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The Effect of Digital Storytelling on Elementary School Students' Reading Literacy: An Experimental Research

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Abstract: In the digital era, cultivating early reading literacy requires innovative pedagogical approaches that move beyond traditional print-based methods. While digital storytelling has emerged as a promising tool, empirical evidence regarding its specific efficacy in primary school settings remains limited. This study aims to examine the effect of digital storytelling on the reading literacy of elementary school students. Utilizing a quantitative approach with a quasi-experimental design, this research involved 36 students from SD Negeri Kalibuntu, who were divided into an experimental group and a control group. Data on students' reading literacy were systematically gathered using structured observation techniques. The collected data were analyzed using descriptive statistics evaluating individual acquisition scores and classical averages based on a categorization table and inferential parametric statistics via independent and paired-sample t-tests.The findings demonstrated that digital storytelling exerts a highly positive and statistically significant effect on elementary school students' reading literacy. This is evidenced by a substantial increase in the experimental group's average literacy score from a pre-test baseline of 60.17 (low category) to a post-test peak of 92.34 (very high category). Furthermore, the experimental group's post-test literacy score (M = 92.34) significantly outperformed the control group (M = 65.61, low category), with inferential analysis confirming a high statistical significance (p < 0.000). These results indicate that integrating multimedia narratives enhances cognitive engagement and textual comprehension in young learners. Consequently, this study underscores that digital storytelling serves as a potent pedagogical alternative to mitigate low reading literacy, offering critical insights for primary school educators.

Keywords: Digital storytelling, reading literacy, elementary school, multimedia learning, quantitative experiment.

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INTRODUCTION

Reading literacy has become one of the most critical competencies in contemporary education because it serves as the foundation for students' academic achievement, lifelong learning, and participation in an increasingly information-driven society. Literacy is no

longer understood merely as the ability to decode written symbols but also as the capacity to comprehend, interpret, evaluate, and utilize information from various texts in meaningful ways. In elementary education, reading literacy plays a pivotal role because it influences students' performance across different subject areas and supports the development of higher-order thinking skills. Consequently, improving reading literacy has become a major concern for educators, policymakers, and researchers worldwide (OECD, 2023).

Recent international assessments indicate that reading literacy remains a significant challenge for many elementary school students. Findings from the Programme for International Student Assessment (PISA) reveal that a considerable proportion of students struggle to reach minimum proficiency levels in reading, limiting their ability to understand and critically engage with written information (OECD, 2023). Similar concerns have been reported across developing and developed countries, where disparities in literacy achievement continue to affect educational quality and equity. These findings highlight the need for innovative instructional approaches that can enhance students' engagement with reading activities and improve literacy outcomes.

In the Indonesian educational context, reading literacy has emerged as a strategic priority due to persistent concerns regarding students' literacy achievement. National and international reports suggest that many elementary school students experience difficulties in reading comprehension, critical interpretation, and information synthesis (Kemendikbudristek, 2022). Although various literacy programs have been implemented through school literacy movements and curriculum reforms, significant challenges remain in fostering students' interest in reading and strengthening their literacy competencies. Therefore, effective instructional innovations are urgently needed to support literacy development at the elementary level.

One of the factors contributing to low reading literacy is the limited use of engaging learning media during classroom instruction. Traditional literacy instruction often relies heavily on printed texts and teacher-centered approaches, which may not adequately accommodate the learning preferences of contemporary students who are increasingly exposed to digital technologies in their daily lives. Research has shown that monotonous instructional practices can reduce students' motivation and engagement in reading activities, ultimately affecting literacy achievement (Guthrie & Wigfield, 2000). As a result, educators are encouraged to integrate technology-enhanced learning strategies that can make literacy learning more meaningful and attractive.

The rapid advancement of digital technology has transformed educational practices and created new opportunities for literacy instruction. Digital technologies enable the integration of multimedia elements such as text, audio, images, animation, and video into learning activities, thereby enriching students' learning experiences (Mayer, 2021). The incorporation of multimedia resources in literacy instruction is particularly relevant because it can facilitate comprehension, increase learner engagement, and support diverse learning styles. Consequently, technology-based instructional approaches have attracted growing attention among researchers and practitioners seeking to improve literacy outcomes.

