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Enhancing Beginning Reading and Writing Skills through Educational Multimedia Games and Direct Instruction

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Abstract

Early reading and writing skills are fundamental competencies that support children's subsequent academic achievement. However, conventional instructional approaches often fail to provide engaging learning experiences that effectively stimulate young learners' literacy development. This study aimed to examine the effect of integrating educational multimedia games with the direct instruction learning model on the early reading and writing skills of first-grade students. A quantitative approach employing a quasi-experimental design with a non-equivalent control group was adopted. The participants consisted of first-grade students assigned to experimental and control groups. Data were collected through pre-tests, post-tests, classroom observations, and documentation, and analyzed using descriptive statistics, the Shapiro-Wilk normality test, Levene's homogeneity test, an independent samples t-test, and N-Gain analysis. The findings revealed that the experimental group achieved significantly higher post-test scores than the control group (84.30 vs. 69.80), with a statistically significant difference ($p < 0.05$). The experimental group also demonstrated a higher N-Gain score (0.61, moderate category) and greater classroom engagement. These findings indicate that integrating educational multimedia games with the direct instruction model effectively enhances early reading and writing skills by creating a more interactive, engaging, and meaningful learning environment for elementary school students.

Keywords

Beginning Reading, Beginning Writing Skills, Direct Instruction, Educational Multimedia Games.

1. Introduction

Primary education provides the foundation for students' academic success in subsequent stages of learning. Among the essential competencies that should be developed during the early years of schooling are beginning reading and writing skills, which form the basis for acquiring knowledge across all subject areas. Strong literacy skills enable students to comprehend information, construct knowledge, and gradually develop higher-order thinking abilities. Conversely, inadequate reading and writing proficiency may hinder overall academic achievement and limit students' learning opportunities (Azzahra et al., 2021; Susanto, 2022; Nadzifa et al., 2025). Therefore, teachers are expected to adopt instructional strategies that accommodate young learners' developmental characteristics while fostering active engagement in the learning process (Mulyani, 2025).

The rapid advancement of digital technology has created new opportunities to design learning environments that are more interactive, engaging, and learner-centered. Multimedia learning, which integrates text, images, audio, animation, and video, helps transform abstract concepts into concrete learning experiences, making instructional content more accessible for primary school students (Adila & Rodiyah, 2024; Thalib et al., 2024). By stimulating multiple sensory channels, multimedia also enhances students' attention, motivation, and comprehension, resulting in more meaningful learning experiences (Rendini et al., 2024). Among these innovations, educational multimedia games have emerged as a promising instructional medium. By combining educational content with game elements such as challenges, immediate feedback, and rewards, these games create an enjoyable learning environment while maintaining instructional objectives (Männistö et al., 2019; Afifah et al., 2022). Such characteristics are particularly appropriate for young learners who are still in the concrete operational stage of cognitive development.

Despite these opportunities, beginning reading and writing instruction remains challenging in many Indonesian primary schools. Preliminary observations conducted at SDN 1 Sendangrejo, Lamongan, revealed that several first-grade students experienced difficulties in recognizing letters, reading simple words, and writing simple sentences accurately. These learning difficulties were associated with low learning motivation, limited use of instructional media, and the predominance of teacher-centered classroom practices (Dalman, 2014). As a result, students tended to participate passively and showed limited engagement throughout the learning process.

Previous studies have consistently reported the positive effects of educational multimedia on literacy development. Mahdalena et al. (2022) found that Android-based educational games significantly improved the reading ability of students with hearing impairments. Similarly, Setiarini et al. (2024) demonstrated that educational games designed for beginning reading increased learning motivation among first-grade students. Azzahrah and Rustini (2023) further reported that interactive digital learning media enhanced elementary students' reading and writing skills. However, these studies primarily evaluated the effectiveness of multimedia as a standalone instructional tool. Limited attention has been given to integrating educational multimedia games with a structured pedagogical approach, particularly the direct instruction model, to improve beginning reading and writing skills. This gap is noteworthy because direct instruction provides systematic learning phases, including orientation, modeling, guided practice, feedback, and independent practice, that may maximize the instructional effectiveness of multimedia-based learning (Lubis et al. 2024).

