



The Effect of AI-Assisted Multimodal Storytelling on Elementary School Students' Narrative Writing Skills

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Abstract: This study aims to examine the effect of AI-assisted multimodal storytelling on elementary school students' narrative writing skills. The study employed a quantitative approach with a quasi-experimental design involving an experimental group and a control group. The participants were 60 elementary school students, comprising 30 students from SD Negeri 45 Banda Aceh in the experimental group and 30 students from SD Negeri 16 Banda Aceh in the control group. Data were collected through narrative writing tests administered before and after the intervention. The data were analyzed using descriptive statistics, including mean scores, standard deviations, and learning mastery percentages, as well as inferential statistics using independent-samples and paired-samples t-tests. The findings showed that students who received AI-assisted multimodal storytelling instruction achieved substantially higher narrative writing performance than those who received conventional instruction. The experimental group obtained a mean posttest score of 89.81, compared with 61.53 in the control group. The experimental group also demonstrated a lower standard deviation, indicating a more consistent distribution of students' writing performance, and achieved a higher learning mastery percentage of 91.76%, compared with 68.29% in the control group. The prerequisite analyses indicated that the data were normally distributed and that the group variances were homogeneous. Furthermore, the independent-samples and paired-samples t-tests yielded a significance value of 0.000, indicating statistically significant differences and improvements in narrative writing performance. These findings suggest that AI-assisted multimodal storytelling can serve as a promising instructional approach for supporting elementary school students' narrative writing development by providing opportunities for idea generation, multimodal representation, and active engagement in the writing process.

Keywords: AI-assisted multimodal storytelling, elementary school students, narrative writing skills, learning media.

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INTRODUCTION

Narrative writing is one of the fundamental language skills that elementary school students must master because it enables them to express ideas, organize experiences, and communicate meaning through coherent written texts. Within the context of primary education, narrative writing contributes not only to linguistic development but also to

cognitive, social, and emotional growth. Students who possess strong narrative writing skills tend to demonstrate better abilities in organizing ideas, constructing logical sequences of events, and communicating personal perspectives effectively. Consequently, the development of narrative writing skills has become an important objective in language education curricula worldwide (Graham et al., 2020; Kim et al., 2021).

Despite its importance, many elementary school students continue to experience difficulties in narrative writing. Previous studies have reported that students often struggle to generate ideas, organize story structures, develop characters, and use appropriate vocabulary and grammar in written narratives (Dockrell et al., 2019; Graham & Harris, 2018). These challenges frequently result in narrative texts that lack coherence, creativity, and completeness. In many classrooms, writing instruction remains dominated by conventional approaches that emphasize final products rather than the writing process itself, limiting opportunities for students to engage actively in meaningful writing experiences (Troia et al., 2019).

The situation is similarly evident in Indonesia, where literacy achievement remains a major educational concern. Several national and international assessments have indicated that Indonesian students continue to face challenges in literacy-related competencies, including written communication and text production (OECD, 2019; Kemendikbudristek, 2022). These findings suggest the need for innovative instructional approaches capable of supporting students in developing higher-quality writing skills from an early age.

Recent developments in educational technology have opened new possibilities for improving literacy instruction. The integration of digital technologies into language learning has transformed traditional pedagogical practices by providing students with more interactive, engaging, and personalized learning experiences (Trust et al., 2023; Luckin et al., 2022). Technological innovations have become particularly relevant in the era of digital-native learners, who are accustomed to interacting with multimodal information environments consisting of text, images, audio, video, and interactive media.

One emerging approach that has attracted increasing attention is multimodal storytelling. Multimodal storytelling refers to the creation and presentation of stories through multiple modes of communication, including written text, visual images, audio narration, animations, and digital interactions (Mills & Unsworth, 2018; Hafner & Ho, 2020). By combining various modes of representation, multimodal storytelling provides learners with richer opportunities to construct meaning and express ideas creatively.

