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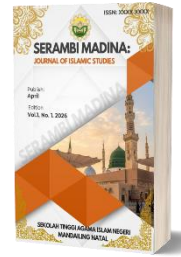
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The Implementation of Deep Learning Approach in Enhancing the Quality of Learning in Elementary Schools: A Literature Review

ORIGINAL ARTICLE

OPEN ACCES

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Abstract

This study aims to analyze the development, trends, and quality of scientific publications related to the Implementation of Deep Learning in Elementary Schools based on article searches on Google Scholar. This research employs a Systematic Literature Review (SLR) method, where data were obtained through systematic searches of scientific articles using the keyword "Implementation of Deep Learning in Elementary Schools." The process continued with filtering, classification, content analysis, and data presentation in the form of tables, graphs, and narrative descriptions. The results of the study show that there are 20 related articles, with a significant increase in publications in 2025. Affiliation analysis reveals that these articles originate from various regions in Indonesia, particularly West Java, Central Java, West Sumatra, and Central Sulawesi, indicating that the application of deep learning has gained national attention. Meanwhile, the journal accreditation classification indicates that 85% of the articles were published in non-accredited journals, while only a small portion were indexed in Sinta 4 and Sinta 5. Overall, this study concludes that the implementation of deep learning in elementary school learning is increasingly developing. A number of the reviewed studies report positive contributions in areas such as literacy, numeracy, critical thinking,

student discipline, and teacher pedagogical competence, for example through adaptive learning systems and interactive media. However, the variation in methodological quality of the publications suggests that the quality of scientific outputs still needs improvement to achieve a stronger academic impact.

Keywords: Deep Learning; Elementary School; Google Scholar; Article Analysis; Systematic Literature Review

Abstrak

Penelitian ini bertujuan untuk menganalisis perkembangan, kecenderungan, dan kualitas publikasi ilmiah terkait Implementasi Deep Learning di Sekolah Dasar berdasarkan hasil penelusuran artikel pada Google Scholar. Penelitian ini menggunakan metode Systematic Literature Review (SLR), di mana data diperoleh melalui penelusuran sistematis artikel ilmiah menggunakan kata kunci "Implementasi Deep Learning di Sekolah Dasar", dilanjutkan dengan proses filterisasi, klasifikasi, analisis isi, serta penyajian data dalam bentuk tabel, grafik, dan uraian naratif. Hasil penelitian menunjukkan bahwa terdapat 20 artikel terkait, dengan peningkatan publikasi yang signifikan pada tahun 2025. Analisis afiliasi mengungkapkan bahwa artikel-artikel tersebut berasal dari berbagai wilayah di Indonesia, terutama Jawa Barat, Jawa Tengah, Sumatra Barat, dan Sulawesi Tengah, menunjukkan bahwa penerapan deep learning telah menjadi perhatian nasional. Sementara itu, hasil klasifikasi akreditasi jurnal memperlihatkan bahwa 85% artikel diterbitkan oleh jurnal yang belum terakreditasi, sedangkan hanya sebagian kecil terindeks Sinta 4 dan Sinta 5. Secara keseluruhan, penelitian ini menyimpulkan bahwa implementasi deep learning pada pembelajaran sekolah dasar semakin berkembang. Sejumlah penelitian yang ditinjau melaporkan kontribusi positif dalam aspek literasi, numerasi, berpikir kritis, kedisiplinan siswa, serta kompetensi pedagogik guru, misalnya melalui sistem pembelajaran adaptif dan media interaktif. Namun, variasi kualitas metodologi publikasi menunjukkan bahwa kualitas luaran ilmiah masih perlu ditingkatkan untuk mencapai dampak akademis yang lebih kuat.

Kata Kunci: Deep Learning; Sekolah Dasar; Google Scholar; Analisis Artikel; Systematic Literature Review

INTRODUCTION

The rapid development of digital technology has brought significant changes in various aspects of human life, including in the field of education (social fact). The era of the Industrial Revolution 4.0 and the transition toward Society 5.0 demand that the education sector adapt to technological innovations in order to produce human resources who are competent, creative, and competitive. In this context, technology-based pedagogical innovation has become a strategic effort to improve the quality of education, particularly at the elementary school level, which serves as the fundamental stage for shaping students' knowledge and character.

Elementary schools play an important role in developing students' literacy and numeracy skills, as well as their basic attitudes and values. However, learning practices in elementary schools still frequently face various challenges, such as the limited use of innovative teaching methods, difficulties for teachers in monitoring students' individual learning progress, and the low level of active student engagement in the learning process (social fact). Previous studies indicate that conventional learning approaches are often unable to accommodate the diverse learning needs of students. Biggs & Tang, (2003), Therefore, a more adaptive and responsive approach to students' individual needs is required.

In educational studies, the term "deep learning" refers to two distinct yet complementary meanings. First, it is understood as a branch of Artificial Intelligence (AI) that utilizes artificial neural networks to process complex data and generate accurate predictions Pahlevi, (2024). Second, and more dominant in the context of the articles reviewed in this study, it refers to a "pedagogical approach or deep learning pedagogy".