Among various technology-supported pedagogical innovations, digital storytelling has emerged as a promising approach for literacy education. Digital storytelling refers to the practice of creating and presenting stories through digital media by combining narrative elements with multimedia components such as images, sound effects, music, animations, and videos (Robin, 2016). This approach enables students to experience stories in more interactive and engaging formats than conventional printed texts. By presenting information through multiple modes of representation, digital storytelling can support students' understanding and interpretation of textual content.

The theoretical foundation of digital storytelling can be linked to the Cognitive Theory of Multimedia Learning, which posits that individuals learn more effectively when information is presented through both verbal and visual channels rather than through

words alone (Mayer, 2021). According to this theory, the integration of text, narration, and visual elements facilitates cognitive processing and enhances comprehension. Therefore, digital storytelling has the potential to improve students' reading literacy by providing richer contextual cues that support meaning construction during reading activities.

Digital storytelling is also consistent with constructivist learning theory, which emphasizes the active role of learners in constructing knowledge through meaningful experiences (Vygotsky, 1978). Through digital storytelling activities, students are exposed to authentic narratives that encourage them to connect new information with prior knowledge. This process fosters deeper understanding and promotes active engagement in literacy learning. Furthermore, storytelling naturally supports language development by exposing students to vocabulary, sentence structures, and narrative patterns that are essential for reading comprehension.

Several studies have demonstrated the educational benefits of digital storytelling across different learning contexts. Research conducted by Sadik (2008) found that digital storytelling enhanced students' motivation, creativity, and communication skills. Similarly, Yang and Wu (2012) reported that digital storytelling improved students' academic achievement and critical thinking abilities. These findings suggest that digital storytelling can serve as an effective instructional tool for promoting meaningful learning experiences.

In literacy education specifically, digital storytelling has shown considerable potential for improving reading comprehension and engagement. Research by Smeda et al. (2014) indicated that students who participated in digital storytelling activities demonstrated higher levels of motivation and literacy development than those who experienced conventional instruction. The multimedia-rich nature of digital stories helps students visualize narrative content and establish stronger connections between textual and contextual information, thereby facilitating comprehension.

Another important advantage of digital storytelling is its ability to increase students' reading motivation. Motivation is widely recognized as a significant predictor of reading achievement because motivated readers tend to engage more frequently and deeply with texts (Guthrie et al., 2012). Digital storytelling can enhance motivation by presenting stories in visually appealing and interactive formats that capture students' attention. As students become more interested in reading activities, they are more likely to develop positive reading habits and improve their literacy skills.

The effectiveness of digital storytelling is also associated with its capacity to support multimodal literacy. Contemporary literacy extends beyond traditional print-based reading and writing to include the interpretation of information presented through multiple modes and media (Kress, 2010). By engaging with digital stories, students learn to process and integrate textual, visual, and auditory information simultaneously. Such experiences can contribute to the development of broader literacy competencies required in the twenty-first century.

Despite the growing body of literature supporting digital storytelling, empirical findings remain varied across educational contexts. Some studies have reported substantial improvements in literacy outcomes following digital storytelling interventions (Yang & Wu, 2012; Smeda et al., 2014), whereas others have found more moderate effects influenced by contextual factors such as instructional design, technological infrastructure, and student characteristics (Niemi & Multisilta, 2016). These inconsistencies suggest the need for further investigation to clarify the effectiveness of digital storytelling in different educational settings.

In the context of elementary education, research focusing specifically on reading literacy remains relatively limited compared with studies examining writing skills, creativity, or digital competence. Many existing studies have concentrated on secondary or higher education populations, leaving a gap in understanding how digital storytelling affects younger learners during the foundational stages of literacy development (Robin, 2016). Given the importance of elementary education in establishing lifelong literacy habits, this gap warrants further scholarly attention.