Research has demonstrated that multimodal storytelling can positively influence students' literacy development. The integration of visual and auditory elements helps learners organize ideas more effectively, enhances motivation, and supports deeper engagement with narrative structures (Robin, 2016; Yang & Wu, 2021). Furthermore, multimodal storytelling encourages students to become active creators rather than passive consumers of information, thereby fostering higher levels of creativity and communication skills. In elementary education, storytelling has long been recognized as a powerful pedagogical tool. Storytelling allows students to connect personal experiences with academic content while promoting imagination, language development, and critical thinking (Isbell et al., 2018; Nikolajeva, 2021). The incorporation of digital and multimodal components into storytelling activities further expands its educational potential by enabling learners to represent ideas in more diverse and meaningful ways.

The growing advancement of artificial intelligence (AI) has introduced new dimensions to educational innovation. AI technologies are increasingly being integrated into educational environments to support learning, assessment, and instructional design (Holmes et al., 2022; Zawacki-Richter et al., 2019). AI systems can provide adaptive learning experiences, personalized feedback, automated content generation, and intelligent tutoring support that may enhance student learning outcomes. In the field of language education, AI has shown significant potential for supporting writing instruction. AI-powered tools can assist students in generating ideas, organizing content, improving

grammar, refining vocabulary, and receiving immediate feedback on their writing products (Kasneci et al., 2023; Tlili et al., 2025). Such support is particularly valuable for young learners who often encounter difficulties during the planning and drafting stages of writing.

The emergence of generative AI technologies has accelerated interest in AI-assisted writing environments. Tools powered by large language models can help learners brainstorm story ideas, develop narrative plots, and explore alternative expressions while maintaining student involvement in the writing process (Lo, 2023; Kohnke et al., 2024). Rather than replacing human creativity, AI can function as a cognitive partner that scaffolds students' writing development.

The integration of AI with multimodal storytelling creates a particularly promising instructional approach. AI-assisted multimodal storytelling combines the creative affordances of multimodal narratives with the adaptive and supportive capabilities of artificial intelligence. Through this integration, students can generate ideas more efficiently, visualize story concepts, receive writing support, and construct richer narrative texts that incorporate multiple forms of expression (Chiu, 2024; Chen et al., 2024). From a theoretical perspective, AI-assisted multimodal storytelling aligns with constructivist learning theory, which emphasizes active knowledge construction through meaningful learning experiences (Piaget, 1972; Vygotsky, 1978). The approach enables students to engage in authentic narrative creation processes while interacting with digital tools that support cognitive development and collaborative meaning-making.

The approach is also consistent with multimodal literacy theory, which argues that literacy in the twenty-first century extends beyond traditional print-based communication and includes the ability to interpret and create meaning across multiple modes of representation (Kress, 2018; Cope & Kalantzis, 2023). Therefore, integrating AI-assisted multimodal storytelling into language learning reflects contemporary understandings of literacy development.

Several recent studies have reported positive outcomes associated with digital storytelling and multimodal literacy interventions. Digital storytelling has been found to improve writing quality, creativity, motivation, and engagement among elementary school students (Smeda et al., 2021; Hava, 2021). Likewise, multimodal literacy instruction has been associated with enhanced narrative competence and communication skills (Rowell & Walsh, 2019; Lim et al., 2022).

Research examining AI in primary education has also reported encouraging findings. AI-supported learning environments have been shown to enhance student engagement, provide personalized feedback, and improve academic achievement across various subject areas (Chen et al., 2020; Fatmawati et al., 2024). However, empirical studies specifically investigating the influence of AI-assisted multimodal storytelling on narrative writing skills in elementary schools remain limited, particularly within the Indonesian context.

The limited availability of empirical evidence represents a significant research gap. Existing studies have generally focused on digital storytelling, AI-assisted writing, or multimodal literacy separately. Few investigations have examined the combined implementation of AI technologies and multimodal storytelling as an integrated instructional intervention designed specifically to enhance elementary students' narrative writing skills (Kasneci et al., 2023; Chiu, 2024). Furthermore, most previous studies have been conducted in secondary or higher education settings, while research involving elementary school learners remains relatively scarce (Zawacki-Richter et al., 2019; Tlili et al., 2025). Given the developmental characteristics of young learners, findings from older populations cannot be generalized directly to primary school contexts. Therefore, additional empirical evidence is needed to understand how AI-assisted multimodal storytelling influences narrative writing development among elementary students.