In this research, the term deep learning is consistently defined as a deep learning pedagogical approach oriented toward conceptual understanding, active student engagement, reflection, and meaningful learning. This approach is rooted in constructivist theory, active learning, and metacognition as proposed by Biggs & Tang, (2003) serta Vygotsky, (1978). The discussion of deep learning as an artificial intelligence technology is not the main focus of this study, but rather positioned only as a supporting context in several relevant literatures. Thus, this research explicitly focuses on the implementation of the deep learning pedagogical approach in the context of elementary schools.

This concept refers to a learning process that promotes conceptual understanding, critical thinking, and meaningful internalization of knowledge, going beyond mere memorization Biggs & Tang, (2003). This approach emphasizes active student participation, reflection, and connections between concepts to build lasting knowledge.

Based on preliminary exploration, the majority of literature discussing the "implementation of deep learning in elementary schools" actually adopts the second meaning, namely as a strategy or model of deep learning pedagogy (deep learning as a pedagogical approach), rather than the implementation of technical AI systems. However, studies that systematically map the development, trends, publication quality, and specific contributions of this deep learning approach in the context of elementary education in Indonesia are still limited (research gap). Most existing studies remain partial in nature, focusing on specific subjects and lacking integration

within a comprehensive literature review that examines patterns and impacts at the national level. This approach has the potential to address learning challenges in elementary schools by creating a more adaptive, interactive, and student-centered learning environment. Although the potential integration of deep learning in its first meaning (AI technology) for personalized learning remains open as a future development opportunity, the focus of this study is on its implementation as a pedagogical approach.

Based on the description and identification of the research gap, this article has the following specific objectives: (1) to analyze the development and trends of scientific publications regarding the implementation of deep learning (as a pedagogical approach) in elementary schools in Indonesia; (2) to classify the quality of publications based on journal accreditation and the geographical distribution of the studies; and (3) to synthesize the main findings regarding the contribution of this approach to improving literacy, numeracy, critical thinking, and teachers' pedagogical competence at the elementary level (research objectives). This study is relevant to the focus on examining value-based educational innovation, including the development of meaningful and character-based learning, as reflected in the deep learning approach.

This study is based on the argument that integrating the principles of deep learning into instructional design can overcome the limitations of traditional methods and significantly improve the quality of both the learning process and outcomes of elementary school students (hypothesis/argument). By analyzing the development, trends, and quality of scientific publications on this topic through a Systematic Literature Review (SLR), this study is expected to contribute theoretically to the advancement of educational research based on pedagogical innovation, while also serving as a practical reference for educators, researchers, and policymakers in designing innovative, adaptive, and learner-centered instruction in the digital era, as well as filling the existing gaps in the literature.

LITERATURE REVIEW

Based on the author's search using the Dimensions website, previous studies were identified and are presented in the following graph:

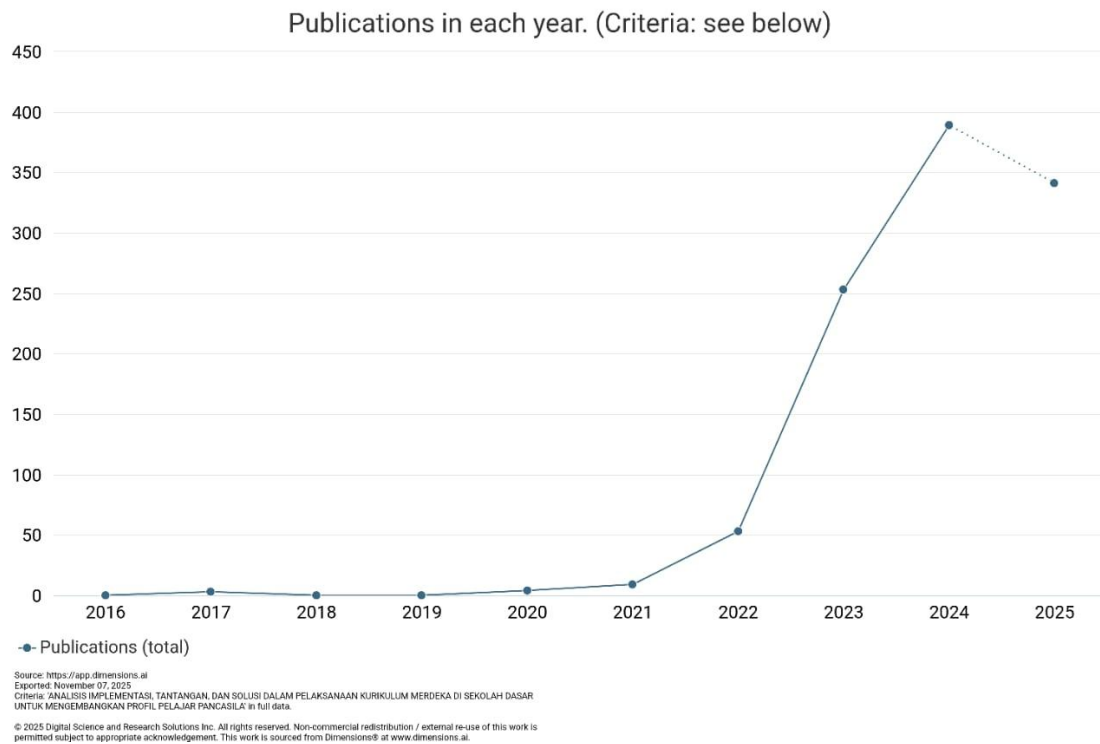


Figure 1. Trends in Research Publications in the Field of Elementary School Learning