Furthermore, previous studies have frequently employed qualitative approaches or mixed-method designs that focus on students' perceptions and learning experiences. While such studies provide valuable insights, quantitative experimental evidence is still needed to establish causal relationships between digital storytelling and reading literacy achievement. Experimental research allows researchers to determine whether observed improvements in literacy outcomes can be attributed to the instructional intervention rather than to external factors (Creswell & Creswell, 2018).

Another limitation of previous research is the insufficient availability of evidence from Indonesian elementary school contexts. Educational environments differ considerably in terms of curriculum implementation, technological resources, teacher competencies, and student characteristics. Consequently, findings from other countries may not be directly applicable to Indonesian schools. Conducting empirical studies within local educational settings is therefore necessary to generate contextually relevant evidence that can inform educational practice and policy.

The present study addresses these gaps by examining the effect of digital storytelling on elementary school students' reading literacy through a quasi-experimental design. The study compares literacy outcomes between students who receive instruction using digital storytelling and those who experience conventional learning approaches. Such a design provides stronger evidence regarding the effectiveness of digital storytelling as an instructional intervention.

This research is particularly relevant in light of ongoing efforts to strengthen literacy education and integrate technology into elementary school classrooms. Educational policies increasingly emphasize the importance of digital competence and innovative pedagogical practices that can prepare students for the demands of the digital era (UNESCO, 2023). Digital storytelling represents a practical strategy that aligns with these objectives while simultaneously addressing literacy challenges.

The significance of this study extends beyond academic considerations. From a pedagogical perspective, the findings may provide teachers with evidence-based guidance regarding the use of digital storytelling as an instructional medium for literacy learning. From a policy perspective, the results may support the development of literacy programs that integrate digital technologies to enhance educational quality. From a research perspective, the study contributes to the growing literature on technology-enhanced literacy instruction in elementary education.

Based on the theoretical foundations and empirical evidence discussed above, digital storytelling is expected to facilitate reading literacy development by increasing student engagement, supporting comprehension processes, and creating meaningful learning experiences. Nevertheless, further experimental evidence is required to confirm these assumptions in elementary school contexts. Therefore, investigating the effectiveness of digital storytelling remains an important area of educational research.

Accordingly, the objective of this study is to examine the effect of digital storytelling on elementary school students' reading literacy. Specifically, the study seeks to determine whether the use of digital storytelling leads to significantly higher reading literacy achievement compared with conventional instructional approaches. The findings are expected to contribute to the advancement of literacy education and provide practical recommendations for improving reading literacy among elementary school students.

METHODS

Research Design

This study employed a quantitative approach with an experimental research design to examine the effect of digital storytelling on elementary school students' reading literacy. A quasi-experimental design was chosen because intact classes were used without assigning students randomly to groups, which is commonly applied in educational settings where

researchers must work within existing classroom arrangements (Creswell & Creswell, 2018).

The design used in this study was the non-equivalent control group design, which involves two groups: an experimental group that received the treatment (digital storytelling-based instruction) and a control group that received conventional instruction. Both groups were measured before the treatment (pre-test) and after the treatment (post-test) to determine the effect of the intervention (Fraenkel, Wallen, & Hyun, 2015). The design is illustrated in Figure 1.

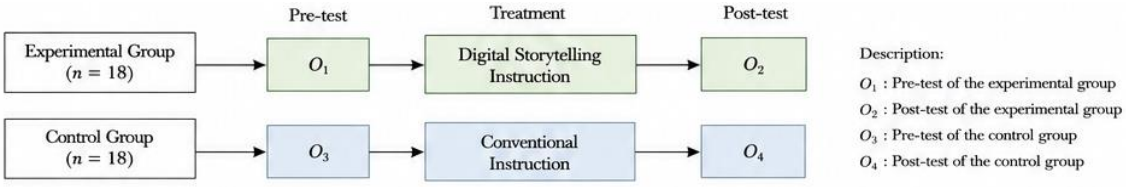

Figure 1. Non-Equivalent Control Group Design Used in This Study

Description:
O_1 : Pre-test of the experimental group
O_2 : Post-test of the experimental group
O_3 : Pre-test of the control group
O_4 : Post-test of the control group

This design enables the researcher to compare the improvement in reading literacy scores within each group and between groups to determine the effect of digital storytelling on students' reading literacy achievement.

