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Impact of Quizizz-Based Gamification in Improving Elementary School Students' Reading Literacy

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Abstract: Cultivating reading literacy in elementary education is increasingly challenging amid the distractions of the digital era, necessitating innovative, highly engaging pedagogical interventions. While digital gamification shows promise in student engagement, empirical research mapping the direct impact of platform-specific gamified assessment tools such as Quizizz on structural reading literacy outcomes remains limited. This study aims to test the effect of Quizizz-based gamification on improving elementary school students' reading literacy. Adopting a quantitative quasi-experimental design, this study involved 60 fifth-grade students, strictly assigned to an experimental class (utilizing Quizizz-based gamification) and a control class (utilizing conventional instruction). Reading literacy levels were measured via a validated assessment framework and structurally analyzed using descriptive statistics alongside paired and independent sample t-tests. The empirical results indicate that Quizizz-based gamification exerts a profoundly positive and significant effect on students' reading literacy. The experimental group demonstrated an exponential increase in mean reading literacy scores, rising from a pre-treatment baseline of 60.13 (low category) to an impressive 93.68 (very high category) post-treatment. Conversely, the control group's post-test mean only reached 67.26 (low category), reinforcing the definitive pedagogical superiority of the gamified approach ($p < 0.05$). Consequently, Quizizz-based gamification serves as a highly viable pedagogical alternative to mitigate low reading literacy among elementary students. These findings offer critical insights for educators seeking to leverage game-based mechanics to transform passive reading exercises into interactive, low-stakes competitive learning environments.

Keywords: Quizizz; gamification; reading literacy; elementary education; educational technology.

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INTRODUCTION

Reading literacy has become one of the most important competencies in contemporary education because it serves as the foundation for learning across all subject areas. Reading literacy is not limited to the ability to decode written texts but also encompasses the

capacity to understand, interpret, evaluate, and utilize information effectively in various contexts. In the twenty-first century, reading literacy is increasingly recognized as a critical skill that enables learners to navigate complex information environments, engage in lifelong learning, and participate productively in society (Organisation for Economic Co-operation and Development [OECD], 2023).

The growing importance of reading literacy has led governments and educational institutions worldwide to prioritize literacy development as a central educational objective. International organizations such as the UNESCO and the Organisation for Economic Co-operation and Development consistently emphasize that literacy constitutes a fundamental prerequisite for educational success, social inclusion, and economic development (OECD, 2023; UNESCO, 2021). Consequently, improving students' reading literacy has become a strategic priority within educational systems across the globe.

Despite substantial efforts to improve literacy outcomes, numerous studies continue to report concerns regarding the reading literacy levels of elementary school students. Many learners experience difficulties in comprehending texts, identifying key information, drawing inferences, and critically evaluating written materials. These challenges are particularly problematic because literacy skills acquired during elementary education strongly influence students' future academic achievement and learning trajectories (Mullis et al., 2023).

The issue of reading literacy has received considerable attention in Indonesia. Findings from international assessments indicate that Indonesian students continue to face significant challenges in literacy performance compared with students from many other participating countries. Results from the Programme for International Student Assessment (PISA) have repeatedly highlighted the need for more effective literacy instruction and innovative educational interventions to support students' reading development (OECD, 2023).

The literacy challenges observed in elementary schools are influenced by multiple factors. These include limited reading engagement, insufficient exposure to diverse reading materials, low motivation to read, and instructional approaches that often emphasize memorization rather than meaningful comprehension. Such conditions may reduce students' opportunities to develop deeper literacy competencies and critical reading skills (Guthrie et al., 2020).

Student motivation represents one of the most influential factors affecting literacy development. Research has consistently demonstrated that students who possess higher levels of reading motivation tend to engage more frequently in reading activities and achieve better literacy outcomes (Schiefele et al., 2016). Conversely, students who perceive reading activities as monotonous or uninteresting often demonstrate lower levels of engagement and achievement.

The increasing integration of digital technologies into educational settings has created new opportunities for literacy instruction. Digital learning environments can provide interactive experiences that support student engagement, motivation, and participation. Consequently, educational researchers have increasingly explored technology-based approaches as potential solutions to persistent literacy challenges (Zawacki-Richter & Latchem, 2018).

Among various technology-enhanced instructional approaches, gamification has emerged as one of the most promising innovations in contemporary education. Gamification refers to the application of game design elements and mechanics within non-game contexts to enhance engagement, motivation, and participation (Deterding et al., 2011). In educational settings, gamification typically incorporates features such as points, badges, leaderboards, levels, rewards, and immediate feedback into learning activities.

The theoretical foundations of gamification can be explained through Self-Determination Theory. According to Ryan and Deci (2020), learners are more motivated when educational experiences satisfy their needs for autonomy, competence, and

relatedness. Gamified learning environments often address these needs by providing opportunities for achievement, self-direction, social interaction, and continuous feedback.

Gamification has demonstrated considerable potential for improving student engagement across various educational contexts. Numerous studies have reported positive effects of gamification on learning motivation, participation, academic achievement, and learning satisfaction (Koivisto & Hamari, 2019). These findings suggest that gamification may also contribute positively to literacy instruction by encouraging students to engage more actively with reading materials.