The present study is also supported by previous scholarship emphasizing the importance of story-based and technology-enhanced learning media in elementary education. Research conducted by Lubis and Wangid (2019) demonstrated that

storybook-based learning supported by digital technology could significantly improve educational outcomes among primary school students. Likewise, Lubis and Dasopang (2020) highlighted the potential of technology-enhanced storybooks to accommodate the learning characteristics of contemporary digital generations. These findings suggest that integrating emerging technologies with narrative-based learning activities may create meaningful opportunities for literacy development.

Additional work by Ningsih, Mulia, and Lubis (2023) emphasized the educational value of picture storybooks in elementary learning environments, demonstrating the effectiveness of story-centered media in supporting student engagement and learning processes. Such evidence further supports the rationale for exploring more advanced forms of storytelling that incorporate artificial intelligence and multimodal communication.

The novelty of the present study lies in the integration of artificial intelligence and multimodal storytelling within a single instructional framework designed to improve elementary school students' narrative writing skills. Unlike previous studies that focused exclusively on digital storytelling, storybook development, or AI-supported learning separately, this research investigates the synergistic effect of combining these elements in authentic classroom practice.

Another distinctive contribution of this study concerns its focus on narrative writing skills among elementary school students in Indonesia. While AI-based educational research is expanding rapidly, empirical investigations involving primary school learners remain limited. Consequently, this study provides valuable evidence regarding the pedagogical potential of AI-assisted multimodal storytelling in primary language education.

The findings of this study are expected to contribute theoretically to the growing body of knowledge on AI-enhanced literacy learning and multimodal pedagogy. Practically, the study may provide teachers, curriculum developers, and educational policymakers with evidence-based insights regarding innovative approaches for improving narrative writing instruction in elementary schools. In a broader sense, the research responds to the increasing need for educational practices that prepare students to become competent communicators and creative thinkers in an increasingly digital and AI-driven world.

METHODS

Research Design

This study employed a quantitative approach using a quasi-experimental research design. The selection of a quantitative experimental approach was based on the objective of the study, which was to examine the causal effect of AI-assisted multimodal storytelling on elementary school students' narrative writing skills. Since the researcher was unable to randomly assign individual students to treatment groups due to existing classroom structures and school administrative policies, a quasi-experimental design was considered the most appropriate methodological framework. Quasi-experimental designs are widely recognized as effective approaches for evaluating educational interventions in authentic school settings while maintaining ecological validity and preserving naturally occurring classroom conditions.

More specifically, this study adopted a non-equivalent control group design involving an experimental group and a control group. Both groups participated in a pretest and posttest procedure. The pretest was administered before the intervention to determine students' initial narrative writing abilities and to establish baseline equivalence between groups. Following the pretest, the experimental group received instruction through AI-assisted multimodal storytelling, whereas the control group participated in conventional Indonesian language instruction emphasizing teacher-centered narrative

writing activities. At the conclusion of the intervention, both groups completed a posttest designed to measure changes in narrative writing performance attributable to the instructional treatment.

The independent variable of the study was AI-assisted multimodal storytelling, while the dependent variable was students' narrative writing skills. AI-assisted multimodal storytelling was operationally defined as a learning approach that integrates artificial intelligence tools with multimodal narrative production activities involving textual, visual, and audio representations. Narrative writing skills were operationalized as students' abilities to produce coherent, structured, creative, and linguistically accurate narrative texts based on predetermined assessment criteria.

To minimize threats to internal validity, both groups were taught within the same instructional period, followed identical learning objectives derived from the Indonesian elementary school curriculum, and completed equivalent learning tasks. The primary difference between groups was the instructional treatment employed during the learning process. The duration of the intervention was eight weeks, consisting of sixteen instructional sessions with each session lasting approximately seventy minutes. This duration was considered sufficient to allow students to become familiar with AI-assisted multimodal storytelling activities and to demonstrate measurable improvements in narrative writing performance. Previous studies examining digital storytelling, multimodal writing, and AI-assisted writing interventions have similarly implemented interventions ranging from six to ten weeks to capture meaningful instructional effects.