Participants

The population of this study consisted of all fifth-grade students at SD Kalibuntu, a public elementary school located in the Brebes Regency, Central Java, Indonesia. The school has four parallel classes with relatively similar academic backgrounds and learning conditions. The sample of this study consisted of 36 students who were selected using a cluster sampling technique. Two intact classes were chosen as the sample and assigned as the experimental group (18 students) and the control group (18 students). The demographic information of the participants is presented in Table 1.

Table 1. Demographic Information of Participants

Variable	Experimental Group (n = 18)	Control Group (n = 18)	Total (N = 36)
Male	9 (50.00%)	10 (55.56%)	19 (52.78%)
Female	9 (50.00%)	8 (44.44%)	17 (47.22%)
Mean Age (Years)	10.67	10.72	10.69
Age Range (Years)	10–11	10–11	10–11

Note. M = mean; SD = standard deviation.

Based on Table 1, the two classes had relatively similar characteristics in terms of age and previous social studies achievement, indicating that both groups were comparable prior to the treatment.

Materials and Instruments

The main instrument used in this study was a reading literacy test developed by the researcher based on the Indonesian National Curriculum for Grade 5. The test measured students' ability in four reading literacy aspects, namely (1) accessing and retrieving information, (2) integrating and interpreting information, (3) evaluating and reflecting on content, and (4) using information for various purposes (OECD, 2023). The instrument consisted of 30 multiple-choice items with four options (A, B, C, D).

The test content was validated by three experts in Indonesian language education and educational measurement. The validation results indicated that the content validity index (CVI) of the instrument was 0.92, which falls into the "very high" category (Lynn, 1986). A pilot test was conducted with 30 students from another elementary school with similar characteristics to determine the reliability, item difficulty, and item discrimination of the test. The reliability analysis used the KR-20 formula (Kuder–Richardson 20), which is appropriate for dichotomous items (Kuder & Richardson, 1937). The results of the item analysis are shown in Table 2.

Table 2. Reliability, Item Difficulty, and Item Discrimination Results (Pilot Test)

Statistic	Result	Interpretation / Criteria	Reference
Reliability (KR-20)	0.87	Very High (≥ 0.80)	Kuder & Richardson (1937)
Mean Item Difficulty (p)	0.58	Moderate (0.30–0.70)	Ebel & Frisbie (1991)
Mean Item Discrimination (D)	0.46	Good (0.40–0.70)	Ebel & Frisbie (1991)

The results in Table 2 indicate that the instrument has high reliability with appropriate item difficulty and good discrimination, thus it is feasible to be used as a research instrument.

Procedure

The research procedure consisted of several stages. First, permission was obtained from the school principal and informed consent was obtained from students and their parents. Second, a pre-test was administered to both groups to measure the initial reading literacy levels. Third, the experimental group received digital storytelling-based instruction for four weeks (eight meetings), while the control group received conventional instruction using textbooks and teacher explanation. Finally, a post-test was administered to both groups.

Treatment (Digital Storytelling)

The digital storytelling-based instruction involved multimedia stories created using a combination of text, images, narration, music, animations, and videos. The digital stories were designed to align with the reading materials in the Grade 5 curriculum. During the learning process, students watched and discussed the stories, answered guiding questions, and engaged in activities that promoted reading comprehension and critical thinking (Robin, 2016; Smeda, Dakich, & Sharda, 2014). The control group, on the other hand, received instruction using conventional methods, including reading printed texts, teacher explanation, and worksheets.

Data Analysis

Data analysis consisted of descriptive and inferential statistics. Descriptive statistics were used to describe the central tendency and dispersion of the data, while inferential statistics were used to test the research hypotheses.

