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Article

The Effectiveness of Gemini AI-Generated Imagery towards Junior High School Students Writing Skills

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A B S T R A C T

This study investigates the effect of Gemini AI-generated imagery on junior high school students' descriptive writing skills. Gemini-generated visuals are hypothesized to help students generate ideas, enrich vocabulary, and develop more detailed descriptions by providing concrete visual prompts. The researchers employed a pre-experimental method using one-group pretest–posttest design to determine the effect of Gemini AI-generated imagery on students' descriptive writing performance. The study involved 30 seventh-grade students and was conducted over five meetings, consisting of one pre-test session, three treatment sessions, and one post-test session. Before the treatment, the students' mean pretest score was 60.58. After the treatment, the mean posttest score increased to 67.78, resulting a mean gain of 7.20 points. A paired-samples t-test indicated a statistically significant improvement ($p < .001$), with a large effect size ($d = 1.34$). The study concludes that integrating Gemini AI-generated imagery into writing instruction can effectively improve students' descriptive writing skills.

Keywords: *AI-Generated Imagery, Descriptive Text, Writing Skill*

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INTRODUCTION

Writing is widely regarded as one of the most challenging language skills for EFL learners because it requires students to generate ideas, organize thoughts, and express meaning clearly through a continuous process (Herman et al., 2023). In recent years, language learning has increasingly been viewed as multimodal, in which meaning is constructed not only through written language but also through interaction with other modes such as images (Kress, 2009). From a multimedia learning perspective, learners tend to understand information more effectively when verbal input is supported by relevant visuals (R. Mayer, 2009). In writing instruction, visual support can reduce cognitive load and assist students in idea generation and content organization, which is particularly important for descriptive writing that requires learners to transform mental images into written descriptions (Kress, 2009; R. Mayer, 2009).

Developing writing skills also demands sustained practice and the integration of multiple language components. Nunan (2003) emphasizes that writing proficiency is achieved through time and continuous effort, while Heaton (1988) highlights that effective writing requires the integration of content, organization, vocabulary, language use, and mechanics into a coherent text. These components often pose serious challenges for junior high school students, especially in descriptive writing tasks that require detailed observation and precise expression(Heaton, 1988; Nunan, 2003). This aligns with the Kurikulum Merdeka, which expects junior high school students to be able to produce various genres, including descriptive texts (Kementerian Pendidikan Riset, dan Teknologi Republik Indonesia, 2024).

In the Indonesian junior high school context, particularly in Surabaya, visual learning has been reported as a dominant learning preference. Rohmah et al. (2025) found that junior high school students in Surabaya showed better comprehension and engagement when English materials were supported by images and visual representations. This suggests that

visually enriched support is pedagogically relevant for younger learners who benefit from concrete input when producing written descriptions (Rohmah et al., 2025).

Despite the importance of descriptive writing, many students still struggle and find writing tasks confusing. Students often have difficulty starting a paragraph, deciding what to write next, and completing their ideas due to problems in idea generation, organization, and precise vocabulary choice (Agustin et al., 2022). Their texts may lack coherence, emotional depth, and detailed descriptions (Bernieke et al., 2023; Yuniar & Siswana, 2023). Traditional textbook-based prompts may also fail to engage students meaningfully (Hu, 2024), especially for learners who need concrete visual stimuli to spark imagination, as visual aids can be more effective in encouraging creativity in writing (Hussein et al., 2023). In a local context, Pratiwi & Trisusana (2024) reported that seventh-grade students in Surabaya commonly experienced difficulties in generating ideas, organizing texts, and enriching vocabulary, while textbook-based learning reduced motivation and creativity.

To address these issues, educators have increasingly explored the integration of Artificial Intelligence (AI) in education. AI integration is reported to bring substantial impacts on teaching and learning processes (S. Wang et al., 2024), including supporting creativity, independent thinking, and collaboration (Haase & Pokutta, 2024). In writing instruction, AI tools can assist learners by supporting vocabulary development Nga & Dang (2024) and idea generation through interactive feedback (C. Wang, 2024). Complementing these findings, recent classroom-based evidence suggests that AI can function as a supportive writing companion by facilitating idea elaboration, drafting, and language refinement in EFL contexts (Azizah et al., 2025). However, the adoption of AI should be approached responsibly because AI-generated outputs may not always be verified or contextually appropriate (Longpre et al., 2024), and educators are expected to guide ethical and critical use aligned with curriculum goals (Kamali et al., 2024).