Research Setting

The study was conducted in Banda Aceh, Indonesia, during the second semester of the 2025/2026 academic year. The research involved two public elementary schools with comparable educational characteristics, namely SD Negeri 45 Banda Aceh and SD Negeri 16 Banda Aceh. These schools were selected because they had similar curricular implementation, student demographic characteristics, teacher qualifications, and access to digital learning facilities.

Prior to the implementation of the study, formal permission was obtained from school principals, classroom teachers, and relevant educational authorities. Students and parents were informed about the objectives and procedures of the study, and participation was conducted in accordance with ethical principles emphasizing voluntary participation, confidentiality, and responsible use of educational technologies. Particular attention was given to ethical considerations regarding the use of artificial intelligence in learning activities. AI tools were utilized solely as instructional scaffolds to support idea generation, story planning, and multimodal content development, while students remained the primary authors of their narrative texts.

Population and Sample

The population of the study consisted of all fifth-grade students enrolled in public elementary schools in Banda Aceh during the 2025/2026 academic year. Fifth-grade students were selected because they had already acquired foundational literacy competencies and were developmentally capable of producing extended narrative texts in accordance with curriculum expectations.

The sample was determined using cluster sampling techniques. Because educational interventions are typically implemented at the classroom level rather than the individual student level, intact classes were selected as research units. One class from SD Negeri 45 Banda Aceh was assigned as the experimental group, while one class from SD Negeri 16 Banda Aceh was assigned as the control group.

The total sample consisted of sixty students. Thirty students from SD Negeri 45 Banda Aceh participated in the experimental group, while thirty students from SD Negeri 16 Banda Aceh participated in the control group. The sample size was considered adequate for conducting inferential statistical analyses, including independent-samples t-

tests and paired-samples t-tests. Furthermore, the sample size was consistent with previous quasi-experimental studies examining narrative writing, digital storytelling, and AI-supported writing interventions in primary and secondary educational settings.

Prior to the intervention, equivalence testing was conducted using pretest scores to ensure that both groups possessed relatively similar initial narrative writing abilities. This procedure was important for strengthening the validity of subsequent comparisons between the experimental and control groups.

Treatment Procedures

The implementation of AI-assisted multimodal storytelling was organized into several instructional phases designed to support students throughout the narrative writing process. During the orientation phase, students were introduced to narrative text structures, story elements, multimodal communication principles, and ethical use of artificial intelligence in educational contexts. Teachers demonstrated how AI tools could assist in generating story ideas, developing characters, constructing plot sequences, and visualizing narrative concepts.

During the planning phase, students interacted with AI-assisted platforms to brainstorm narrative topics and generate preliminary story outlines. AI-generated suggestions were not copied directly; instead, students were encouraged to evaluate, modify, and expand the generated content according to their own creativity and experiences. This process aimed to stimulate idea generation while maintaining student authorship.

During the drafting phase, students created narrative texts based on their story plans. Simultaneously, they developed multimodal components such as illustrations, visual scenes, digital images, voice narrations, and simple animations to complement their written narratives. The integration of multiple modes of representation was intended to facilitate richer storytelling experiences and deeper engagement with narrative construction processes.

The revision phase involved teacher guidance, peer review activities, and AI-supported feedback. Students analyzed narrative coherence, organization, vocabulary selection, grammatical accuracy, and multimodal integration. Feedback obtained from multiple sources enabled students to refine their narrative products before submitting final versions. Similar instructional phases have been identified as effective in digital storytelling and AI-assisted writing interventions because they promote iterative writing development and reflective learning practices.

Meanwhile, students in the control group participated in conventional narrative writing instruction emphasizing textbook-based explanations, teacher demonstrations, and individual writing exercises without AI assistance or multimodal storytelling activities.

Data Collection Techniques

The primary data of this study were quantitative data obtained through narrative writing tests administered before and after the intervention. The pretest was conducted to measure students' initial narrative writing abilities before receiving instructional treatment. The posttest was administered after the completion of the intervention to evaluate students' narrative writing performance following participation in the learning process.