Descriptive Statistics Formulas

Mean (Rata-rata)

$$M = \frac{\sum_{i=1}^{N} X_i}{N}$$

Where:
M = mean score (rata-rata)
X_i = individual score (skor individu)
N = number of students (jumlah siswa)

Standard Deviation (Deviasi Standar)

$$SD = \sqrt{\frac{\sum_{i=1}^{N} (X_i - M)^2}{N - 1}}$$

Where:
SD = standard deviation (deviasi standar)
X_i = individual score (skor individu)
M = mean score (rata-rata)
N = number of students (jumlah siswa)

Percentage

$$P = \frac{X}{X_{max}} \times 100\%$$

Where:
P = percentage score (skor persentase)
X = obtained score (skor yang diperoleh)
X{max} = maximum score (skor maksimum)

Inferential Statistical Analysis

Prior to hypothesis testing, the data were subjected to prerequisite tests consisting of normality and homogeneity tests. These analyses were conducted to ensure that the assumptions for parametric statistical testing were satisfied. After the assumptions were met, paired sample t-tests and independent sample t-tests were performed to examine the effect of digital storytelling on students' reading literacy.

Normality Test

The normality test was conducted using the Shapiro–Wilk test because the sample size was fewer than 50 participants. The test statistic is calculated as follows:

$$W = \frac{\left(\sum_{i=1}^{n} a_i \, x_{(i)}\right)^2}{\sum_{i=1}^{n} (x_i - \bar{x})^2}$$

Where:

W = Shapiro–Wilk test statistic

a_i = constant generated from covariance matrix values

$x_{(i)}$ = ordered sample values

x_i = observed score

$\bar{x}$ = sample mean

n = sample size

The decision criterion was that the data were considered normally distributed when the significance value (Sig.) was greater than 0.05.

Homogeneity Test

The homogeneity of variance between the experimental and control groups was tested using Levene's Test. The formula is expressed as follows:

$$W = \frac{(N-k)}{(k-1)} \cdot \frac{\sum_{i=1}^{k} N_i (Z_{i\cdot} - Z_{\cdot\cdot})^2}{\sum_{i=1}^{k} \sum_{j=1}^{N_i} (Z_{ij} - Z_{i\cdot})^2}$$

Where:

W = Levene statistic

N = total number of observations

k = number of groups

N_i = number of observations in group i

Z_{ij} = transformed score

$Z_{i\cdot}$ = group mean

$Z_{\cdot\cdot}$ = overall mean

The variances were considered homogeneous if the significance value was greater than 0.05.

Paired Sample t-Test

The paired sample t-test was used to determine whether there was a significant difference between pre-test and post-test scores within the experimental group. The test statistic is calculated as follows:

$$t = \frac{\bar{D}}{S_D / \sqrt{n}}$$

Where:

t = paired sample t-test value

$\bar{D}$ = mean difference between paired observations

S_D = standard deviation of the differences

n = number of paired observations

The standard deviation of differences is calculated as:

$$S_D = \sqrt{\frac{\sum (D_i - \bar{D})^2}{n-1}}$$

The null hypothesis was rejected when the significance value was less than 0.05, indicating a significant improvement in students' reading literacy after the implementation of digital storytelling.

Independent Sample t-Test

The independent sample t-test was employed to compare the post-test reading literacy scores between the experimental and control groups. The formula is given by:

$$t = \frac{\bar{X}_1 - \bar{X}_2}{S_p\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

where the pooled standard deviation is:

$$S_p = \sqrt{\frac{(n_1 - 1)S_1^2 + (n_2 - 1)S_2^2}{n_1 + n_2 - 2}}$$

Where:

t= independent sample t-test statistic

$\bar{X}_1$= mean score of the experimental group

$\bar{X}_2$= mean score of the control group

S_p= pooled standard deviation

S_1^2= variance of the experimental group

S_2^2= variance of the control group

n_1= sample size of the experimental group

n_2= sample size of the control group

The null hypothesis was rejected if the significance value was less than 0.05, indicating a statistically significant difference between the reading literacy achievement of students taught using digital storytelling and those taught through conventional instruction.