Accordingly, the novelty of this study lies in integrating educational multimedia games with the direct instruction model to support beginning reading and writing instruction for first-grade students. Rather than treating multimedia solely as a

teaching aid, this study embeds it within a structured instructional framework that actively guides students through each stage of skill acquisition. This integration is expected to increase student engagement while improving foundational literacy outcomes.

Therefore, this study aims to examine the effect of educational multimedia games implemented through the direct instruction model on the beginning reading and writing skills of first-grade students at SDN 1 Sendangrejo, Lamongan. The findings are expected to contribute theoretically by extending the literature on integrating multimedia learning and direct instruction in early literacy education. Practically, the study offers an evidence-based instructional alternative for primary school teachers seeking to improve beginning reading and writing skills through effective technology-enhanced learning.

2. Literature Review and Hypothesis Development

2.1. Beginning Reading and Writing Skills

Reading is a fundamental receptive language skill that enables learners to construct meaning from written texts. defines reading as the process of understanding the messages conveyed by an author through written language, while Tarigan (2015) describes it as the process of receiving and interpreting ideas expressed in written words. In primary education, reading instruction begins with beginning reading, which focuses on developing students' ability to recognize letters, decode syllables, read words, and comprehend simple sentences (Jannah et al., 2023). These foundational skills are essential because they underpin students' subsequent literacy development and support learning across all subject areas. Early mastery of reading allows children to expand their vocabulary, improve language comprehension, and develop the cognitive abilities required for more advanced literacy tasks. Consequently, effective beginning reading instruction should provide systematic learning experiences that correspond to young learners' cognitive and linguistic development.

Writing is a productive language skill through which learners express ideas, knowledge, and experiences in written form. Beginning writing is the initial stage of writing instruction that focuses on developing students' ability to write letters, words, and simple sentences accurately and systematically. This stage requires mastery of foundational skills, including holding a pencil correctly, tracing and copying letters, writing words from visual cues, and constructing simple sentences. These activities involve the integration of fine motor, visual, linguistic, and cognitive abilities (Abidin, 2019). As students' beginning writing skills improve, they become better prepared to produce more complex written texts. Beginning reading and writing are closely interconnected in elementary language education. Reading enriches vocabulary, sentence awareness, and text comprehension, while writing reinforces the recognition of letters, word patterns, and language structures. Therefore, beginning reading and writing should be taught in an integrated manner through engaging and developmentally appropriate instructional strategies to promote meaningful literacy development among elementary school students (Mayer, 2021).

2.2. Educational Multimedia Games

Educational multimedia games are technology-enhanced instructional media that integrate text, images, audio, animation, and interactive game elements into a unified learning environment designed to achieve specific educational objectives. Grounded in the principles of multimedia learning, these games facilitate meaningful learning by engaging multiple sensory channels and encouraging active learner participation (Mayer, 2021). Unlike conventional instructional media, educational multimedia games combine educational content with game mechanics, such as challenges,

rewards, and immediate feedback, enabling students to learn through exploration and repeated practice in an enjoyable environment. Previous studies have consistently demonstrated their positive impact on learning. Ramadhan et al. (2023) reported that educational games significantly improved elementary students' literacy and numeracy skills by increasing engagement during classroom activities. Similarly, Rendini et al. (2024) found that game-based interactive multimedia effectively enhanced elementary students' reading competence, while Aini et al. (2024) showed that Wordwall-based educational games increased students' participation and learning achievement in Indonesian language instruction. These findings suggest that educational multimedia games are an effective medium for supporting literacy development in primary education.

Educational multimedia games offer several pedagogical advantages that make them particularly suitable for beginning reading and writing instruction. Their interactive features foster motivation to learn, sustain students' attention, and encourage independent learning by allowing learners to progress at their own pace while receiving immediate feedback (Siswoyo et al., 2023). Continuous practice within a game environment also strengthens students' mastery of foundational literacy skills, including letter recognition, word decoding, vocabulary development, spelling, and simple sentence construction. These characteristics are well aligned with the developmental needs of primary school students, who learn most effectively through concrete, visual, and interactive experiences. Therefore, educational multimedia games represent an appropriate instructional medium for improving beginning reading and writing skills while simultaneously creating meaningful, engaging, and student-centered learning experiences (Nugroho et al., 2025).

