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Review Article

The Effect of AI-Based Deep Learning on Narrative Writing Skills for Elementary School Students

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Abstract: Narrative writing skills are crucial for the literacy development of elementary school students. However, many students face challenges in writing narrative essays due to limited vocabulary, grammar understanding, and imagination. Traditional teaching methods often fail to address these issues. This study explores the impact of AI-based Deep Learning on narrative writing skills. Using a quantitative approach with an experimental design, the research employed a pretest-posttest design with a nonrandomized control group. The study involved 65 students from SD 4 Sidomulyo, including 30 students from class IV A and 35 from class IV B. A nonprobability sampling technique with saturated sampling was used. Data was collected through tests, and content validity was applied for validation. Hypothesis testing with the Independent Samples t-test yielded a significance value of 0.001 ($p < 0.05$) and a calculated t-value of 3.472, which is greater than the t-table value of 2.0024. These results indicate that AI-based Deep Learning significantly affects narrative writing skills in elementary school students. Keywords: AI-Based Deep Learning, Narrative Writing Skills.

Keywords: AI; Deep Learning; Grammar; Imagination; Writing Skills

1. Introduction

The development of digital technology in education is increasingly encouraging the use of more varied and interactive learning media (Zhang, 2021). The digital era has brought fundamental changes to the world of education, marked by the increasingly intensive use of information technology to support the teaching and learning process (Okoye et al., 2023: 2291). The Deep Learning approach is one approach that can support the teaching and learning process in learning and encourage conceptual understanding, in-depth competency, and application of knowledge in real life through a meaningful, mindful, and joyful learning atmosphere (Putra, 2018). According to Suwandi et al. (2023), the Deep Learning approach seeks to transform the traditional learning paradigm that tends to emphasize memorization and repetition of information, into more constructive and reflective learning. This change allows students to not only understand the learning content but also develop critical thinking skills, creativity, and problem-solving abilities. This is in line with research conducted by (Otto, et al., 2020). Deep Learning refers to a learning approach that focuses not only on mastering knowledge, but also on developing critical thinking, collaboration, creativity, and communication skills. Critical thinking skills to build a logical story structure, collaboration to enrich perspectives through feedback, writing narratives through creativity to create unique ideas, and communication to convey the message effectively to the reader (Nelson, S., & Park, 2019).

Narrative writing skills serve as a means for students to represent life experiences and develop a personal voice. Furthermore, it emphasizes that mastering writing strategies from an early age, particularly in narrative genres, is crucial for advanced literacy skills and successful

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communication in social settings (Eka et al., 2023). Narrative writing skills are a crucial foundation for students' literacy development at the elementary school level (Rahman, 2022). Narrative writing skills are not simply about constructing sentences, but rather a complex cognitive process that trains students to organize ideas, express imagination, and build logical thought structures (Fitria, 2024). Narrative writing skills help students understand the sequence of events (chronology) and develop empathy by creating characters and conflicts. These skills are closely related to future academic success, as writing is the primary tool for communicating understanding in almost all subjects (Suprayogi et al., 2021). Narrative writing skills are a crucial component in elementary school students' literacy development, as students learn to organize stories with a logical beginning, middle, and end (Graham, S., & Perin, 2017). However, many elementary school students struggle with narrative writing due to limited vocabulary, grammatical comprehension, and imagination, which are often not addressed by traditional teaching methods (Rasinski et al., 2017). Based on the aforementioned paradigm, reality shows that many elementary school students struggle to produce coherent text because they often focus solely on knowledge-telling rather than knowledge transformation. Poor narrative writing skills are a common problem across all levels of education, with students often struggling to organize ideas, use correct grammar, and produce coherent content (Graham & Perin, 2007). Deep Learning, a branch of artificial intelligence (AI), has developed rapidly and offers great potential to address these challenges through models such as artificial neural networks that can automatically process and generate text (LeCun et al., 2015). With AI's ability to provide real-time feedback, correction suggestions, and interactive exercises, this technology can improve students' writing skills in a more personalized and efficient manner than traditional methods (Zheng et al., 2020).