The publication trend analysis in Figure 1 is illustrative and shows the general development of research in the field of elementary education. The graph was generated based on a search in Dimensions.ai using the keyword “learning in elementary schools,” and reflects an increasing research interest over the period 2020–2024. Although it does not specifically address deep learning, the graph provides context that the field of elementary education continues to be a growing area of study.

Based on the author’s search using the VOSviewer application, previous studies were identified and mapped as follows:

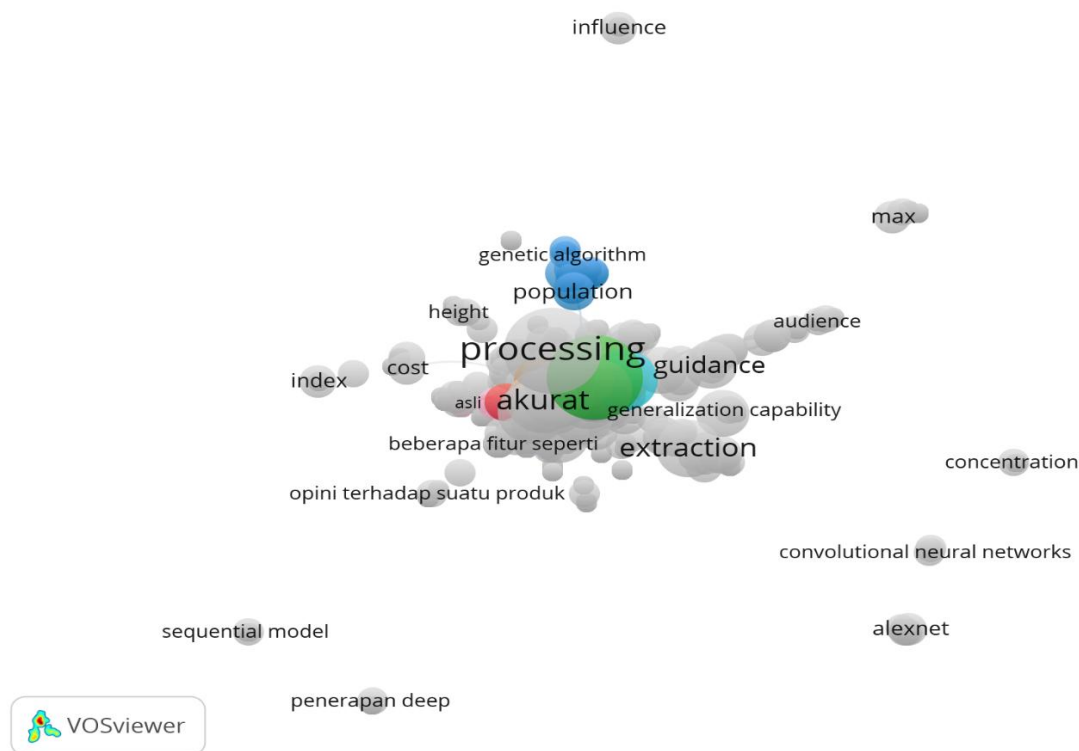


Figure 2 . Conceptual Mapping of Deep Learning Research in Education

The conceptual mapping in Figure 2 was generated from a VOSviewer analysis of articles on deep learning related to education. The results indicate that research on deep learning in education is divided into two major clusters: a technical cluster (such as CNN, algorithm, accuracy) associated with deep learning as an artificial intelligence technology, and a pedagogical cluster (such as learning, student, engagement) associated with deep learning as a learning approach. This study focuses on the pedagogical cluster in accordance with the characteristics of the articles to be reviewed.

Based on a search of articles using the keyword “Implementation of Deep Learning in Elementary Schools” in Google Scholar, five of the most recent (2025) and relevant articles were selected for analysis:

First, the study by Mutmainnah et al., (2025), entitled “*The Implementation of the Deep Learning Approach in Mathematics Learning in Elementary Schools.*” This study concludes that the implementation of the deep learning approach has a positive impact on improving the quality of mathematics learning in elementary schools, as it makes the learning process more active, reflective, and enjoyable. However, the success of this method still depends on the availability of technological facilities, teacher training,

and effective classroom management strategies to achieve more optimal learning outcomes. Theoretically, this study is grounded in Lev Vygotsky's social constructivism theory, which emphasizes the importance of scaffolding and the Zone of Proximal Development (ZPD) in the learning process. This research employs a qualitative approach using a triangulation technique, combining various data collection methods such as observation and interviews to obtain more valid results.