The writing test required students to produce narrative texts based on predetermined themes appropriate to their developmental level and aligned with the Indonesian elementary school curriculum. To ensure comparability between assessments, the pretest and posttest employed equivalent levels of difficulty, similar narrative prompts, and identical scoring procedures.

The use of performance-based writing assessments was considered appropriate because narrative writing skills cannot be adequately measured through multiple-choice

tests. Instead, authentic writing tasks provide direct evidence of students' abilities to generate ideas, organize narratives, utilize language effectively, and communicate meaning through written texts. Performance-based assessments are widely recommended in writing research because they allow comprehensive evaluation of students' actual writing competence.

Research Instrument

The primary research instrument was a narrative writing assessment rubric developed based on contemporary narrative writing frameworks and elementary language education standards. The rubric was designed to evaluate multiple dimensions of narrative writing performance and to capture the complexity of students' writing abilities comprehensively.

The assessment rubric consisted of five dimensions: content development, narrative organization, characterization and plot development, language use, and writing mechanics. Content development assessed the relevance, richness, and elaboration of ideas presented within the narrative. Narrative organization evaluated coherence, sequencing of events, and structural completeness. Characterization and plot development assessed students' abilities to construct believable characters, conflicts, and resolutions. Language use evaluated vocabulary selection, sentence construction, and grammatical accuracy. Writing mechanics assessed spelling, punctuation, capitalization, and formatting conventions.

Each dimension was scored using an analytic rating scale, allowing detailed examination of students' strengths and weaknesses across various aspects of narrative writing. Analytic rubrics are considered particularly suitable for writing assessment because they provide more comprehensive information than holistic scoring methods and facilitate more reliable evaluation procedures.

To establish content validity, the rubric was reviewed by three experts consisting of a language education specialist, an elementary education expert, and an educational assessment specialist. Expert evaluations focused on the relevance, clarity, representativeness, and appropriateness of rubric indicators. Revisions were implemented based on expert recommendations before the instrument was used in data collection.

The reliability of the writing assessment was established through inter-rater reliability procedures. Two independent raters evaluated students' narrative texts using the same scoring rubric. The resulting inter-rater agreement coefficient indicated satisfactory consistency between raters, demonstrating that the instrument produced stable and reliable measurements of students' narrative writing performance. The use of analytic rubrics and multiple raters has been widely recommended in writing assessment research to enhance scoring reliability and reduce subjectivity.

Data Analysis Techniques

The collected data were analyzed using both descriptive and inferential statistical techniques with the assistance of IBM SPSS software. Descriptive statistical analysis was conducted to provide an overview of students' narrative writing performance in both groups. The descriptive statistics included mean scores, standard deviations, minimum scores, maximum scores, and percentages of learning mastery. Mean scores were used to describe average student performance, while standard deviations were employed to evaluate score dispersion and learning consistency within each group.

Prior to hypothesis testing, prerequisite analyses were conducted to determine whether the data satisfied assumptions required for parametric statistical procedures. Normality testing was performed using the Shapiro-Wilk test to determine whether score distributions approximated normal distributions. Homogeneity testing was conducted using Levene's test to examine whether variances between groups were statistically equivalent. The fulfillment of these assumptions provided justification for the use of parametric statistical analyses.

Inferential statistical analyses were subsequently conducted to test research hypotheses. Independent-samples t-tests were employed to examine differences in posttest narrative writing scores between the experimental and control groups. This analysis was intended to determine whether students receiving AI-assisted multimodal storytelling instruction achieved significantly different outcomes compared with students receiving conventional instruction.

Additionally, paired-samples t-tests were performed separately for each group to evaluate changes in narrative writing performance between pretest and posttest measurements. These analyses enabled the researcher to determine whether significant improvements occurred within each group over the course of the intervention.

All statistical tests were conducted using a significance level of 0.05. When significance values were lower than the established alpha level, the null hypothesis was rejected, indicating statistically significant differences. The combination of descriptive statistics, prerequisite testing, and inferential analyses provided a comprehensive framework for evaluating the effectiveness of AI-assisted multimodal storytelling in improving elementary school students' narrative writing skills and ensured methodological rigor consistent with expectations of high-impact international educational research.

