Learning positions students as active agents who explore and apply concepts, thereby making the learning process more authentic and relevant to real-life needs.

Within this context, the Gasing method, which stands for *Gampang, Asyik, dan Menyenangkan* (Easy, Fun, and Enjoyable), is highly compatible as it emphasizes active student engagement through concrete and enjoyable learning activities. This method was first developed by Prof. Yohanes Surya as an alternative approach aimed at simplifying mathematics learning, particularly for elementary school students (Surya, 2015). The Gasing instructional procedure, which progresses from concrete to abstract stages, supports the gradual and natural development of deep conceptual understanding. This aligns with the principles of meaningful learning within constructivist theory as proposed by Bruner (1966) and Piaget (1952). Therefore, the integration of the Deep Learning approach and the Gasing method represents a highly promising strategy for fostering strong and sustainable mathematical conceptual understanding (Fullan and Langworthy, 2014).

Furthermore, the implementation of the Gasing method has been shown to effectively address common misconceptions experienced by students in understanding integer operations. The use of concrete learning media, such as the "Mountain–Valley" tool to represent positive and negative numbers, provides clear and intuitive visualization, thereby facilitating students' conceptual comprehension. This approach is consistent with the principles of visual and manipulative learning in mathematics as articulated by Suyatna (2017). The significant improvement in learning outcomes indicates that students have developed deep conceptual understanding rather than merely following mechanical procedures. This reflects the core principle of Deep Learning, namely the transfer of knowledge to new contexts or situations (Fullan and Langworthy, 2014).

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Overall, these findings indicate that the synergy between the Deep Learning approach and the Gasing method contributes significantly to improving the quality of mathematics learning. This success is not limited to cognitive mastery alone but also encompasses the development of critical, collaborative, and creative thinking skills (Gardner, 1999; Fullan and Langworthy, 2014). Supported by contextual learning media and reflective teaching strategies, mathematics learning becomes more accessible, engaging, and aligned with the demands of twenty-first century education. Table 1 presents a synthesis of findings from 14 articles that examine the potential relationship between the implementation of the Gasing method based on Deep Learning and improvements in students' learning outcomes.

Table 1. Article Synthesis

No	Title	Authors	Research Objective	Research Method	Research Findings	Relevance to the Topic
1	The Effect of the Gasing Mathematics Learning Method on Mathematics Learning Outcomes	Md Wahyu Kurniadhi Kusuma, I Nyoman Jampel, Gd Wira Bayu	To identify differences in learning outcomes between students taught using the Gasing method and those taught without it	Quasi-experimental, non-equivalent posttest-only control group design	The use of the Gasing method significantly improved mathematics achievement of Grade III elementary students	Supports the transformation of elementary mathematics instruction through the implementation of the Gasing method
2	The Effectiveness of the Gasing Mathematics Method in Improving Understanding of Two-Digit Multiplication Concepts	Olifvia Rizky Lestari and Agustina Tyas Asri Hardini	To evaluate the effectiveness of the Gasing method on two-digit multiplication among Grade VI students	Quasi-experimental design, non-equivalent control group	Posttest scores in the Gasing group were higher (35.00 vs 29.73)	Relevant for strengthening concrete conceptual understanding within the Deep Learning context
3	The Effect of the Gasing Mathematics Learning Method on Students' Numeracy Skills	Mutiara, Hardianto Rahman, Hotimah	To examine the impact of the Gasing method on numeracy skills of Grade IV students	Quasi-experimental design	A significant effect was found, with posttest results in the experimental class categorized as very high	Supports numeracy development through the integration of Gasing and Deep Learning approaches
4	Gasing Mathematics Learning Viewed from Various Learning Theory Perspectives	Sulistiawati	To examine the compatibility of the Gasing method from learning theory perspectives	Non-interactive qualitative analysis (conceptual study)	The Gasing method aligns with behaviorist, humanistic, cognitive, and constructivist learning theories	Provides a theoretical foundation for integrating Gasing within Deep Learning strategies
5	The Effect of the Deep Learning Approach and Canva-Based	Yuni Karsih Asmi and Zainnur Wijayanto	To investigate the effectiveness of the Deep	Pre-experimental, one-group	Mean scores increased from 67.19 to 83.50, with an	Relevant for applying technology and the Deep