Second, the study by Ar-Rasyid et al., (2025a), entitled "*The Implementation of Deep Learning Methods in Enhancing Student Engagement in Elementary Schools.*" This research employs a Systematic Literature Review (SLR) method with a content analysis approach to examine various studies related to the application of deep learning methods in increasing elementary school students' engagement. The study is based on theories of student engagement and personalized learning supported by artificial intelligence (AI), particularly the use of Convolutional Neural Networks (CNN) and Recurrent Neural Networks (RNN). These algorithms are utilized to analyze learning behaviors, recognize facial expressions, and adjust teaching strategies according to individual learning styles. The study concludes that deep learning methods have great potential to create more adaptive, interactive, and relevant learning in elementary schools, provided they are supported by teacher training, progressive educational policies, and equitable access to technology across regions in Indonesia.

Third, the study by S. N. Amalia, (2025), entitled "*Students' Perceptions of the Implementation of the Deep Learning Model in Civic Education (PKn) to Develop Elementary Students' Critical Thinking Skills.*" This research uses a descriptive qualitative method involving 10 elementary teacher education (PGSD) students as respondents. The theoretical framework is based on constructivist theory and experiential learning theory, which emphasize the importance of direct experience, active interaction, and reflection in building knowledge and critical thinking skills. The study concludes that the deep learning model has significant potential to transform Civic Education learning into a more analytical and reflective process, provided it is supported by an adaptive curriculum and adequate teacher training.

Fourth, the study by Rasma et al., (2025), entitled "*The Implementation of Deep Learning-Based Instruction to Improve Numeracy Skills of Grade VI Students at UPT SD 79 Gura.*" This research employs a Classroom Action Research (CAR) method using the Kemmis & McTaggart model, which consists of four stages: planning, implementation, observation, and reflection. The study is grounded in constructivist theory, where students construct their understanding through active interaction with the learning environment. The results show a significant improvement in students'

numeracy skills. In Cycle I, the average score was 67.2, with 56% of students achieving mastery. After improvements in Cycle II, the average score increased to 78.6, with 80% of students achieving mastery. In addition to improved learning outcomes, student engagement and motivation also increased through the use of interactive media, small group discussions, and digital simulations. Overall, the deep learning-based instructional method proved effective in enhancing students' numeracy skills both conceptually and practically.

Fifth, the study by Hasanah & Pujiati, (2025), entitled "*The Implementation of the Deep Learning Approach in Elementary Schools in Bekasi City.*" This research uses a quantitative descriptive survey method with a Likert-scale questionnaire distributed to 50 elementary school teachers in Bekasi City, supported by a literature review. The theoretical foundation includes constructivism (Vygotsky, 1978), active learning (Bonwell & Eison, 1991), and metacognition (Flavell, 1979), which emphasize the importance of students' reflective and meaningful engagement in learning. The results indicate that elementary school teachers have a good understanding of and positive attitudes toward deep learning, although they still face challenges related to training and curriculum support. Overall, this approach has been shown to improve critical thinking skills, active engagement, and students' conceptual understanding at the elementary school level.

Thematic Synthesis

From the five articles, several patterns can be synthesized:

- Subjects: Predominantly Mathematics and Civic Education (PKn)
- Theoretical foundation: Based on Constructivism and Active Learning
- Forms of implementation: Utilizing discussions, conceptual problem-solving, interactive media, and reflection
- Learning outcomes: Focused on improving student engagement, conceptual understanding, and critical thinking skills

Position of This Study

Based on the analysis of existing literature, it is identified that there has been no study that systematically maps the development of publications, research trends, and the quality of scientific publications regarding the implementation of deep learning as a pedagogical approach in Indonesian elementary schools. Therefore, this study aims to fill this gap through a systematic literature review of articles addressing this topic in Google Scholar. The five articles share the common finding that deep learning has significant potential to improve the quality of learning, strengthen

conceptual understanding, and enhance students' thinking skills in elementary schools. The differences among them lie in the subjects studied, research methods employed, and the focus of implementation.

RESEARCH METHOD

This study employs a Systematic Literature Review (SLR) method to analyze scientific publications related to the implementation of deep learning as a pedagogical approach in elementary schools.

Data Sources and Selection Criteria

The data were obtained from Google Scholar using the keyword "Implementation of Deep Learning in Elementary Schools" in December 2025. The articles were selected based on the following criteria:

- Inclusion: (1) Empirical articles or literature reviews; (2) Focus on the implementation of deep learning (as a pedagogical approach) in elementary schools; (3) Written in Indonesian or English; (4) Full text available.

- Exclusion: (1) Discusses deep learning solely as an AI technology; (2) Studies conducted outside the elementary school level; (3) Non-journal documents (proceedings, popular articles).

Analysis Procedure

1. Filtering & Classification: Duplicate articles were removed. The remaining data were classified into categories: identity, author affiliation, journal accreditation, research methods, and learning outcome variables (literacy, numeracy, critical thinking, etc.).