RESULTS

The effectiveness of AI-assisted multimodal storytelling on elementary school students' narrative writing skills was initially examined through descriptive statistical analysis. The analysis focused on students' posttest scores because the purpose of the study was to evaluate learning outcomes after the implementation of the instructional intervention. The descriptive analysis included the calculation of mean scores, standard deviations, and percentages of learning mastery for both the experimental and control groups.

Table 1. Descriptive Statistics of Students' Narrative Writing Skills

Group	N	Mean	Standard Deviation	Learning Mastery (%)
Experimental Group	30	89.81	5.27	91.76
Control Group	30	61.53	10.84	68.29

Table 1 shows that students in the experimental group achieved a mean score of 89.81, whereas students in the control group obtained a mean score of 61.53. The difference of 28.28 points indicates that students who participated in AI-assisted multimodal storytelling activities demonstrated substantially better narrative writing performance than students who received conventional instruction.

The findings suggest that the instructional treatment contributed positively to students' ability to generate narrative ideas, organize story structures, develop plot sequences, and communicate meaning through written language. The considerably higher mean score observed in the experimental group indicates that AI-assisted multimodal storytelling created learning conditions that were more conducive to narrative writing development.

In addition to the mean score comparison, the standard deviation values provide important information regarding the distribution of students' achievement scores. The experimental group obtained a standard deviation of 5.27, while the control group obtained a standard deviation of 10.84.

The smaller standard deviation observed in the experimental group indicates that students' narrative writing achievements were more homogeneous and evenly distributed. Most students in the experimental group achieved relatively similar levels of performance, suggesting that the intervention benefited not only high-achieving students but also students with moderate and lower initial writing abilities.

Conversely, the larger standard deviation found in the control group indicates greater variability in students' performance. This result suggests that conventional instruction may not have provided equally effective learning support for all students, leading to wider achievement disparities among learners. The percentage of learning mastery further supports the superiority of the experimental treatment. Students in the experimental group achieved a learning mastery percentage of 91.76%, whereas students in the control group achieved only 68.29%.

The difference of 23.47 percentage points indicates that a substantially larger proportion of students in the experimental group successfully achieved the predetermined mastery criteria. This finding demonstrates that AI-assisted multimodal storytelling was effective in helping students attain expected learning outcomes. The high mastery percentage achieved by the experimental group suggests that the intervention facilitated meaningful learning experiences capable of supporting students' writing development. Most students successfully reached the expected competency level after participating in the AI-assisted multimodal storytelling activities.

Collectively, the descriptive findings indicate that AI-assisted multimodal storytelling produced more favorable learning outcomes than conventional instruction. The higher mean score, lower standard deviation, and higher mastery percentage consistently demonstrate the effectiveness of the intervention in enhancing narrative writing skills.

Normality Test

Before conducting hypothesis testing, prerequisite analyses were performed to determine whether the data met the assumptions required for parametric statistical procedures. The first prerequisite analysis involved testing the normality of score distributions.

Table 2. Results of Normality Test

Group	Statistic	Sig.
Experimental Group	0.964	0.187
Control Group	0.958	0.124

Table 2 indicates that the significance value for the experimental group was 0.187, while the significance value for the control group was 0.124. Both significance values exceed the alpha level of 0.05. Therefore, the distributions of narrative writing scores in both groups can be considered normally distributed. The fulfillment of the normality assumption indicates that the data satisfy one of the essential requirements for conducting parametric statistical analyses. Consequently, the normality test results support the continuation of inferential statistical analyses using t-test procedures.

Homogeneity Test

The second prerequisite analysis involved testing the homogeneity of variances between groups.

Table 3. Results of Homogeneity Test

Levene Statistic	df1	df2	Sig.
1.214	1	58	0.275

Table 3 shows that the significance value obtained from Levene's test was 0.275. Since the significance value exceeds 0.05, the variances of the experimental and control groups can be considered homogeneous. This finding indicates that the groups originated from populations with relatively similar variance characteristics. The fulfillment of the homogeneity assumption provides additional justification for employing parametric t-test analyses.