RESULTS

This study was conducted to examine the effect of digital storytelling on elementary school students' reading literacy. The analysis consisted of descriptive statistical analysis and inferential statistical analysis. Descriptive statistics were employed to describe students' literacy achievement before and after the intervention, whereas inferential statistics were used to test the research hypothesis. Prior to hypothesis testing, prerequisite analyses including normality and homogeneity tests were conducted to ensure compliance with the assumptions required for parametric testing.

Descriptive Statistics

The descriptive statistical analysis was performed to determine the central tendency and distribution of reading literacy scores in both the experimental and control groups. The analysis included the mean score, standard deviation, minimum score, maximum score, and learning mastery percentage.

Table 3. Descriptive Statistics of Reading Literacy Scores

Group	Test	N	Mean	SD	Minimum	Maximum	Mastery (%)
Experimental	Pre-test	18	60.17	8.42	45	74	27.78
Experimental	Post-test	18	92.34	4.16	85	98	100.00
Control	Pre-test	18	59.83	8.67	44	75	22.22
Control	Post-test	18	65.61	7.95	52	78	38.89

Table 1 shows that the experimental group and control group had relatively similar literacy achievement before the intervention. The mean pre-test score of the experimental group was 60.17, while the control group obtained a mean score of 59.83.

The difference of only 0.34 points indicates that the two groups started from nearly equivalent levels of reading literacy.

The standard deviation values in the pre-test phase were also relatively similar. The experimental group had a standard deviation of 8.42, while the control group had a standard deviation of 8.67. This finding suggests that the distribution of literacy abilities among students in both groups was relatively homogeneous before the implementation of the treatment.

The mastery percentage analysis further supports the equivalence of the two groups at baseline. Only 27.78% of students in the experimental group achieved the minimum mastery criterion, while 22.22% of students in the control group met the criterion. These percentages indicate that the majority of students in both groups initially demonstrated low reading literacy performance.

A substantial improvement was observed in the experimental group after the implementation of digital storytelling. The post-test mean score increased from 60.17 to 92.34, representing an improvement of 32.17 points. Based on the predetermined categorization criteria, this score falls within the very high category.

The control group also demonstrated improvement between the pre-test and post-test phases. However, the increase was considerably smaller than that observed in the experimental group. The mean score increased from 59.83 to 65.61, representing a gain of only 5.78 points. The comparison of post-test means reveals a substantial difference between the two groups. Students who received digital storytelling instruction achieved a mean score of 92.34, whereas students who participated in conventional instruction achieved a mean score of only 65.61. This difference indicates that digital storytelling contributed positively to students' reading literacy achievement.

The standard deviation in the experimental group decreased from 8.42 during the pre-test to 4.16 during the post-test. This reduction indicates that students' literacy performance became more consistent following the intervention. In other words, improvements were experienced by nearly all students rather than by only a few high-performing individuals. In contrast, the control group exhibited only a slight reduction in score dispersion, from 8.67 to 7.95. This finding suggests that conventional instruction was less effective in producing uniform improvements among students.

The mastery percentage findings provide additional evidence regarding the effectiveness of digital storytelling. Following the intervention, all students in the experimental group achieved the minimum mastery criterion, resulting in a mastery percentage of 100%. Meanwhile, the mastery percentage in the control group increased from 22.22% to only 38.89%. Although some improvement occurred, the majority of students still failed to achieve mastery.

These findings collectively indicate that digital storytelling not only improved average reading literacy scores but also enhanced consistency in student achievement and increased learning mastery. The substantial gain score observed in the experimental group suggests that students benefited considerably from the multimedia features incorporated into digital storytelling activities.

The descriptive analysis therefore provides preliminary evidence supporting the effectiveness of digital storytelling as an instructional medium for reading literacy development.

The observed improvements are consistent across multiple indicators, including mean scores, standard deviations, and mastery percentages. Taken together, the descriptive statistical findings indicate that digital storytelling facilitated meaningful improvements in students' reading literacy achievement.

Prerequisite Test Results

Prior to conducting hypothesis testing, normality and homogeneity tests were performed.