2. Content Analysis: Identifying thematic trends and patterns of findings across studies.

3. Visualization & Narrative: The results are presented in tables, graphs, and narrative descriptions to address the research objectives.

This SLR protocol ensures a systematic and structured review.

RESULT AND DISCUSSION

Article Search Based on Research Themes Using Google Scholar

Based on an initial search on Google Scholar using the keyword "Implementation of Deep Learning in Elementary Schools," a number of documents were obtained. After undergoing a filtering process based on the inclusion and exclusion criteria (as described in the methodology), 20 relevant articles were identified as meeting the requirements for analysis. These articles were then classified based on year of publication, author affiliation, and journal accreditation.

N O	Author	Title	Journal Name	Volume, Issue, Year	Accreditation
1	Hendrianty et al.,(2024)	Membangun Pola Pikir Deep Learning Guru Sekolah Dasar.	Kalam Cendekia: Jurnal Ilmiah Kependidikan,	12.3 (2024).	Non Sinta
2	Mutmainnah et al., (2025)	Implementasi Pendekatan Deep Learning Terhadap Pembelajaran Matematika Di Sekolah Dasar	Pendas: Jurnal Ilmiah Pendidikan Dasar	10(01), 848-871 2025	Sinta 4
3	Aryanto et al., (2025)	Pembelajaran Literasi Dan Numerasi Melalui Deep Learning: Pendekatan Transformasional Di Sekolah Dasar.	Journal of Professional Elementary Education,	4(1), 49-57. 2025	Sinta 5
4	Nabila et al., (2025)	Pendekatan Deep Learning Untuk Pembelajaran IPA Yang Bermakna Di Sekolah Dasar	Primera Educatia Mandalika: Elementary Education Journa	2(1), 9-20. 2025	Non Sinta
5	R. Amalia et al., (2025)	Analisis Dampak Pendekatan Deep Learning Terhadap Peningkatan Kedisiplinan Siswa Sekolah Dasar	Jurnal Pengajaran Sekolah Dasar,	4(1), 180-191. 2025	Non Sinta
6	Hasanah & Pujiati, (2025b)	Penerapan Pendekatan Deep Learning Pada Pembelajaran Di Sekolah Dasar Kota Bekasi	El Banar: Jurnal Pendidikan dan Pengajaran,	8(1), 72-79. 2025	Non Sinta

7	Ar-Rasyid et al., (2025b)	Implementasi Metode Deep Learning Dalam Meningkatkan Keterlibatan Siswa Di Sekolah Dasar.	JOEBAS: Journal of Education, Behavior, and Social Studies,	1(1), 29-40. 2025	Non Sinta
8	Isnayanti et al., (2025a)	Integrasi Pembelajaran Mendalam (Deep Learning) Dalam Kurikulum Sekolah Dasar: Tantangan Dan Peluang	Cokroaminoto Journal of Primary Education,	8(2), 911-920. 2025	Non Sinta
9	Atmojo et al., (2025)	Pelatihan Implementasi Pendekatan Pembelajaran Deep Learning Untuk Meningkatkan Kompetensi Pedagogik Guru SD Di Kota Surakarta	jurnal Pengabdian UNDIKMA	6(1), 123-131. 2025	Non Sinta
10	(Zafirah et al., 2025)	Strategi Deep Learning Terhadap Hasil Belajar Siswa Di Sekolah Dasar	JOEBAS: Journal of Education, Behavior, and Social Studies	1(1), 41-47. 2025	Non Sinta
11	(Wahyuni, 2025)	Pancasila Dalam Ekspresi Siswa Aktualisasi Nilai Dengan Pendekatan Pembelajaran Deep Learning Di Sekolah Alam Kendal	Jurnal Ilmiah Pendidik Indonesia,	4(2), 170-180 2025	Non Sinta
12	(Natsir, 2025)	Implementasi Kurikulum	Journal of Innovation	4(9), 7263-7274 2025	Non Sinta

		Merdeka Dalam Pembelajaran Matematika Di Sekolah Dasar: Studi Deskriptif Pendekatan Deep Learning Dalam Kerangka Kurikulum Merdeka Belajar	Research and Knowledge,		
13	Isnayanti et al., (2025b).	Integrasi Pembelajaran Mendalam (Deep Learning) Dalam Kurikulum Sekolah Dasar: Tantangan Dan Peluang.	Cokroaminoto Journal of Primary Education,	8(2), 911-920. 2025	Non Sinta
14	Wahyuning sih et al., (2025)	Strategi Deep Learning Melalui Kegiatan Ko-Kurikuler Di Sekolah Dasar	Didaktika: Jurnal Kependidikan	14(3 Agustus), 5637-5650. 2025	Non Sinta
15	Muttaqin et al., (2025)	Analisis Penerapan Deep Learning Dalam Pembelajaran Di Sekolah Dasar: Studi Empiris Di Kota Mataram	Sibatik Journal: Jurnal Ilmiah Bidang Sosial, Ekonomi, Budaya, Teknologi, Dan Pendidikan	4(6), 651-660. 2025	Sinta 4
16	(Adnyana, (2024)	Implementasi Pendekatan Deep Learning Dalam Pembelajaran Bahasa Indonesia.	Retorika: Jurnal Pembelajaran Bahasa dan Sastra Indonesia,	5(2), 1-14. 2024	Non Sinta
17	Irfanuddin et al., (2025)	Analisis Implementasi Pembelajaran Mendalam (Deep	Jurnal Pendidikan Dan Pembelajaran	5(3), 1566-1576. 2025	Sinta 4