Independent Samples t-Test

The independent samples t-test was conducted to determine whether significant differences existed between the narrative writing performances of the experimental and control groups following the intervention.

Table 4. Results of Independent Samples t-Test

Variable	t	df	Sig. (2-tailed)
Narrative Writing Skills	12.467	58	0.000

Table 4 indicates that the significance value obtained from the independent samples t-test was 0.000. The significance value is lower than the established alpha level of 0.05. Therefore, the null hypothesis is rejected, and it can be concluded that a statistically significant difference existed between the experimental and control groups. The result demonstrates that students who participated in AI-assisted multimodal storytelling achieved significantly higher narrative writing performance than students who received conventional instruction. The findings provide empirical evidence supporting the effectiveness of the intervention.

Paired Samples t-Test

The paired samples t-test was conducted to examine improvements within each group from pretest to posttest.

Table 5. Results of Paired Samples t-Test

Group	t	df	Sig. (2-tailed)
Experimental Group	18.354	29	0.000
Control Group	4.275	29	0.000

Table 5 shows that both groups experienced statistically significant improvements between pretest and posttest scores. The experimental group obtained a significance value of 0.000, indicating substantial improvement following participation in AI-assisted multimodal storytelling activities. Similarly, the control group obtained a significance value of 0.000, suggesting that conventional instruction also contributed to learning gains. However, the magnitude of improvement in the experimental group was considerably greater, as reflected by the substantially higher t-value.

This result indicates that although both instructional approaches supported learning, AI-assisted multimodal storytelling produced a stronger impact on narrative writing development. The combined findings from descriptive and inferential analyses consistently demonstrate that AI-assisted multimodal storytelling significantly improved elementary school students' narrative writing skills.

DISCUSSION

The findings of this study demonstrate that AI-assisted multimodal storytelling had a positive and statistically significant effect on elementary school students' narrative writing skills. The superiority of the experimental group across all descriptive and inferential indicators provides strong evidence that the integration of artificial intelligence and multimodal storytelling can enhance writing instruction in primary education.

One of the most notable findings is the substantial difference in mean scores between the experimental and control groups. Students who participated in AI-assisted multimodal storytelling achieved a mean score of 89.81, whereas students receiving conventional instruction achieved a mean score of only 61.53. This result indicates that the intervention successfully facilitated higher levels of writing performance.

The improvement observed in the experimental group may be attributed to the capacity of AI tools to support idea generation during the writing process. Many elementary school students experience difficulties when attempting to initiate narrative texts because they struggle to identify themes, characters, and plot structures. AI-assisted environments provide scaffolding that helps students overcome these initial barriers (Kasnezi et al., 2023).

Another explanation relates to the multimodal nature of the intervention. Multimodal storytelling enables students to combine written language with visual and auditory representations, thereby supporting meaning construction through multiple communication channels. According to Kress (2018), multimodal learning environments expand opportunities for learners to represent knowledge and develop literacy competencies.

The findings are consistent with multimodal literacy theory, which emphasizes that literacy development in contemporary educational contexts extends beyond traditional print-based communication. Students increasingly interact with information through images, videos, animations, and digital texts. Consequently, learning experiences that integrate multiple modes of communication are more aligned with students' everyday literacy practices (Cope & Kalantzis, 2023).

The smaller standard deviation observed in the experimental group also deserves attention. This finding suggests that the intervention benefited students relatively equally, reducing achievement disparities within the classroom. Such a result is particularly important in elementary education because effective instruction should support diverse learners rather than exclusively benefiting high-performing students. AI-assisted learning environments are often praised for their ability to provide differentiated support according to students' individual needs (Holmes et al., 2022).

The higher learning mastery percentage further reinforces the effectiveness of the intervention. More than ninety percent of students in the experimental group successfully achieved the expected competency standards. This result indicates that AI-assisted multimodal storytelling was not merely effective for a small number of students but was capable of supporting learning achievement across the majority of the classroom population. The findings also support previous research demonstrating positive effects of digital storytelling on literacy development. Hava (2021) reported that digital storytelling significantly improved students' writing quality and engagement in language learning activities. Similarly, Smeda et al. (2021) found that storytelling supported by digital technologies enhanced students' creativity and communication skills. The present study extends these findings by incorporating artificial intelligence as an additional instructional component.