	Interactive Media on Learning Outcomes in Area Measurement		Learning approach using Canva-based media in teaching plane area measurement	pretest–posttest design	N-Gain of 0.4232	Learning approach in mathematics instruction
6	The Effect of Deep Learning on Learning Outcomes in Integrated Science for Grade V Elementary Students	Arviana Ayu Kurnia Dewi and Ani Rusilowati	To reveal the impact of Deep Learning-based instruction on Grade V students' science learning outcomes	Quasi-experimental, non-equivalent control group design	Experimental group scores (94.60) exceeded the control group (86.05), with high effectiveness (d = 1.15)	Demonstrates the effectiveness of the Deep Learning approach in thematic and conceptual learning
7	Development of Digital Comic Media Using a Deep Learning Approach to Improve Student Learning Outcomes	Muhammad Fathul Fuadi, Panca Dewi Purwati, Agus Yuwono	To develop Deep Learning-based digital comic media for Indonesian language learning	Research and development (Borg and Gall model)	The media was proven highly effective (90%), valid, and user-friendly	Demonstrates the effectiveness of interactive media based on Deep Learning at the elementary level
8	Implementation of Deep Learning to Improve Learning Outcomes in Vocational High Schools in West Jakarta	M. Ardiansyah and Mohamad Lutfi Nugraha	To develop a learning outcome prediction model using a Deep Learning approach in vocational schools	Quantitative experimental research applying CNN and RNN	The prediction model was accurate and supported early intervention for students needing assistance	Inspires the application of AI-based technologies in education, adaptable to the elementary school context
9	The Effectiveness of the Gasing Mathematics Approach on Elementary School Students' Learning Outcomes	Novita and Alamsyah	To examine the effectiveness of the Gasing method in teaching number operations	Experimental design, pretest–posttest with control group	A significant improvement in learning outcomes was observed in the experimental class	Strengthens empirical evidence of the effectiveness of the Gasing method in elementary mathematics learning
10	A Deep Learning-Based Learning Model for Elementary School Students' Numeracy	Kustini, H.	To design a numeracy learning model based on the Deep Learning approach	Model development with limited trials	The model improved students' critical thinking and numeracy skills	Relevant for strengthening numeracy through deep conceptual understanding
11	Implementation of the Gasing Mathematics Method in Two-	Wiwik Wiyanti and Nur Safitri Wakhyuningsih	To evaluate the effectiveness of the Gasing method in two-	Quasi-experimental, Mann–	Significant differences were found between	Supports the effectiveness of the Gasing method in

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	Digit Addition for Grade I Students at SDN Cihuni II		digit addition for Grade I students	Whitney U test	control and experimental groups in posttest scores	strengthening basic mathematical concepts in early grades
12	The Effect of the Gasing Mathematics Method on Integer Multiplication Learning Outcomes of STKIP Surya Matriculation Students	Armianti, Indri Yani, Kartika Widuri, Sulistiawati	To determine the effect of the Gasing method on mastery of integer multiplication	Pre-experimental, one-group pretest–posttest design	Learning outcomes improved with an N-Gain of 0.59 (moderate category) using the "Mountain–Valley" tool	Demonstrates the potential of Gasing in addressing mathematical misconceptions through concrete visual approaches
13	The Effect of the Deep Dialogue Critical Thinking Learning Model on Improving Mathematics Achievement of Students at SMP Negeri 1 Hiliserangkai	Nofati Waruwu, Amin Harefa, Yakin Telaumbanua, Yulisman Zega	To examine the effect of a deep critical thinking model on mathematics learning outcomes	Experimental design, randomized control-group pretest–posttest	A significant improvement was found (t-count = 6.538 > t-table = 1.674)	Confirms that reflective and deep thinking models are effective and relevant for integration with the Gasing method
14	The Effect of a Modified TGT Learning Model Based on the Gasing Method on Mathematics Learning Outcomes	Rahmi Diah and Nurdiana Siregar	To analyze the effect of a Gasing-based TGT model on elementary students' mathematics achievement	Pre-experimental, one-group pretest–posttest design	Mean scores increased from 56.84 to 80, with an N-Gain of 0.6241 (moderate category)	Demonstrates the effectiveness of a hybrid instructional model combining TGT and the Gasing method

The implementation of the Gasing Mathematics method has been empirically proven to have a positive and significant impact on improving elementary school students' learning outcomes, particularly in mastering basic mathematical skills. Numerous studies indicate that this approach effectively supports students' understanding of arithmetic concepts such as addition, subtraction, and multiplication, while also strengthening numerical abilities at more complex levels. For instance, a study by Kusuma et al. (2022) demonstrated that the application of the Gasing method significantly improved third-grade students' mathematics achievement through a systematically designed quasi-experimental study. Similar findings were reported by Lestari and Hardini (2023), who found that post-test scores in the experimental group for two-digit multiplication material were considerably higher than those in the control group (35.00 versus 29.73). These results reinforce the view that the Gasing method functions not merely as a rapid calculation technique but also as an instructional approach capable of fostering robust mathematical understanding that is empirically verifiable. In the context of strengthening numeracy literacy and developing critical thinking skills, the Gasing method plays a significant cognitive role in supporting students' learning processes. Specifically, this approach is highly effective in building foundational numerical competencies as part of numeracy literacy at the elementary education level. A study conducted by Mutiara et al. (2023) revealed that the implementation of the Gasing method placed students in the "very high" category based on post-test numeracy results. The learning pattern, which progresses gradually from concrete to abstract representations, aligns closely with the principles of Deep Learning, emphasizing meaningful, in-depth learning focused on knowledge construction. Through a logical and structured instructional flow, the Gasing method enables students to understand mathematical patterns and relationships not merely as memorized procedures, but as meaningful concepts that can be contextualized and applied in real-life situations. The advantages of the Gasing method can also be examined from the perspective of its underlying learning theories. Research by Sulistiawati (2021) confirms that the Gasing method is consistent with several major learning theories, including behaviorism (through practice and reinforcement), humanistic theory (by enhancing students' self-confidence), cognitivism (through information processing and conceptual understanding), and constructivism (through exploratory and discovery-based activities). The integration of these theoretical foundations provides strong pedagogical justification for educators to adopt the Gasing method as a learning strategy that goes beyond procedural skills and supports comprehensive conceptual understanding. This orientation is in line with the essence of the Deep Learning approach, in which students are not passive recipients of knowledge but active agents in constructing their own cognitive structures.