		Learning) Dalam Kurikulum PAI Di SD Negeri 125 Ogan Komering Ulu Sumatera Selatan.	Indonesia (JPPI),		
18	Rahayu et al., (2025)	Pendidikan Matematika Realistik Indonesia Dalam Pembelajaran Mendalam (Deep Learning): Tinjauan Literatur.	Jurnal Pendidikan Matematika Universitas Lampung,	13(1), 9-25. 2025	Non Sinta
19	Fatmawati, (2025)	Transformasi Pembelajaran Sejarah Dengan Deep Learning Berbasis Digital Untuk Gen Z.	Revorma: Jurnal Pendidikan Dan Pemikiran,	5(1), 25-39. 2025	Non Sinta
20	Mahardika & Jaya, (2025)	Persepsi Guru Terhadap Penerapan Deep Learning Dalam Kerangka Kerja Pembelajaran Mendalam.	Edukasiana: Jurnal Inovasi Pendidikan,	4(3), 1123-1139. 2025	Non Sinta

Table 3. Article Search Based on the Keyword "Implementation of Deep Learning in Elementary Schools" Using Google Scholar

Based on the author's analysis of the classified articles, they can be grouped according to their year of publication as follows:

No	Year	Number of Articles
1	2024	2
2	2025	18

Table 4. Author's Analysis of Articles Based on Year of Publication

Based on the results of the article search through Google Scholar using the keyword "Implementation of Deep Learning in Elementary Schools," the author

identified a total of 20 relevant articles, as listed in the classification table. Based on the figure above, the distribution of articles by year of publication shows that in 2024 only 2 articles were found, while in 2025 the number increased significantly to 18 articles.

This increase indicates that the topic of deep learning implementation in the context of elementary education has gained growing attention from researchers, particularly in 2025. The large number of studies in that year suggests that deep learning is increasingly being considered a promising pedagogical approach for improving the quality of teaching and learning processes in elementary schools, including in aspects of pedagogy, literacy, numeracy, and curriculum integration.

These data reflect a rapidly developing research trend and the expanding scope of studies on deep learning-based educational innovation in the elementary education context.

The following is a graph of the author's analysis of the classified articles based on their year of publication:

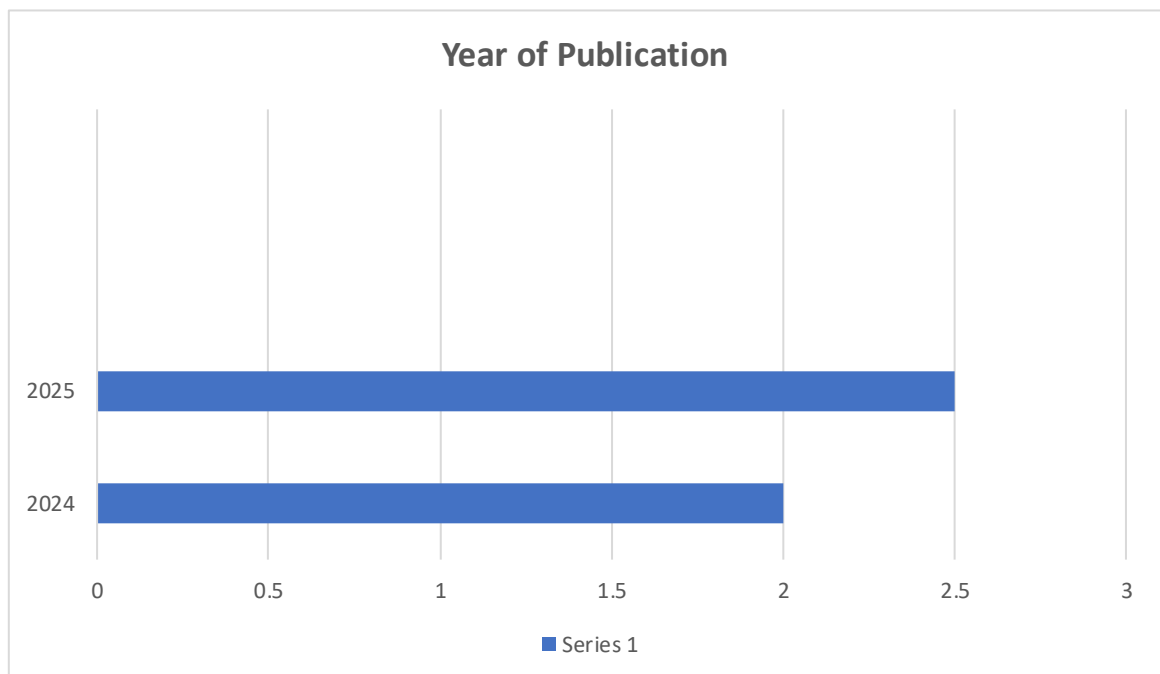


Figure 5. Graph of Analysis Based on Year of Publication

The graph above shows the number of articles published in two different years, namely 2024 and 2025. It can be seen that the number of articles in 2025 is significantly higher than in 2024. In 2024, only a small number of articles were published, whereas in 2025 the number increased sharply to around 18 articles. This difference illustrates a significant rise in publication activity in 2025.