One widely discussed AI application is AI-generated imagery. As of 2024, the volume of AI-generated images has increased rapidly, indicating the widespread adoption of AI for visual content creation (Photoroom, 2024). In educational settings, visual prompts can anchor students' imagination and help them describe scenes, objects, or characters with greater clarity (Marpaung, 2021). Tafonao (2018) also argues that visual media can boost motivation and help students represent abstract concepts more effectively. AI-generated images can therefore function not only as inspiration but also as scaffolds that support richer, more structured descriptive writing.

In this study, the visual prompts were produced using Gemini. Gemini AI-generated imagery refers to visual content created through Google's Gemini platform, which generates images from user prompts and can support writing by helping students visualize ideas, generate richer content, apply more precise vocabulary, and organize descriptions more coherently (Cloud, 2025). This is consistent with Dual Coding Theory, which explains that learning improves when information is processed through both verbal and non-verbal systems (Paivio, 1986), and is supported by multimedia learning evidence suggesting that combining words and relevant visuals leads to deeper understanding than text-only input (R. E. Mayer, 2024).

The present study is also grounded in the Cognitive Theory of Multimedia Learning (R. Mayer, 2009), which proposes that learners understand information more effectively when verbal and visual materials are presented together. In descriptive writing, AI-generated imagery can provide meaningful visual representations that help students generate ideas, organize information, and select appropriate vocabulary. This perspective is further supported by Dual Coding Theory (Paivio, 1986), which explains that learning is enhanced when information is processed through both verbal and non-verbal systems. Therefore, Gemini AI-generated imagery is expected to facilitate descriptive writing by strengthening the connection between visual observation and written expression.

Although research on AI in writing has grown, most studies have focused on higher education and have primarily examined text-based AI tools or AI integrated within broader instructional approaches. Zahari et al. (2025) reported significant improvement in university

students' descriptive writing using AI image generators, while Najah & Ghozali (2024) highlighted ChatGPT's role in supporting brainstorming and text organization. However, evidence remains limited regarding the use of AI-generated imagery specifically for junior high school students' descriptive writing, particularly when AI-generated images are used as independent visual stimuli rather than as part of a larger intervention. This study addresses that gap by examining Gemini AI-generated imagery as a stand-alone visual prompt to support seventh-grade students' descriptive writing development.

METHOD

Research Design

This study adopted a quantitative approach to investigate the effect of Gemini AI-generated imagery on junior high school students' descriptive writing skills. Quantitative research is used to evaluate objective theories by analyzing relationships among measurable variables that can be systematically assessed through statistical techniques (Creswell & Creswell, 2022). In line with this purpose, the present study applied a pre-experimental method.

The researchers employed a one-group pretest–posttest design conducted over five meetings, consisting of one pretest session, three treatment sessions implementing Gemini AI-generated imagery during the instructional process, and one posttest session. The initial pretest was administered to determine students' baseline level of descriptive writing proficiency, while the posttest measured students' writing performance after the treatment. The improvement was examined by comparing students' pretest and posttest scores within the same group.

Population and Sample

The study was carried out among seventh-grade students at a junior high school in Surabaya, East Java. Data collection was embedded within routine English instructional sessions. The research was implemented within 2 months and involved three seventh-grade classes, yielding a total study population of 90 students. The researchers only chose one class as the sample using convenience sampling due to accessibility and feasibility, with a total of 30 students.

Research Instruments

To measure changes attributable to the intervention, the researchers administered a pretest and a posttest as the study's main instruments. Creswell & Creswell (2022) notes that in quantitative research, variables are typically measured using instruments so that numerical data may be examined through appropriate statistical techniques. Students completed the tests individually in the form of performance tasks, responding to situational prompts prepared by the teacher and designed in accordance with the study objectives and the defined research topic. To establish the instrument's appropriateness, the researchers examined face and content validity through expert judgment from an eighth-grade English teacher at a junior high school in Surabaya, who was familiar with the students' abilities and could assess whether the tasks were appropriate for the target participants.

Validity and Reliability of the Instruments

Brown & Abeywickrama (2018) emphasize that validity is a critical component in developing a well-designed assessment tool. Validity refers to how well an instrument measures what it is intended to measure (Ary et al., 2009). Therefore, the researchers evaluated the instrument's validity using expert judgment through content validity and face validity to ensure that the writing tasks, instructions, and scoring rubric were appropriate and aligned with the research objectives (L. Cohen et al., 2018).