2.3. Direct Instruction Learning Model

The direct instruction model is a teacher-centered instructional approach designed to facilitate the systematic acquisition of declarative and procedural knowledge through explicit and structured teaching. In this model, teachers play a central role in introducing learning objectives, demonstrating knowledge or skills, guiding students through practice, and providing continuous feedback to ensure that learning objectives are achieved (Eggen & Kauchak, 2012). Because learning activities are carefully sequenced from simple to more complex tasks, direct instruction is particularly effective for developing foundational skills that require repeated practice and gradual mastery, such as beginning reading and writing in primary education.

Huda (2014) explains that the direct instruction model begins with communicating learning objectives and preparing students for the lesson, followed by teacher demonstrations of the target knowledge or skills. Students then participate in guided practice under the teacher's supervision before their understanding is assessed through continuous feedback and corrective instruction. Finally, students are provided with opportunities for independent practice to strengthen their mastery of the acquired skills. This systematic progression enables teachers to provide appropriate scaffolding throughout the learning process while gradually fostering students' independence. Given that beginning reading and writing require explicit instruction, continuous guidance, and repeated practice, the direct instruction model provides a suitable pedagogical framework for integrating educational multimedia games into classroom instruction. The combination of structured teacher guidance and interactive multimedia activities is expected to promote active participation and improve students' beginning reading and writing skills.

2.4. Research Hypothesis Development

Drawing on multimedia learning theory and previous empirical findings, this study proposes that the use of educational multimedia games implemented through

the Direct Instruction learning model can effectively improve students' beginning reading and writing skills. Educational multimedia games create interactive learning environments that enhance students' motivation, engagement, and learning outcomes by integrating text, images, audio, animation, and game elements into meaningful learning experiences (Mayer, 2021; Nugroho et al., 2025). This multimodal approach facilitates students' cognitive processing by presenting information through multiple sensory channels, thereby reducing cognitive overload and promoting deeper understanding of literacy concepts. In addition, game-based learning encourages active participation and sustained attention, making early literacy instruction more enjoyable and meaningful for young learners. Previous studies by Ramadhan et al. (2023), Aini et al. (2024), and Rendini et al. (2024) have consistently demonstrated that educational games contribute positively to literacy development by improving students' reading skills, learning motivation, classroom participation, and overall learning achievement.

Furthermore, the direct instruction learning model provides explicit and systematic instruction through teacher demonstrations, guided practice, corrective feedback, and independent practice, making it particularly appropriate for teaching foundational literacy skills that require gradual mastery (Eggen & Kauchak, 2012; Huda, 2014). The structured sequence of instruction ensures that students receive sufficient guidance before practicing skills independently, thereby minimizing learning difficulties during the early stages of literacy acquisition. When integrated with educational multimedia games, direct instruction combines systematic teacher support with interactive digital learning experiences, enabling students to develop beginning reading and writing skills more effectively than through conventional instruction.

H1: There is a significant difference in the beginning reading and writing skills between students who learn using educational multimedia games integrated with the direct instruction model and those who learn using conventional instruction.

3. Methods

This study employed a quantitative approach using a quasi-experimental design to examine the effect of educational multimedia games implemented through the direct instruction learning model on students' beginning reading and writing skills. Specifically, the study adopted the Nonequivalent Control Group Design, which allows researchers to compare learning outcomes between an experimental group receiving the intervention and a control group receiving conventional instruction without random assignment. This design was selected because the existing classroom structure could not be reorganized into randomly assigned groups, making it appropriate for educational research conducted in natural school settings. The research was carried out at SDN 1 Sendangrejo, Lamongan, during the second semester of the 2025/2026 academic year.

The population comprised all first-grade students enrolled at SDN 1 Sendangrejo, Lamongan. Participants were selected using cluster sampling, in which intact classrooms were assigned as research groups. Class IA, consisting of 22 students, served as the experimental group and received instruction using educational multimedia games implemented through the direct instruction learning model. Meanwhile, Class IB, consisting of 21 students, served as the control group and received conventional classroom instruction. Both groups completed a pre-test before the intervention to measure their initial beginning reading and writing abilities and a post-test after the intervention to evaluate learning outcomes.