This is in line with research conducted by Roscoe et al., (2019) that explores Deep Learning and AI can be integrated into the writing learning process to address low skills, with a focus on practical applications and empirical evidence from current research. Artificial Intelligence (AI), particularly through Deep Learning applications, offers innovative solutions by providing tools such as automatic text generators and interactive feedback systems that can help elementary school students improve narrative writing skills gradually (Abdel, 2020). Through AI integration, students can receive personalized suggestions, repeated practice, and motivation through gamification elements, thus positively influencing their skill development (Liu, 2021). This study aims to determine the effect of AI-Based Deep Learning on Learning Narrative Writing Skills for elementary school students.

2. Literature Review

Deep Learning

Abbas, (2025) explains that Deep Learning is a branch of artificial intelligence and machine learning that develops multi-layered artificial neural networks to improve accuracy in various tasks, such as object detection, speech recognition, and language translation. Deep Learning not only understands learning content, but also develops critical thinking skills, creativity, and problem-solving abilities (Suwandi, 2024). Deep Learning is defined as part of the large Machine Learning family that attempts to imitate the way the human brain (neurons) works in processing data and creating patterns for decision making (LeCun et al., 2015).

Artificial Intelligence (AI)

Artificial Intelligence (AI) is the ability of a system to correctly interpret external data, learn from that data, and use that learning to achieve specific goals or tasks through flexible adaptation. This definition highlights the aspects of data interpretation, learning, and adaptation essential points when emphasizing how AI systems (including Deep Learning models) can tailor feedback to students' writing processes (Kaplan & Haenlein, 2019). Artificial Intelligence (AI) is the competence of computer systems to perform tasks that typically require human intelligence, such as speech recognition, vision, and decision-making. It has been applied in various fields, from healthcare and transportation to education, and has had a significant impact on increasing the efficiency and effectiveness of various services (Abdulmunem, 2023). In line with the above opinion, with the integration of AI, students can receive personalized advice, repetitive practice, and motivation through gamification elements, thus positively influencing their skill development (Wijayanti et al., 2025). AI is a learning efficiency and provides a more personalized learning experience (Zuheir et al., 2023).

Narrative Essay

The learning experience of narrative writing serves as a means for students to represent life experiences and develop their personal voice (Eka et al., 2023). Mastery of writing strategies from an early age, particularly in the narrative genre, is crucial for advanced literacy skills and successful communication in social settings (Al-Fitrie et al., 2023). Narrative skills are considered a strong predictor of reading comprehension and expository writing skills in higher grades. Kim explains that the integration of language knowledge and story structure in narrative writing helps strengthen students' cognitive neural networks in processing complex information (Rasinski et al., 2017). Narrative writing skills are a crucial component in elementary school students' literacy development, as children learn to organize stories with a logical beginning, middle, and end (Bruner, 2009).

3. Research Method

This study uses a quantitative research type, with an experimental method (Rukminingsih et al., 2020:37). The research design used in this study is a pretest-posttest design using a control group without random assignment (Nonequivalent control group design). The population in this study amounted to 65 students of SD 4 Sidomulyo consisting of 30 students of class IV A and 35 students of class IV B. This study used a sample of all students of class IV A SD 4 Sidomulyo totaling 30 students and all students of class IV B totaling 35 students. The sampling technique used in this study is a type of nonprobability sampling with a saturated sampling technique, namely a sampling determination technique when all members of the population are used as samples (Sugiyono, 2013:85). The data collection technique in this study used tests. This writing test was used during the pretest and posttest. The pretest was given to both the experimental and control classes to determine students' initial abilities in writing narrative essays. Then, after the learning process, students were given a posttest. The posttest given to the experimental class used AI-based Deep Learning, and the posttest to the control class did not use AI-based Deep Learning. This test method was used to determine students' writing skills before and after the learning process. The validity test in this study used content validity, which was carried out by expert assessment or validators to measure the narrative essay writing test instrument that had been prepared based on the material taught. The data from the validity test are as follows:

Table 1. Expert Validity Test Results

ITEM	APPRAISAL			S1	S2	S3	∑S	V	KET
	I	II	III						
P1-P6	23	24	24	17	18	18	53	0,981481	TALL

Based on the Aiken V validity criteria, if the V value is > 0.80 and close to 1.0, the validity result is high. From the data above, it can be concluded that V = 0.981481 > 0.80, so the question is valid and can be tested. After conducting expert validity, the question was then tested on 30 students who had received writing skills material to determine the construct validity using Product Moment assisted by SPSS. The data from the construct validity test results are as follows:

Table 2. Expert Validity Test Results

r_{value}	r_{table}	Information
0,459	0,349	VALID
0,528	0,349	VALID
0,794	0,349	VALID
0,815	0,349	VALID
0,735	0,349	VALID

Based on the construct validity test, the calculated r value is greater than the tabulated r value, indicating that the item meets the construct validity test. Because the item meets both content and construct validity, it is declared valid and can be used as a pretest and posttest for the control and experimental classes.