In addition, the researchers applied inter-rater reliability to strengthen scoring consistency, as reliability concerns the stability of an instrument's results (Creswell, 2012). Two raters independently assessed students' pretest and posttest writing using the same analytic

scoring rubric adapted from Jacobs et al. (1981), Each student's final score was derived by averaging the ratings assigned by the two assessors. To evaluate consistency between raters, the researchers intended to compute the Intraclass Correlation Coefficient (ICC) using the raters' scoring data.

Data Analysis Technique

The results were derived from systematically analyzing, calculating, and interpreting the dataset, then translating the SPSS outputs into descriptive statements outlining the computation process. Differences between two paired measurements were examined using a paired-samples t-test to evaluate the hypothesis and answer the research question. The paired-samples t-test is employed to test for a significant change in mean scores when the same individuals are assessed twice, such as prior to and following a treatment (Pallant, 2020).

Normality testing aimed to verify whether the pretest and posttest data originated from a population that follows a normal distribution. Because the total sample comprised fewer than 50 participants, the Shapiro–Wilk procedure was employed using a significance level of $\alpha = 0.05$. (Avram & Măruşteri, 2022). The data were considered normally distributed when the normality test produced a significance value greater than the alpha level of 0.05 ($p > \alpha = 0.05$). This indicates that the assumption of normality was satisfied. In contrast, when the significance value was below 0.05 ($p < \alpha = 0.05$), the data were interpreted as not normally distributed, meaning the normality assumption was not met. The researchers assessed the magnitude of the treatment effect using Cohen's d (J. Cohen, 1988). The interpretation guideline of Cohen's d is presented in Table 1.

Table 1. Interpretation of Cohen's d Effect Size

Cohen's d (d)	ES Interpretation
0.20 – 0.50	Small effect
0.51 – 0.80	Medium effect
> 0.81	Large effect

FINDINGS AND DISCUSSION

Finding

Before the implementation of Gemini AI-generated imagery as the instructional treatment, the students' pre-test results (N = 30) showed a mean score of 60.58 (SD = 5.68). After three treatment sessions using Gemini-generated visual prompts, the students' post-test results increased to a mean score of 67.78 (SD = 5.09). This shows an improvement in students' descriptive writing performance, with a mean gain of 7.20 points from pre-test to post-test. A paired-samples t-test further confirmed that the difference was statistically significant, $t(29) = -6.433$, $p < .001$. Additionally, the lower standard deviation in the post-test indicates that students' scores became slightly more consistent after the treatment. Overall, these descriptive results suggest that Gemini AI-generated imagery may have supported students in idea generation, coherent organization of descriptions, and the use of more precise and context-appropriate vocabulary when writing descriptive texts.

Table 2. Mean Score of Pre-Test and Post-Test

	Pre-test	Post-test
N	30	30
Mean	60.583	67.783
Std. Deviation	5.6813	5.0934

Reliability Test

Inter-rater reliability was examined to ensure consistent scoring between the two raters who assessed students' descriptive writing using the same analytic scoring rubric adapted from Jacobs et al. (1981). The reliability analysis was conducted using the Intraclass Correlation

Coefficient (ICC) in SPSS. The results showed strong agreement between the raters, as presented in Table 3.

Table 3. Inter-rater Reliability Test using ICC

	Intraclass Correlation[b]	95% Confidence Interval		F Test with True Value 0			
		Lower Bound	Upper Bound	Value	df1	df2	Sig
Single Measures	.906[a]	.793	.956	23.261	29	29	.000
Average Measures	.951[c]	.885	.978	23.261	29	29	.000

The Average Measures ICC (0.951) shows that the two raters were highly consistent when scoring the students' writing, meaning the averaged scores used in this study can be treated as dependable. The 95% confidence interval (0.885–0.978) stays high even at its lowest point, which supports the strength of the agreement, and the result is statistically significant ($p < .001$), indicating it is unlikely to have occurred by chance. This aligns with (Cicchetti, 1994), who categorizes ICC values from 0.75 to 1.00 as excellent reliability.

Normality Test

This study utilized quantitative data analysis. Before performing the paired-samples t-test, a normality assessment was undertaken to verify that the pretest and posttest scores approximated a normal distribution. Considering that the total sample comprised fewer than 50 participants, the Shapiro–Wilk test was selected and evaluated at the 0.05 significance level ($\alpha = 0.05$). (Avram & Măruşteri, 2022).