This increase may indicate that research interest or the number of completed studies grew rapidly in that year compared to the previous one. The graph clearly highlights a publication growth trend within a one-year period.

Classification of Articles Based on Author Affiliation and Region Based on the author’s analysis of affiliations and regions, it is evident that research on the topic “Implementation of Deep Learning in Elementary Schools” has been conducted by researchers from various regions and higher education institutions across Indonesia. According to the classification data, the identified articles originate from universities located in different provinces, such as West Java, DKI Jakarta, West Sumatra, Central Sulawesi, Central Java, West Nusa Tenggara, and Lampung.

This diversity of affiliations indicates that the issue of deep learning implementation in elementary schools has gained national attention and is being studied by various educational institutions, both public and private universities. The dominance of research from regions such as West Java, Central Java, and West Sumatra suggests the presence of more active research hubs in developing the application of deep learning across various learning aspects, including literacy, numeracy, science education, the independent curriculum, and teachers’ pedagogical competence.

Overall, the variation in affiliations and the geographical distribution of authors demonstrate that the implementation of deep learning at the elementary school level is not merely a narrow academic trend, but has evolved into a broad and relevant research focus for improving the quality of basic education in Indonesia.

The following is a graph of the author’s analysis of the classified articles based on author affiliation and region:



Figure 6. Mapping Graph of Authors’ Regions

Based on the analysis conducted, the map presented in Figure 6 provides a spatial visualization of the geographical distribution of researchers' affiliations studying the implementation of deep learning in elementary schools in Indonesia. This map was created by plotting the locations of the authors' institutions based on data obtained from the article classification table. Color symbols are used to represent each article, where the intensity of the color indicates the number of articles originating from a particular region: darker colors represent regions with a higher number of articles.

The mapping results show that this research topic has been explored by scholars from various universities across several provinces, such as West Java, DKI Jakarta, West Sumatra, Central Sulawesi, Central Java, West Nusa Tenggara, and other regions. It can be observed that the concentration of research is more dominant in West Java, followed by Central Java and West Sumatra, as indicated by the darker blue symbols on the map.

Classification of Scientific Articles Based on Journal Accreditation

Based on the author's analysis of the accreditation status of 20 recent articles using the keyword "Implementation of Deep Learning in Elementary Schools," it was found that the majority of articles on this topic were published in non-accredited journals (Non-Sinta), while only a few were indexed in Sinta 4 and Sinta 5. From the total classified articles, only two journals were accredited in Sinta, namely *Pendas: Jurnal Ilmiah Pendidikan Dasar* (Sinta 4) and *Journal of Professional Elementary Education* (Sinta 5).

The dominance of non-accredited journals indicates that studies on the implementation of deep learning at the elementary school level are still in the early stages of development within Indonesia's scientific publication landscape. As a result, dissemination is more commonly carried out through newer journals or community service journals that have not yet been accredited.

Nevertheless, the high number of publications across various journals demonstrates that researchers' interest in the application of deep learning in elementary school learning processes is increasing. This suggests that the topic is beginning to be seen as relevant for educational innovation, although the quality of publications still requires strengthening through higher-reputation journals in the future.

The following is a graph of the author's analysis of the classified articles based on journal accreditation:

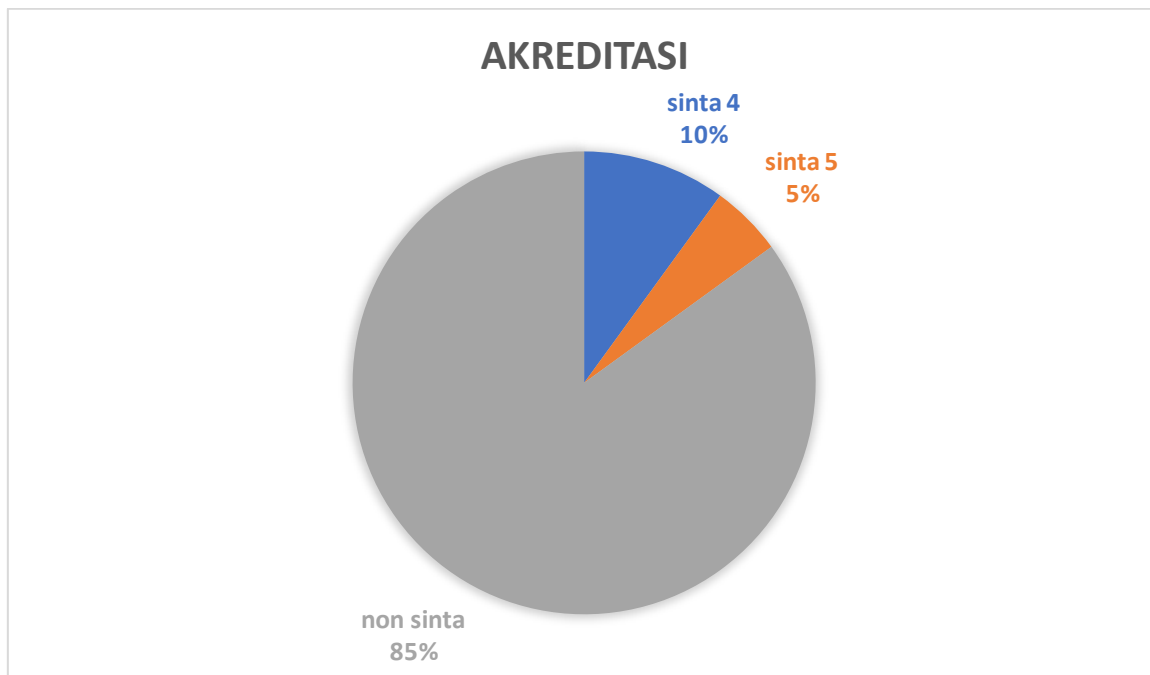


Figure 7. Grafik Visualisasi Distribusi Akreditasi Jurnal

The pie chart in Figure 5 visualizes the distribution of journal accreditation in which articles on the topic "Implementation of Deep Learning in Elementary Schools" are published. The data show that the majority of publications, namely 85%, come from non-SINTA (Science and Technology Index) journals, which is Indonesia's national indexing system. Meanwhile, publications in SINTA-accredited journals represent a much smaller proportion, with 10% in SINTA 4 journals and only 5% in SINTA 5 journals.

This composition indicates that although this research topic has attracted considerable interest and has been widely studied, most of the findings are still published through channels that are not yet nationally accredited. The dominance of non-SINTA publications may reflect several factors, such as researchers' access to reputable journals, a preference for faster and more accessible publication outlets, or the possibility that this field is still in an early stage of development within Indonesia's academic publication landscape. However, the significant proportion of non-SINTA journals also highlights the need for further efforts to improve the quality and reputation of publications so that more studies can be accepted in accredited journals, thereby increasing their impact and visibility.

Discussion

The finding of a significant increase in publications in 2025 is aligned with the national trend of adopting innovative learning approaches, as promoted in the *Merdeka Curriculum*. The dominance of research from regions such as West Java, Central Java, and West Sumatra may reflect the readiness of research and educational infrastructure in those areas. However, this also highlights the need to encourage more evenly distributed research across all regions of Indonesia.

The fact that the majority of articles are published in non-accredited journals (85%) is an important observation. This may be due to several factors, such as the accessibility of these journals for early-career researchers, a preference for faster publication processes, or the possibility that this topic is still in an early stage of development in Indonesia's scientific publication domain. Nevertheless, this finding does not diminish the substantive contribution of these articles to elementary school learning practices.

Substantively, the analyzed articles consistently report that the deep learning approach (in its pedagogical sense) contributes positively to improving literacy, numeracy, critical thinking skills, and student engagement. These findings address the research objectives while reinforcing the initial argument that this approach is relevant for enhancing the quality of elementary education. Recurring challenges identified include limited teacher training and insufficient curriculum support, which provide important practical implications for policymakers.

This study has certain limitations, particularly as the data sources are limited to Google Scholar and may not cover all relevant publications. Future research may expand the database scope and conduct more in-depth content analysis on the effectiveness of various deep learning strategies in classroom practice.

CONCLUSION

This study concludes that research on the implementation of deep learning as a pedagogical approach in elementary schools has shown rapid development, particularly in 2025. This finding indicates the increasing attention of academics and practitioners toward this approach as a relevant pedagogical innovation.

In general, the analyzed studies report that the deep learning approach contributes to improvements in literacy, numeracy, critical thinking skills, and student engagement at the elementary level. This study also maps the geographical distribution of research, which is dominated by regions such as West Java, Central Java, and West Sumatra, indicating a national focus with certain concentrations.

However, the findings regarding publication quality provide an important note. The majority of articles (85%) are published in journals that are not yet SINTA-accredited, indicating that there is still considerable room for improvement in academic quality and visibility. The limitations of this study include the data scope being limited to Google Scholar and the dominance of publications from a single year (2025), which may affect the generalization of long-term trends.

The implication of this study highlights the importance of encouraging research with more rigorous methodologies and publication in higher-reputation journals. For future research, it is recommended to expand the search to other databases and conduct in-depth analyses of the effectiveness of implementing the deep learning approach across various regional contexts in Indonesia.

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