The reliability of the descriptive test instrument can be tested using the Crobach's Alpha formula using SPSS. The reliability test results are as follows:

Table 3. Reliability Results

Reliability Statistics	
Cronbach's Alpha	N of Items
0,709	5

Based on Cronbach's reliability criteria, if a variable shows a Cronbach Alpha value > 0.60, it can be concluded that the variable is reliable or consistent in its measurement (Taherdoost in Fitria, 2022). The data above shows a reliability value of 0.709 > 0.6, indicating that the item has good reliability.

4. Results and Discussion

Data Description

The pretest was conducted before students received the treatment. The pretest was administered to students in grades IV A and IV B. Grade IV A served as the experimental class, with a pretest administered on November 18, 2025, to 30 students. Grade IV B received a pretest administered on November 20, 2025, to 35 students.

The results of the pretest data analysis for the experimental and control classes are as follows:

Table 4. Results of Pretest Data Analysis

Descriptive Statistics					
	N	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**
PretestEksperimen	30	30	75	48,83	11,647
PretestKontrol	27	30	70	48,15	10,844

Source: Pretest Data Analysis with SPSS 25

Based on table 4 above, it can be seen that the pretest score of the experimental class of 30 students has a mean (average) of 48.83, with a minimum score of 30 and a maximum score of 75. Meanwhile, the pretest score of the control class of 35 students has a mean (average) of 48.15, with a minimum score of 30 and a maximum score of 70. The results of the posttest data analysis of the experimental class and the control class are as follows:

Table 5. Posttest Data Analysis Results

Descriptive Statistics					
	N	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**
PosttestEksperimen	30	60	85	70,67	6,789
PosttestKontrol	35	50	85	63,33	9,094

Source: posttest data analysis with SPSS 25.

Based on table 4.2 above, it can be seen that the posttest score of the experimental class of 30 students has a mean (average) of 70.67, with a minimum score of 60 and a maximum score of 85. Meanwhile, the posttest score of the control class of 35 students has a mean (average) of 63.33, with a minimum score of 50 and a maximum score of 85.

Prerequisite Test

Normality Test

A normality test was conducted to determine whether the data were normally distributed. The Kolmogorov-Smirnov test was used to test the pretest and posttest data for the experimental and control classes using SPSS. A significance value >0.05 indicates a normal distribution, and a significance value <0.05 indicates a non-normal distribution. The results of the normality test in this study are as follows:

Table 6. Pretest & Posttest Normality Test Results

Tests of Normality				
		Kolmogorov-Smirnov[a]		
Class		**Statistic**	**df**	**Sig.**
Narrative Writing Skills	*PreTestEksperimen*	0,107	30	,200*
	PostTestEksperimen	0,139	30	0,143
	PreTestKontrol	0,123	27	,200*
	PostTestKontrol	0,165	27	0,056

Based on the results of the normality test above, the significance value of the experimental class pretest = 0.200 > 0.05, the control class pretest = 0.200 > 0.05, the experimental class posttest = 0.143 > 0.05, and the control class posttest = 0.056 > 0.05. These results indicate that the data is normally distributed.

Homogeneity Test

A homogeneity test was conducted to determine whether the data came from the same variant. The homogeneity test was conducted on the pretest data from the experimental and control classes using SPSS. If the significance value is >0.05, the data is homogeneous, and if the

significance value is <0.05, the data is not homogeneous. The results of the homogeneity test in this study are as follows:

Table 7. Pretest Homogeneity Test Results

Test of Homogeneity of Variances					
		Levene Statistic	**df1**	**df2**	**Sig.**
Narrative Writing Skills	*Based on Mean*	0,120	1	55	0,730
	Based on Median	0,124	1	55	0,726
	Based on Median and with adjusted df	0,124	1	54,888	0,726
	Based on trimmed mean	0,129	1	55	0,720

Based on the results of the pretest homogeneity test of the experimental class and the control class, the significance value was 0.730 > 0.05, so the data came from the same variance (homogeneous).