Table 4. Normality Test Output

	Kolmogorov-Smirnov[a]			**Shapiro-Wilk**		
	Statistic	df	Sig.	Statistic	df	Sig.
Pre-test	.109	30	.200*	.948	30	.154
Post-test	.134	30	.179	.953	30	.202

Hypothesis Test

Following the normality assessment, the researchers advanced to hypothesis testing. A hypothesis is a provisional statement that posits a relationship among variables (Ary et al., 2009). In this study, hypothesis testing aimed to determine whether the use of Gemini AI–generated imagery enhanced students' descriptive writing performance. To evaluate this assumption, students' scores obtained before and after the intervention were compared using a paired-samples t-test, a parametric procedure designed to examine mean differences between two related (matched) sets of scores. Accordingly, a paired-samples t-test was performed in SPSS, and the results are presented in the table below.

Table 5. Paired Sample T-test

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pre-test - Post-test	-7.2000	6.1302	1.1192	-9.4891	-4.9109	-6.433	29	<.001

Based on Table 5, the paired-samples t-test indicates that students' post-test performance exceeded their pre-test performance, as evidenced by the mean difference of -7.20 (Pre-test – Post-test). This negative mean difference signifies an increase in scores

following the treatment. Moreover, the result demonstrates a statistically significant difference, t(29) = -6.433, p < .001 (2-tailed), showing that the probability value is well below the 0.05 threshold. Accordingly, it can be inferred that the implementation of Gemini AI-generated imagery produced a significant improvement in students' descriptive writing scores. Therefore, the null hypothesis (H0) is rejected, while the alternative hypothesis (Ha) is accepted, indicating that the treatment had a meaningful effect on students' writing performance.

Effect Size

To determine the magnitude of the intervention's impact, the researchers computed the effect size using Cohen's d (J. Cohen, 1988), a statistic that expresses the difference between two means in standardized units. While the paired-samples t-test determines whether the observed difference is statistically significant (through the p-value), it does not explain how substantial the improvement is in practical terms. Therefore, Cohen's d was employed to quantify the extent to which Gemini AI-generated imagery influenced students' descriptive writing scores from the pre-test to the post-test.

$$d = \frac{M_{post} - M_{pre}}{SD_{pooled}}$$

In this study, the post test mean score was 67.78, while the pre test mean score was 60.58. The pooled standard deviation was 5.39. Therefore, the effect size calculation is presented as follows:

$$d = \frac{67.78 - 60.58}{5.39} = \frac{7.20}{5.39} = 1.34$$

Based on the calculation above, the effect size value is d = 1.34, which falls into the large category according to Cohen (1988) criteria. This indicates that Gemini AI-generated imagery had a substantial impact on improving students' descriptive writing performance, suggesting that the visual prompts meaningfully supported students in generating ideas, developing more detailed descriptions, and producing higher-quality descriptive texts.

Discussion

The findings of this study provide evidence that the use of Gemini AI-generated imagery exerted a positive and statistically significant effect on junior high school students' descriptive writing skills. Quantitatively, students' mean writing score increased from 60.58 in the pre-test to 67.78 in the post-test, resulting in a mean gain of 7.20 points across 30 participants (N = 30). This improvement represents an increase of approximately 12% from the initial mean score. At the 0.05 significance level (α = 0.05), the paired-samples t-test indicated that the mean difference between pretest and posttest scores was statistically significant. In addition, the standard deviation decreased from 5.68 to 5.09 (−0.59), indicating that students' writing performance became more consistent after the intervention, suggesting not only higher achievement but also reduced variability among learners.

The findings of the present study are consistent with earlier research showing that AI-based visual support can strengthen students' performance in descriptive writing. In particular, this study aligns with Zahari et al. (2025), who reported significant improvements in students' descriptive writing after integrating AI image generators, especially in content development, organizational clarity, and vocabulary richness. Similarly, the current study recorded a meaningful overall gain of 7.20 points, suggesting that AI-generated imagery functions as an effective stimulus that helps students translate visual details into written descriptions. Moreover, the present findings are also consistent with Sa'adah et al. (2025), who highlighted that AI-powered tools facilitate learning through features such as instant feedback and flexibility, which can support learners' engagement and self-directed learning during instructional activities.