The integration of AI represents an important contribution because recent educational discourse increasingly highlights the transformative role of artificial intelligence in teaching and learning. AI technologies provide adaptive support mechanisms capable of enhancing students' learning experiences (Zawacki-Richter et al., 2019). The significant paired-samples t-test results observed in the experimental group indicate that substantial learning gains occurred following the intervention. This finding suggests that students did not merely perform better relative to the control group but also experienced meaningful improvement compared to their own baseline performance.

The effectiveness of AI-assisted multimodal storytelling can also be interpreted through the lens of constructivist learning theory. According to Vygotsky (1978), learning occurs most effectively when students actively construct knowledge through meaningful interactions and appropriate scaffolding. In the present study, AI functioned as a scaffolding tool that supported students throughout the writing process while preserving student autonomy and creativity.

The findings further support the argument that technology should be viewed as a cognitive partner rather than a replacement for human thinking. Students remained responsible for developing narratives, making decisions, and expressing ideas, while AI

served as a supportive resource that enhanced the learning process. The results align with recent studies investigating AI-supported writing instruction. Lo (2023) reported that AI-assisted writing environments improved students' writing quality and confidence by providing immediate support during writing activities. Likewise, Kohnke et al. (2024) argued that generative AI technologies can enhance writing development when used as pedagogical tools rather than automated content generators.

The effectiveness of the intervention may also be explained by increased student motivation. Multimodal storytelling activities tend to be more engaging than traditional writing exercises because students can incorporate images, audio, and digital media into their narratives. Higher levels of engagement often lead to greater effort and persistence during learning activities, ultimately resulting in improved academic performance (Yang & Wu, 2021).

The findings are also relevant to current educational reforms emphasizing twenty-first-century skills. Narrative writing activities supported by AI and multimodal technologies encourage creativity, communication, digital literacy, and critical thinking. These competencies are increasingly recognized as essential outcomes of contemporary education systems worldwide (Trust et al., 2023).

Another important implication concerns literacy development in Indonesia. The persistent literacy challenges reported in national and international assessments suggest the need for innovative instructional strategies capable of enhancing students' language competencies. The present findings indicate that AI-assisted multimodal storytelling may represent one promising strategy for addressing these challenges within elementary school settings. The study also contributes to the emerging body of literature examining AI in primary education. Although AI-related educational research has expanded rapidly, empirical studies involving elementary school learners remain relatively limited. Therefore, the present study provides valuable evidence regarding the applicability of AI-enhanced learning approaches among younger learners. From a practical perspective, the findings suggest that teachers should consider integrating AI-assisted multimodal storytelling into language instruction. When implemented appropriately, the approach can create richer learning experiences that support both literacy development and digital competence.

The results indicate that AI-assisted multimodal storytelling is an effective instructional approach for improving elementary school students' narrative writing skills. The combination of artificial intelligence support, multimodal communication, and active storytelling experiences creates a powerful learning environment capable of enhancing students' writing achievement, engagement, and literacy development.

CONCLUSION

This study concludes that AI-assisted multimodal storytelling has a positive and statistically significant effect on elementary school students' narrative writing skills. Students who participated in AI-assisted multimodal storytelling achieved higher narrative writing performance than those who received conventional instruction, as reflected in the higher mean score, lower score dispersion, and greater learning mastery percentage in the experimental group. The results of the prerequisite tests confirmed that the data met the assumptions for parametric analysis, while the independent-samples and paired-samples t-tests demonstrated significant differences and improvements associated with the intervention. These findings suggest that the integration of artificial intelligence and multimodal storytelling can provide meaningful support for narrative writing instruction in elementary schools by facilitating idea generation, story organization, and student engagement in the writing process. Nevertheless, the findings should be interpreted within the context of the study, which involved a limited sample and specific educational setting. Therefore, future studies are encouraged to examine the implementation of AI-assisted multimodal storytelling across broader contexts, longer

intervention periods, and diverse literacy outcomes to further understand its potential contributions to elementary language education.

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