Normality Test

Table 4. Shapiro–Wilk Normality Test Results

Group	Test	Statistic	Sig.
Experimental	Pre-test	0.957	0.521
Experimental	Post-test	0.948	0.397
Control	Pre-test	0.962	0.614
Control	Post-test	0.951	0.435

The significance values obtained from the Shapiro–Wilk test were all greater than 0.05. Therefore, the data in both groups were normally distributed.
The fulfillment of the normality assumption indicates that the score distributions were suitable for subsequent parametric statistical analyses.

Homogeneity Test

Table 5. Levene's Test of Homogeneity

Variable	Levene Statistic	Sig.
Post-test Scores	0.467	0.499

The significance value obtained from Levene's test was 0.499, which exceeded the alpha level of 0.05. Therefore, the variances of the two groups were considered homogeneous. The fulfillment of the homogeneity assumption indicates that the experimental and control groups originated from populations with similar variance characteristics. Because both prerequisite assumptions were satisfied, parametric hypothesis testing was subsequently conducted using paired sample t-tests and independent sample t-tests.

Hypothesis Testing

Paired Sample t-Test

Table 6. Paired Sample t-Test Results

Group	Mean Difference	t	df	Sig. (2-tailed)
Experimental	32.17	16.284	17	0.000
Control	5.78	2.643	17	0.017

The paired sample t-test results revealed a significant difference between pre-test and post-test scores in the experimental group. The significance value of 0.000 was lower than 0.05, indicating that digital storytelling significantly improved students' reading literacy. The control group also demonstrated a statistically significant increase. However, the magnitude of improvement was considerably smaller than that observed in the experimental group. The comparison of mean differences clearly demonstrates the superior effectiveness of digital storytelling compared with conventional instruction.

Independent Sample t-Test

Table 7. Independent Sample t-Test Results

Variable	Mean Difference	t	df	Sig. (2-tailed)
Post-test Scores	26.73	11.782	34	0.000

The independent sample t-test results revealed a statistically significant difference between the post-test scores of the experimental and control groups.

The significance value of 0.000 was substantially lower than 0.05, indicating rejection of the null hypothesis. Therefore, students who learned through digital storytelling achieved significantly higher reading literacy scores than those who received conventional instruction. The inferential statistical findings provide strong evidence that digital storytelling exerted a positive and significant effect on elementary school students' reading literacy.

DISCUSSION

The findings of this study demonstrate that digital storytelling significantly improved elementary school students' reading literacy. The substantial increase in literacy achievement observed in the experimental group indicates that the integration of multimedia-based storytelling created a learning environment that effectively supported literacy development.

One of the most notable findings was the increase in the average literacy score from 60.17 to 92.34 in the experimental group. This improvement suggests that digital storytelling facilitated a deeper understanding of textual content by presenting information through multiple sensory channels. This finding aligns with the Cognitive Theory of Multimedia Learning proposed by Mayer (2021), which argues that learning becomes more effective when information is processed through both verbal and visual pathways.

The superior performance of the experimental group compared with the control group also indicates that digital storytelling was more effective than conventional instructional approaches. Traditional literacy instruction often relies heavily on printed texts and teacher explanations, whereas digital storytelling provides richer contextual support through images, narration, sound, and animation (Robin, 2016).

The decrease in standard deviation observed in the experimental group represents another important finding. The reduction from 8.42 to 4.16 indicates that students' literacy achievement became more homogeneous following the intervention. This suggests that digital storytelling benefited not only high-achieving students but also those who initially experienced literacy difficulties.

The achievement of 100% mastery learning in the experimental group further emphasizes the educational value of digital storytelling. Such a result indicates that the instructional approach was capable of supporting diverse learners and reducing achievement gaps within the classroom.

These findings are consistent with those reported by Smeda et al. (2014), who found that digital storytelling promotes greater student engagement and literacy development than conventional learning approaches. The multimedia characteristics of digital stories enable students to visualize narrative content more effectively and strengthen comprehension processes.