The improvement in this study was most visible in higher-order writing components, particularly content, organization, and vocabulary. The use of Gemini-generated imagery

encouraged students to describe objects and situations in a more structured way, often following a general-to-specific. The visual prompts also supported idea generation by giving students a concrete reference from which to develop descriptions, making it easier to elaborate content and maintain coherence throughout the text. Rather than generating ideas entirely from memory, students could rely on visible details presented in the images. This likely reduced the cognitive effort required to imagine content and decide what to write, allowing them to devote more attention to organizing and expanding their descriptions. This contributed to the observed gain in organization scores (+1.70) and helped students produce more coherent and readable descriptive texts. This outcome is consistent with the writing framework proposed by Jacobs et al. (1981), which emphasizes content and organization as central indicators of writing quality. Similar results were also reported by Ammade et al. (2025), who found that AI-assisted visual tools supported clearer sequencing of ideas and improved coherence in students' written work.

Vocabulary development showed the strongest improvement (+2.49), indicating that Gemini imagery supported students in selecting more accurate and specific words. The increase may be explained by how students interacted with the images during the learning process: visual prompts helped them notice concrete details (shape, color, setting, actions), which then pushed them to use more precise nouns and descriptive adjectives rather than relying on generic words such as good or beautiful. This suggests that Gemini-generated imagery activated students' vocabulary knowledge by providing concrete visual cues that prompted the retrieval and use of more specific lexical items during writing. This finding supports Zahari et al. (2025), who also observed increased lexical variety after using AI-generated visuals, and Amini (2025), who emphasized that AI-supported learning environments can promote creativity and richer language production. In addition, Berg (2024) suggested that generative AI visuals can increase engagement and strengthen memory retention, which may help explain students' improved ability to recall and apply descriptive vocabulary during writing tasks.

However, improvement in accuracy-focused components was relatively smaller than gains in idea-focused aspects. Although language use (+1.38) improved moderately, mechanics (+0.17) showed only slight growth. This pattern suggests that AI-generated imagery is highly effective as visual scaffolding for idea development, elaboration, and organization, but it does not directly teach grammar rules or provide corrective feedback on punctuation and spelling. Therefore, limited improvement in mechanics is understandable unless image-based writing activities are paired with explicit grammar instruction, guided editing, and mechanics-focused practice. This pattern is consistent with Najah & Ghozali (2024), who reported that AI tools tend to support brainstorming, vocabulary, and structural development more strongly than grammatical precision. In other words, Gemini imagery helps students generate and organize meaning, but teacher guidance remains crucial to strengthen accuracy.

From a pedagogical perspective, these findings support the integration of Gemini AI-generated imagery within the Kurikulum Merdeka, which emphasizes creativity, critical thinking, and student-centered learning. The visual prompts encouraged students to become more active participants in the writing process because they could observe, interpret, and evaluate their own writing based on clear visual references. This supports the view of Graham & Harris (2000) that effective writing instruction should promote student autonomy and self-regulation through structured support. In the current study, Gemini imagery served as that support by making writing qualitative tasks more accessible and encouraging students to explore ideas independently while still working within teacher-guided instruction.

Despite these encouraging outcomes, several limitations should be acknowledged. The study used a one-group pre-test–post-test design without a control group, and the sample was limited to 30 students from a single class (N = 30). These constraints reduce the generalizability of the findings and limit causal claims. Future research should apply stronger designs such as quasi-experimental or true experimental studies with control groups and larger samples. It is also recommended to include evidence (e.g., interviews, student reflections, or classroom

observation) to gain deeper insight into how students perceive AI-generated imagery and how it influences their motivation and writing strategies. Based on this research, it is suggested that Gemini AI-generated imagery functions as a powerful visual scaffold that significantly enhances students' descriptive writing performance, particularly in vocabulary, organization, and content, while also highlighting the continued need for targeted instructional support to improve grammar accuracy and mechanics.

CONCLUSIONS

This study demonstrates that Gemini AI-generated imagery effectively supports junior high school students' descriptive writing development in EFL classrooms. The findings show significant improvements in students' ability to generate ideas, organize descriptions coherently, and use more varied vocabulary, resulting in better overall writing performance with a large practical effect. The greatest gains were observed in content, organization, and vocabulary, suggesting that AI-generated visual prompts helped students develop richer and more logical descriptions. However, improvements in grammar and mechanics were less substantial, indicating the need for continued explicit instruction and guided revision. These findings suggest that Gemini AI-generated imagery can serve as an effective supplementary resource for descriptive writing instruction by providing concrete visual stimuli that encourage creativity and reduce students' difficulty in generating ideas. Despite these positive outcomes, the study was limited by the use of a one-group pre-test–post-test design and a single-class sample. Future research should employ experimental designs with larger samples and explore the application of AI-generated imagery across other language skills and learning contexts.

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