Data were collected through tests, classroom observations, and documentation. The primary research instrument was a beginning reading and writing achievement test administered as both the pre-test and post-test to assess students' literacy

performance before and after the intervention. Classroom observations were conducted throughout the implementation of the learning activities to monitor students' participation and the fidelity of the instructional process. Documentation, including class records, learning materials, lesson plans, and photographs of classroom activities, was used to support and validate the research findings.

Data analysis was conducted using IBM SPSS Statistics version 26. Descriptive statistics were first employed to summarize students' beginning reading and writing scores. Before hypothesis testing, the assumptions of normality and homogeneity were examined using the Shapiro–Wilk normality test and Levene's test of homogeneity of variances, respectively. The effectiveness of the intervention was subsequently evaluated using the normalized gain (N-Gain) test to determine the magnitude of students' learning improvement between the pre-test and post-test. An independent-samples t-test was performed to compare the post-test scores of the experimental and control groups and determine whether the observed differences were statistically significant. A significance level of 0.05 was applied to all statistical analyses.

4. Results

In this study, before the intervention, both classes were administered a pretest to assess the students' initial early reading and writing abilities. Following the completion of the instructional process, both classes took a posttest to measure the improvement in their reading and writing skills. The results of the descriptive analysis of the students' pretest and posttest scores are presented in Table 1.

Table 1. Descriptive Statistics of Pre-test and Post-test Scores

Statistic	Experimental Class	Control Class
Number of Students	22	21
Mean Pre-test Score	59.50	58.30
Highest Pre-test Score	75	74
Lowest Pre-test Score	45	44
Mean Post-test Score	84.30	69.80
Highest Post-test Score	95	85
Lowest Post-test Score	70	58
Post-test Standard Deviation	6.12	7.48

Based on Table 1, the average pretest score for the experimental class was 59.50, while that of the control class was 58.30. These results indicate that the students' initial proficiency levels in both classes were relatively similar. Following the intervention, the average post-test score for the experimental class rose to 84.30, whereas the control class reached only 69.80. The experimental class showed an average score increase of 24.80 points, compared to an increase of only 11.50 points in the control class. This demonstrates that instruction utilizing educational multimedia games combined with the direct instruction model is more effective at enhancing students' reading and writing skills than conventional instruction. Student learning mastery was determined based on the Learning Objective Achievement Criteria (*Kriteria Ketercapaian Tujuan Pembelajaran*/KKTP) established by the school, which was set at 75.

Table 2. Students' Learning Mastery

Class	Students Meeting the Passing Standard	Percentage (%)	Students Not Meeting the Passing Standard	Percentage (%)
Experimental	20	90.91	2	9.09
Control	11	52.38	10	47.62

Table 2 shows that the experimental class achieved a substantially higher level of learning mastery than the control class. Of the 22 students in the experimental class, 20 students (90.91%) met the passing standard, while only 2 students (9.09%) did not. In contrast, in the control class, only 11 of 21 students (52.38%) achieved the passing standard, whereas 10 students (47.62%) failed to meet it. These findings indicate that the implementation of educational multimedia games through the direct instruction model was more effective in helping students achieve the expected learning outcomes than conventional instruction, as reflected by the considerably higher proportion of students attaining learning mastery in the experimental class.

Table 3. Results of the Shapiro-Wilk Normality Test

Class	Test	Sig. (p-value)	Interpretation
Experimental	Pre-test	0.200	Normally distributed
	Post-test	0.087	Normally distributed
Control	Pre-test	0.156	Normally distributed
	Post-test	0.092	Normally distributed

Table 3 presents the results of the Shapiro–Wilk normality test for the pre-test and post-test scores of both the experimental and control classes. The findings indicate that all significance (p) values exceeded the threshold of 0.05, with values of 0.200 and 0.087 for the experimental class and 0.156 and 0.092 for the control class in the pre-test and post-test, respectively. These results demonstrate that both groups' data were normally distributed. Therefore, the assumption of normality was satisfied, indicating that the dataset was appropriate for subsequent parametric statistical analyses, including the independent samples t-test.