The significant paired sample t-test result obtained in the experimental group confirms that the observed improvement was not attributable to chance alone. Instead, the findings indicate that digital storytelling functioned as a meaningful pedagogical intervention that directly contributed to literacy growth. The independent sample t-test findings provide even stronger evidence regarding the effectiveness of digital storytelling. The significant difference between groups demonstrates that students exposed to digital

storytelling achieved literacy outcomes substantially higher than those participating in conventional instruction.

One explanation for this finding may be related to increased student motivation. Previous research has consistently identified reading motivation as a key determinant of literacy achievement (Guthrie et al., 2012). Digital storytelling presents narratives in engaging formats that attract students' attention and encourage active participation in reading activities. Another explanation concerns the role of multimodal representation. Kress (2010) argues that contemporary literacy requires learners to interpret information from multiple modes of communication. Digital storytelling exposes students to textual, visual, and auditory representations simultaneously, thereby strengthening literacy competencies relevant to the twenty-first century.

The findings also support constructivist perspectives on learning. According to Vygotsky (1978), knowledge is actively constructed through meaningful interactions with learning materials and social environments. Digital storytelling provides opportunities for students to engage actively with stories, discuss content, and construct meaning collaboratively. The positive outcomes observed in this study are consistent with the findings reported by Yang and Wu (2012), who concluded that digital storytelling enhances academic achievement and learning motivation. The present study extends these findings by demonstrating similar benefits specifically within the context of elementary school reading literacy.

Furthermore, digital storytelling may contribute to vocabulary acquisition. Multimedia elements provide contextual clues that assist students in understanding unfamiliar words and expressions, thereby facilitating reading comprehension. The improvement in literacy achievement may also be attributed to increased student attention during learning activities. Research suggests that multimedia-rich environments can sustain learner attention more effectively than traditional instructional formats (Mayer, 2021). Another important implication concerns inclusivity. Because digital storytelling combines various modes of communication, it can accommodate different learning preferences and cognitive strengths among students. This flexibility may explain the reduction in achievement variability observed in the experimental group.

The findings also contribute to the growing literature emphasizing the importance of integrating technology into elementary literacy instruction. UNESCO (2023) highlights that digital technologies can enhance educational quality when implemented through sound pedagogical practices. The present findings provide empirical support for this assertion. From a practical perspective, teachers may utilize digital storytelling as an alternative instructional medium to address literacy challenges in elementary schools. The approach requires relatively accessible technological resources and can be adapted to various literacy topics and curriculum objectives. From a policy perspective, the findings suggest that literacy improvement initiatives should incorporate technology-enhanced learning strategies. Educational stakeholders may consider providing professional development opportunities that enable teachers to design and implement digital storytelling activities effectively.

The study also contributes to Indonesian literacy research by providing quantitative experimental evidence regarding the effectiveness of digital storytelling. Such evidence remains relatively limited in the context of elementary education and therefore fills an important gap in the literature. Despite the positive findings, several limitations should be acknowledged. The study involved a relatively small sample from a single elementary school, which may limit generalizability. Future research should involve larger samples from multiple schools and regions. Future studies may also examine the long-term impact of digital storytelling on literacy development, investigate its effects on specific literacy dimensions, and compare different digital storytelling models.

The findings consistently demonstrate that digital storytelling represents an effective instructional strategy for improving elementary school students' reading literacy. The integration of multimedia elements, enhanced learner engagement, increased

motivation, and support for multimodal learning collectively explain the substantial literacy gains observed among students who participated in the digital storytelling intervention.

CONCLUSION

This study concludes that digital storytelling had a positive and statistically significant effect on elementary school students' reading literacy. Students who participated in digital storytelling-based instruction demonstrated substantially higher improvements in reading literacy scores than those who received conventional instruction, as evidenced by both descriptive and inferential statistical analyses. The findings suggest that the integration of multimedia elements within storytelling activities can support students' engagement and comprehension during literacy learning. While the results indicate the potential of digital storytelling as an alternative instructional approach for enhancing reading literacy in elementary schools, they should be interpreted within the context of the study's sample and setting. Therefore, further research involving larger and more diverse populations is recommended to strengthen the generalizability of these findings and to explore the long-term impact of digital storytelling on literacy development.

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