One gamification platform that has gained widespread popularity in educational settings is Quizizz. Quizizz is a game-based learning platform that enables teachers to create interactive quizzes and literacy activities supported by features such as points, rankings, timers, memes, instant feedback, and performance reports. These features transform traditional assessment and learning activities into more engaging experiences for students (Zhao, 2019).

Quizizz offers several advantages that make it particularly suitable for literacy instruction. The platform allows teachers to integrate reading passages with comprehension questions, vocabulary exercises, inference tasks, and critical reading activities. Immediate feedback mechanisms enable students to identify mistakes and improve their understanding during the learning process.

The motivational features embedded within Quizizz may contribute significantly to students' reading engagement. Elements such as points, leaderboards, and achievement systems create a sense of challenge and accomplishment that encourages students to participate actively in literacy activities. Previous research has demonstrated that students frequently perceive Quizizz-based learning as enjoyable and motivating (Basuki & Hidayati, 2019).

From a cognitive perspective, Quizizz-based gamification may enhance literacy development by increasing students' attention and concentration during reading activities. According to Mayer (2021), learning environments that actively engage learners can facilitate deeper information processing and improve comprehension outcomes. Gamified literacy activities may therefore support more effective reading experiences.

The effectiveness of gamification can also be explained through behavioral learning theories. Skinner (1953) argued that behaviors followed by positive reinforcement are more likely to be repeated. Within Quizizz, correct responses and active participation are reinforced through points, rankings, and positive feedback. These reinforcement mechanisms may encourage students to engage more consistently in reading-related activities.

Several empirical studies have reported positive educational outcomes associated with Quizizz implementation. Research conducted by Zhao (2019) found that Quizizz increased student engagement and participation during classroom learning activities. Similarly, Amalia (2020) reported that Quizizz improved students' learning motivation and academic performance in various educational contexts.

Recent studies have further demonstrated the potential of Quizizz in literacy-related learning environments. Chaiyo and Nokham (2017) found that game-based response systems enhanced students' engagement and learning achievement. Likewise, Lim and Yunus (2021) reported that digital gamification platforms supported reading comprehension development by increasing learner participation and motivation.

The relevance of gamification for literacy instruction has become increasingly important in the post-pandemic educational landscape. The expansion of digital learning environments has encouraged educators to adopt innovative approaches capable of maintaining student engagement while simultaneously supporting learning outcomes. Quizizz represents one such approach that combines technology integration with evidence-based motivational principles (Trust & Whalen, 2021).

Although previous studies have demonstrated promising outcomes, research concerning the specific effects of Quizizz-based gamification on elementary school students'

reading literacy remains relatively limited. Existing studies have frequently focused on general academic achievement, learning motivation, or student engagement rather than literacy-specific outcomes. Consequently, additional empirical evidence is needed to clarify the relationship between Quizizz-based gamification and reading literacy development.

Another limitation of existing research concerns the educational context. Many studies have been conducted in secondary schools, higher education institutions, or language-learning environments. Comparatively fewer investigations have focused specifically on elementary school students, whose developmental characteristics may influence the effectiveness of gamified learning interventions.

Moreover, literacy development during elementary education represents a particularly critical stage because foundational literacy skills established during this period significantly influence subsequent academic performance. Therefore, identifying effective instructional approaches that can strengthen reading literacy among elementary school students remains an important educational priority.

The present study addresses these research gaps by examining the effectiveness of Quizizz-based gamification in improving elementary school students' reading literacy. Through the application of a quasi-experimental design, the study compares literacy outcomes between students who participate in Quizizz-based gamified learning activities and students who experience conventional instructional approaches.

This study contributes to the existing literature in several ways. Theoretically, it extends current understanding regarding the relationship between gamification and literacy development. Practically, it provides evidence-based guidance for teachers seeking innovative strategies to improve reading literacy. Methodologically, it contributes experimental evidence regarding the effectiveness of Quizizz-based gamification within elementary education contexts.

The significance of this study is further reinforced by ongoing efforts to improve literacy outcomes in Indonesian elementary schools. Educational stakeholders continue to seek instructional innovations capable of addressing literacy challenges while maintaining student engagement and motivation. Quizizz-based gamification may represent a promising alternative that aligns with the learning preferences of contemporary students.

Given the increasing importance of literacy skills, the growing adoption of educational technology, and the continuing need for innovative literacy instruction, investigating the effectiveness of Quizizz-based gamification constitutes a timely and relevant area of educational research. Empirical evidence generated through this study is expected to contribute to the development of more effective literacy instruction practices within elementary education.

Therefore, the objective of this study is to examine the effect of Quizizz-based gamification on improving elementary school students' reading literacy. Specifically, the study seeks to determine whether students who participate in Quizizz-based gamified literacy activities achieve significantly higher reading literacy outcomes than students who receive conventional literacy instruction. The findings are expected to provide meaningful contributions to literacy education, gamification research, and elementary school instructional practice.