Hypothesis Testing

Hypothesis testing is carried out to test the previously formulated hypothesis, namely:

Table 8. Hypothesis Testing

Null hypothesis (Ho)	:	There is no influence of AI-based Deep Learning on narrative writing skills in elementary school students.
Ho	:	$\mu \neq 0$
Alternative hypothesis (Ha)	:	There is an influence of AI-based Deep Learning on narrative writing skills in elementary school students.
Ha	:	$\mu = 0$

The hypothesis testing in this study used the Independent Samples t-test with SPSS. The results of the hypothesis testing are as follows:

Tabel 9. Hypothesis Test Results

Independent Samples Test					
t-test for Equality of Means					
	t	**df**	**Sig. (2-tailed)**	**Mean Difference**	**Std. Error Difference**
Equal variances assumed	3,472	55	0,001	7,333	2,112
Equal variances not assumed	3,420	47,836	0,001	7,333	2,145

From the hypothesis test table above, a 2-tailed significance value of 0.001 and t count of 3.472 were obtained. Based on the decision-making of the Independent Samples Test t test, the sig value of 0.001 <0.05 and t count of 3.472> t table 2.0024 (can be seen in the t distribution table), it can be concluded that Ho is rejected and Ha is accepted, meaning that there is an influence of AI-based Deep Learning on narrative writing skills in elementary school students.

5. Comparison

The discussion on the influence of AI-based Deep Learning on narrative writing skills for elementary school students shows significant results both theoretically and practically. The results of this study empirically reinforce the findings of previous studies that confirmed that the application of Artificial Intelligence (AI)-based technology has a positive impact on students' writing skills. The significant increase in narrative writing skills in the experimental group indicates that AI-based Deep Learning can improve the quality of elementary school students' writing. This finding aligns with a study by (Warschauer, M., & Grimes, 2008) which showed that digital technology can increase the complexity and coherence of students' writing. Furthermore, a study by (Cotos, 2014) also found that AI-based systems can help students understand text structure more systematically. Another study by Li et al., (2021) confirmed that the use of AI in language learning improves the quality of ideas and writing organization. Thus, the results of this study do not stand alone but reinforce existing empirical evidence. This reinforcement is significant because the research context was conducted on elementary school students. Most previous studies have focused on secondary and higher education. Therefore, this study extends the validity of previous findings to the context of early literacy. It confirms the relevance of AI for use starting in elementary education.

The practical contribution of this research is a recommendation to strengthen the theoretical approach of Deep Learning in education that emphasizes meaningful and reflective learning. The improvement of students' narrative writing skills indicates that students do not simply memorize text structures but are able to transform ideas into coherent writing. This finding aligns with research by Fullan et al., (2018) which states that Deep Learning encourages high-level cognitive engagement. A study by Hattie, J., & Donoghue, (2016) also confirmed that deep learning contributes to improved literacy skills. In the context of writing, Deep Learning helps students integrate ideas, language, and structure. AI support strengthens the process of reflection and revision of students' writing. Thus, this research supports the competency-based learning paradigm. This finding also emphasizes the importance of an adaptive pedagogical approach. AI functions as a supporting tool, not a substitute for the learning process. Therefore, this research enriches the discourse on Deep Learning in elementary education.

In terms of practical contributions, this study provides concrete recommendations for teachers in teaching narrative writing. AI-based deep learning integration can be used as an aid during the prewriting, drafting, and text revision stages. AI helps students obtain early feedback on the structure, vocabulary, and coherence of their writing. This finding aligns with research by Zhao et al. (2021) which states that AI is effective as scaffolding in writing learning. Another study by Markauskaite et al. (2022) also shows that AI improves the efficiency of the literacy learning process. With AI, teachers can shift their focus to conceptual guidance, enabling more student-centered learning. AI also helps address differences in writing abilities among students. Therefore, this study has practical implications. AI integration can be an innovative strategy in teaching writing in elementary schools.

Another practical contribution is strengthening the role of teachers as learning facilitators. This study shows that the use of AI does not replace the role of teachers in writing learning. Teachers still play a crucial role in providing conceptual guidance and reflective evaluation. AI only functions as a technical tool that supports students' learning processes. This finding aligns with research by Holmes et al. (2019), which emphasizes the importance of teachers' roles in AI-based learning. A study by Luckin et al. (2016) also emphasized that AI must be used pedagogically and ethically. Therefore, collaboration between teachers and technology is key to successful learning. AI enhances personalized learning. Teachers can adjust teaching strategies based on students' needs. Therefore, this study provides practical guidance for implementing AI in the classroom. This approach is relevant to the demands of 21st-century education.