Table 4. Results of Levene's Test for Homogeneity of Variances

Item	Result
Variable	Post-test Scores
Levene's Statistic	1.587
Sig. (p-value)	0.215
Interpretation	Homogeneous

Table 4 presents the results of Levene's test for homogeneity of variances conducted on the post-test scores. The analysis produced a Levene's statistic of 1.587 with a significance (p) value of 0.215, which is greater than the significance level of 0.05. These results indicate that the variances of the experimental and control groups were homogeneous, meaning that the assumption of homogeneity of variance was satisfied. Therefore, the data met the assumption required to conduct the independent samples t-test to compare the post-test scores between the two groups.

Table 5. N-Gain Test Results

Class	Mean N-Gain Score	Category
Experimental	0.61	Moderate
Control	0.28	Low

Table 5 presents the results of the N-Gain analysis, which was conducted to measure the effectiveness of the learning intervention in improving students' learning outcomes. The experimental class obtained a mean N-Gain score of 0.61, which falls into the moderate category, indicating that the use of educational multimedia games integrated with the direct instruction model resulted in a meaningful improvement in students' achievement. In contrast, the control class achieved a mean N-Gain score of 0.28, which is categorized as low, suggesting only a limited improvement in learning outcomes through conventional instruction.

These findings demonstrate that the experimental treatment was more effective than the conventional learning approach in enhancing students' academic performance.

Table 6. Results of the Independent Samples t-test

Item	Result
Variable	Post-test Scores
t-test	7.184
Degrees of Freedom (df)	41
Sig. (2-tailed)	< 0.001
Decision	Reject H_0

Table 6 presents the results of the independent samples t-test conducted to determine whether there was a significant difference in post-test scores between the experimental and control classes. The analysis yielded a t-test of 7.184 with 41 degrees of freedom and a significance value ($p < 0.001$). Since the p-value was substantially lower than the significance level of 0.05, the null hypothesis (H_0) was rejected. These findings indicate a statistically significant difference in post-test performance between the two groups. Students in the experimental class, who learned through educational multimedia games integrated with the direct instruction model, achieved significantly higher learning outcomes than those in the control class, demonstrating the effectiveness of the instructional intervention.

Table 7. Results of Student Activity Observations

Observed Aspect	Experimental Class (%)	Control Class (%)
Active participation in learning activities	92.00	70.00
Enthusiasm for completing tasks	95.00	72.00
Participation in classroom discussions	88.00	65.00
Independent learning	90.00	68.00
Mean	91.25	68.75

Table 7 shows the results of student activity observations during the learning process in both the experimental and control classes. The findings show that the experimental class consistently demonstrated higher levels of student engagement across all observed aspects than the control class. The experimental class achieved scores of 92.00% for active participation in learning activities, 95.00% for enthusiasm in completing tasks, 88.00% for participation in classroom discussions, and 90.00% for independent learning, resulting in an overall mean of 91.25%. In comparison, the control class recorded lower percentages across the same aspects, with an overall mean of 68.75%. These results indicate that the integration of educational multimedia games with the direct instruction model not only improved students' academic achievement but also enhanced their active participation, motivation, collaboration, and independent learning throughout the instructional process.

5. Discussion

The findings of this study demonstrate that integrating educational multimedia games with the direct instruction model significantly improves the early reading and writing skills of first-grade students. This is evidenced by the higher mean post-test score achieved by the experimental group (84.30) compared with the control group (69.80). Furthermore, the Independent Samples t-test yielded a significance value of $p < 0.05$, indicating a statistically significant difference between the two groups. These findings suggest that educational multimedia games provide a more effective approach to developing early literacy skills than conventional instruction. The results are consistent with those of Mahdalena et al. (2022), who reported that

Android-based educational games significantly improved elementary students' reading skills, and Azzahrah and Rustini (2023), who found that interactive digital learning media through the GEMAR application enhanced students' reading and writing abilities.