The implementation of Deep Learning approaches in mathematics and science education has also demonstrated positive effects on students' understanding. A study by Dewi and Rusilowati (2023) involving fifth-grade elementary students showed that the average achievement score of the experimental group applying Deep Learning reached 94.60, exceeding that of the control group, which achieved an average of 86.05. The effectiveness of this approach was further confirmed by a high Cohen's d value of 1.15. These findings indicate that Deep Learning has substantial potential to create more meaningful and contextual learning processes that support long-term understanding, where students not only memorize concepts but internalize and apply them in real-life contexts. Digital innovation has also contributed significantly to educational transformation in recent years. Research by Fuadi et al. (2024) demonstrated that digital comic-based learning media developed using Deep Learning principles were highly effective, achieving a validity level of 90%. This finding underscores that integrating digital technology into deep learning practices can enhance students' learning motivation and produce positive learning outcomes. Through engaging visualizations, coherent narratives, and high levels of interactivity, students are better able to connect new knowledge with prior experiences, an essential principle of constructivist learning that lies at the core of Deep Learning.

Furthermore, artificial intelligence (AI) technologies such as machine learning have begun to be applied at the secondary education level and hold considerable potential for adaptation in elementary education. Ardiansyah and Nugraha (2022) reported that predictive learning models based on Deep Learning architectures, such as Convolutional Neural Networks (CNN) and Recurrent Neural Networks (RNN), are capable of detecting students' learning needs at an early stage. This development opens opportunities for the creation of data-driven Gasing-based learning platforms that support adaptive learning principles. Through such approaches, instructional interventions can be personalized and targeted according to students' individual learning characteristics, in line with the Deep Learning philosophy that emphasizes differentiation and personalization. Hybrid learning models have also shown positive effects on students' academic achievement. The combination of the Teams Games Tournament (TGT) strategy with the Gasing method, as examined by Diah and Siregar (2021), successfully increased students' average scores from 56.84 to 80, with an N-Gain value of 0.6241, categorized as moderate to high improvement. Additionally, learning models such as Deep Dialogue Critical Thinking, which have been proven effective in enhancing junior high school students' mathematical understanding, show potential for adaptation at the elementary level. By integrating the Gasing method with Deep Learning principles, instructional processes not only improve learning outcomes but also cultivate critical thinking habits, numeracy skills, and self-reflection from an early age—essential foundations for mastering 21st-century competencies.

Overall, the synthesis of existing studies indicates that learning experiences initiated through concrete engagement using the Gasing method can progressively evolve into reflective and conceptual learning through Deep Learning approaches. In other words, the Gasing method is not only effective in improving short-term learning outcomes but also plays a crucial role in building holistic and integrated understanding, as emphasized in the principles of deep learning. As articulated by Biggs and Tang (2007), deep learning occurs when students actively seek meaning, connect new knowledge with prior understanding, and apply it across different contexts. These characteristics align closely with the principles of the Gasing method, which emphasizes gradual, reflective, and meaningful mathematical learning in the daily lives of elementary school students.

CONCLUSION

Based on findings from various studies, it can be concluded that the Gasing method represents a highly appropriate and effective approach for supporting mathematics instruction oriented toward Deep Learning. With its distinctive progression from concrete experiences to abstract understanding and mental calculation, the Gasing method reduces the complexity of mathematical concepts, making them more accessible and engaging for students. This approach provides opportunities for learners to develop comprehensive conceptual understanding through

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active, meaningful, and contextual learning experiences. As a result, students do not merely rely on procedural memorization but gain a deeper understanding of the principles underlying each mathematical concept.

Therefore, when the Gasing method is systematically integrated with Deep Learning principles, the effectiveness of mathematics instruction can be further optimized. The synergy between these approaches significantly enhances students' learning outcomes by combining conceptual clarity through the concrete–abstract–mental calculation sequence with deeper meaning-making, conceptual connections, and active student engagement in the learning process.

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