The main novelty of this research lies in the experimental application of AI-based Deep Learning to elementary school students' narrative writing. Previous research has been conducted primarily in higher education and foreign language learning. This study fills this research gap by highlighting the context of basic literacy. The findings suggest that AI is also effective for early childhood students. With a systematic experimental design, this study provides strong empirical evidence. This novelty is crucial for the development of technology-based educational research. AI has been shown to support the development of early writing skills, broadening the scope of AI applications in education. This research is also relevant to the digital transformation agenda of education. Therefore, this research makes a significant contribution to the educational literature. This novelty strengthens the research's position within the context of reputable journals.

Despite showing significant results, this study has major limitations related to the time and duration of implementation. The learning intervention was conducted over a relatively short period. The measured impact was limited to short-term improvements in writing skills. The process of mastering writing skills requires continuous time. Therefore, the results of this study do not fully describe the long-term impact. This limitation aligns with the findings of Graham et al. (2012) who stated that writing development requires repeated practice. The short duration of the study limited the process of internalizing skills. This needs to be considered in interpreting the results. Generalization of the findings must be done carefully. Therefore, time constraints are an important consideration in this study. The limited duration of the study also limited the optimal exploration of AI's potential by students. Students were not yet fully accustomed to using AI as

a writing reflection tool. The process of adapting to technology requires more time. This can impact the stability of writing skill improvement. A study by van Dijk (2020) shows that the adaptation of educational technology is gradual. With a longer duration, students have the potential to derive more optimal benefits. This study did not examine the longitudinal impact of AI use. Therefore, the results are preliminary. Further research with a longer duration is highly recommended. This is crucial for obtaining a more comprehensive picture of the impact.

In addition to time constraints, this study was also limited to a single elementary school context. Variations in student characteristics and learning environments were not fully accounted for. This could impact the generalizability of the study's findings. A study by Creswell and Plano Clark (2018) emphasized the importance of replicating the study across diverse contexts. Further research could involve more schools, allowing for a more comprehensive analysis. Furthermore, variations in AI models could be explored. This study utilized only one AI approach. Variations in technology could lead to different results. Therefore, the limited context is an important consideration, opening up opportunities for further research. Overall, this study provides empirical, practical, and theoretical contributions to narrative writing instruction in elementary schools. The findings reinforce previous research on the effectiveness of AI in education. The practical contribution of this research provides applicable recommendations for teachers. Its novelty lies in the context of basic literacy and experimental design. Despite its limitations, this research still has significant implications. This research is relevant to the digital transformation agenda in education. AI has been proven to support the improvement of students' writing skills. With the right pedagogical approach, AI can be optimally utilized. This research is expected to serve as a reference for further studies. Therefore, this research has strategic value in the development of technology-based education.

6. Conclusion

This study concludes that the application of Artificial Intelligence (AI)-based Deep Learning has a positive and significant impact on improving elementary school students' narrative writing skills. The integration of AI in writing learning has been shown to support students' higher-order thinking processes, from idea planning and plot development to reflective text revision. These findings strengthen empirical evidence from previous research and broaden the scope of AI's application in basic literacy contexts. In addition to improving the quality of written work, the use of AI also encourages active engagement and independent learning in students. With the right pedagogical approach, AI serves as a supporting tool that enriches the learning experience, not as a substitute for the role of teachers. Therefore, this study confirms the relevance of AI-based Deep Learning as an innovative strategy in writing learning in the digital era.

However, this study still has limitations, particularly related to the relatively short duration of the learning intervention and the limited scope of the study. These limitations open up opportunities for further research to explore the long-term impact of AI use on the development of students' writing skills, as well as its application in more diverse contexts and educational levels. Further research is also recommended to examine variations in AI models and different pedagogical strategies to gain a more comprehensive understanding. Practically, the results of this study are expected to serve as a reference for educators and policymakers in designing adaptive, ethical, and sustainable literacy learning. Thus, the use of AI in education can be optimally directed to support the holistic and sustainable development of students' literacy competencies.

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