The improvement in students' literacy skills indicates that educational multimedia games create a more engaging and meaningful learning environment. By integrating text, images, audio, animation, and game-based activities, the multimedia provides concrete learning experiences that help young learners understand literacy concepts more effectively while maintaining their motivation throughout the learning process. These findings are consistent with Nurhayatin et al. (2023) and Setiarini et al. (2024), who found that educational games for beginning reading significantly increased first-grade students' learning motivation. This finding is also supported by constructivist learning theory, which argues that knowledge is actively constructed through meaningful learning experiences (Wangi et al., 2022). During the learning activities, students actively recognized letters, read words, matched pictures with words, and constructed simple sentences, allowing them to build knowledge through direct interaction with learning materials (Degeng, 2013).

Classroom observations further revealed that students in the experimental group demonstrated substantially higher engagement than those in the control group. Students actively responded to teachers' questions, confidently completed game-based challenges, and participated enthusiastically in reading and writing activities. In contrast, students receiving conventional instruction tended to be more passive because learning relied primarily on teacher explanations and written exercises. This finding supports the study by Setiarini et al. (2024), which reported that educational games effectively enhance students' motivation and classroom participation. Greater student engagement likely contributed to the improved learning outcomes, as active participation promotes deeper understanding and sustained attention during instruction.

The effectiveness of the intervention is further supported by the N-Gain analysis, in which the experimental group achieved a mean score of 0.61 (moderate), compared with only 0.28 (low) for the control group. This result indicates that students receiving the multimedia-based intervention experienced greater learning improvement throughout the instructional process. The finding is consistent with Widodo (2021), who demonstrated that Kahoot-based educational multimedia significantly improved elementary students' writing skills, and further reinforces the findings of Mahdalena et al. (2022) regarding the superiority of game-based learning over conventional instructional approaches.

The positive outcomes can also be attributed to the implementation of the direct instruction model, which provides systematic learning stages, including orientation, demonstration, guided practice, feedback, and independent practice. These structured procedures are particularly appropriate for early elementary students, who require explicit guidance when acquiring foundational literacy skills. This finding is consistent with Wardana (2021) and Lubis et al. (2024), who concluded that direct instruction effectively improves students' mastery of basic skills through sequential and teacher-guided learning. In addition, the findings support behaviorist learning theory, which emphasizes repetition and reinforcement as essential mechanisms for skill acquisition (Eggen & Kauchak, 2012). Through repeated practice and immediate feedback in the form of scores, sounds, and reward animations, educational multimedia games reinforce correct responses and sustain students' motivation to learn (Ramadhan et al., 2023; Ma'sum et al., 2025).

This study demonstrates that integrating educational multimedia games with the direct instruction model provides an effective strategy for improving early reading and writing skills among first-grade students. The findings reinforce previous evidence that combining interactive digital media with structured instructional

approaches enhances literacy achievement, learning motivation, and classroom engagement. Nevertheless, the study was limited to a single school with a relatively small sample size. Future research should involve larger and more diverse samples while examining the effectiveness of educational multimedia games across different grade levels and learning subjects to improve the generalizability of the findings.

6. Conclusion

This study concludes that the integration of educational multimedia games with the direct instruction model significantly improves the early reading and writing skills of first-grade elementary school students. Students in the experimental group achieved significantly higher post-test scores than those in the control group, supported by a statistically significant difference and a higher N-Gain score, indicating greater learning improvement throughout the instructional process. Classroom observations further revealed increased student engagement, participation, and motivation during learning activities. These findings demonstrate that combining interactive multimedia with structured instructional procedures creates a more meaningful and effective learning environment for developing foundational literacy skills. The study also contributes to the growing body of evidence supporting the integration of digital game-based learning and teacher-guided instruction in early literacy education, offering practical implications for teachers and schools seeking innovative approaches to improve students' reading and writing achievement.

Despite these promising findings, several limitations should be acknowledged. The study was conducted in a single elementary school with a relatively small sample, which may limit the generalizability of the results. In addition, the research focused exclusively on first-grade students and early reading and writing skills, leaving the effectiveness of the intervention in other grade levels and subject areas unexplored. Future research should therefore involve larger and more diverse samples across different educational settings to enhance the external validity of the findings. Further studies are also encouraged to investigate the long-term effects of educational multimedia games, compare different game-based learning designs, and examine their impact on other literacy competencies, cognitive skills, and students' learning motivation. Such investigations would provide a more comprehensive understanding of how educational multimedia can support sustainable improvements in elementary education.

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