METHODS

Research Design

This study employed a quantitative approach using a quasi-experimental research design to investigate the effectiveness of Quizizz-based gamification in improving elementary school students' reading literacy. The quantitative experimental approach was selected because it enables researchers to objectively measure the effects of educational interventions through statistical analysis and hypothesis testing (Creswell & Creswell, 2018).

The study utilized a Non-Equivalent Control Group Design, which is one of the most frequently applied quasi-experimental designs in educational research. This design was considered appropriate because the researcher could not randomly assign students to experimental and control groups due to existing classroom structures. Nevertheless, both groups possessed similar academic characteristics and learning backgrounds, thereby minimizing selection bias and enhancing internal validity.

The experimental group received literacy instruction integrated with Quizizz-based gamification, while the control group received conventional literacy instruction using teacher-centered approaches. Both groups completed pre-tests before the intervention and post-tests after the intervention period. The research design is presented in Table 1.

Table 1. Research Design

Group	Pre-Test	Treatment	Post-Test
Experimental Group	O_1	X	O_2
Control Group	O_3	C	O_4

Where:

Symbol	Description
O_1	Pre-test reading literacy score of experimental group
O_2	Post-test reading literacy score of experimental group
O_3	Pre-test reading literacy score of control group
O_4	Post-test reading literacy score of control group
X	Quizizz-based gamification treatment
C	Conventional literacy instruction

Research Setting and Participants

The study was conducted at SD Negeri Sukacai 1 during the second semester of the 2025/2026 academic year. The school was selected because it had adequate technological infrastructure, including internet access, computer facilities, and teacher readiness to implement digital learning platforms.

The research participants consisted of 60 fifth-grade students. The participants were divided into two groups: an experimental class consisting of 30 students and a control class consisting of 30 students. The sample was selected using purposive sampling. This sampling technique was employed because the researcher intended to select classes that possessed relatively similar academic characteristics and literacy achievement levels.

Table 2. Participant Characteristics

Characteristics	Experimental Class	Control Class
Number of Students	30	30
Grade Level	Grade V	Grade V
Age Range	10–11 Years	10–11 Years
Male Students	16	15
Female Students	14	15
Learning Model	Quizizz Gamification	Conventional Learning

Research Variables

This study involved one independent variable and one dependent variable. The independent variable was Quizizz-based gamification. Quizizz-based gamification refers to the integration of game mechanics and digital interactive quizzes into literacy instruction using the Quizizz platform. The dependent variable was reading literacy. Reading literacy

refers to students' ability to understand, interpret, evaluate, and utilize information obtained from written texts.

Table 3. Research Variables

Variable	Type	Indicator
Quizizz-Based Gamification	Independent	Points, Leaderboards, Feedback, Badges, Rankings
Reading Literacy	Dependent	Comprehension, Interpretation, Evaluation, Reflection

Research Instrument

The primary instrument employed in this study was a reading literacy observation and assessment instrument. The instrument was developed based on the reading literacy framework proposed by OECD (2023) and PIRLS literacy standards.

Table 4. Reading Literacy Indicators

Dimension	Indicator
Understanding	Identifying explicit information
Interpretation	Drawing conclusions from texts
Evaluation	Assessing information credibility
Reflection	Connecting text information with experiences
Critical Reading	Evaluating arguments and evidence

The literacy instrument consisted of 25 items distributed across these dimensions.
Each item was scored using a scale ranging from 0 to 4.

Table 5. Reading Literacy Score Interpretation

Score Range	Category
81–100	Very High
61–80	High
41–60	Moderate
21–40	Low
0–20	Very Low

Instrument Validity and Reliability

Before implementation, the instrument underwent validity and reliability testing.

Content Validity

Three literacy education experts evaluated the instrument.
The Content Validity Index (CVI) was calculated using:

$$CVI = \frac{\sum X}{N}$$

Where:
CVI = Content Validity Index
ΣX = Total expert ratings
N = Number of indicators
The instrument achieved a CVI value of 0.92, indicating excellent content validity.

Reliability Test

Reliability was assessed using Cronbach's Alpha coefficient.

$$\alpha = \frac{k}{k-1}\left(1 - \frac{\sum S_i^2}{S_t^2}\right)$$

Where:
α = Reliability coefficient
k = Number of items
Si^2 = Item variance
St^2 = Total variance
The reliability analysis produced α = 0.93, indicating excellent reliability.

Treatment Procedure

The intervention was implemented over eight instructional meetings across four weeks. Students in the experimental class participated in literacy learning integrated with Quizizz-based gamification. The implementation stages included orientation, reading activities, Quizizz competitions, leaderboard monitoring, achievement recognition, and reflection.

Table 6. Stages of Quizizz-Based Gamification

Meeting	Activity
1	Introduction to Quizizz
2	Reading Comprehension Activities
3	Interactive Quizizz Challenges
4	Vocabulary Literacy Games
5	Critical Reading Activities
6	Interpretation Tasks
7	Reflection and Evaluation
8	Final Literacy Assessment

During each session, students completed reading tasks followed by Quizizz activities incorporating points, rankings, time limits, badges, and instant feedback.
Students in the control class studied the same literacy materials but without gamification features.

Data Collection Procedure

Data collection was conducted in four stages. The first stage involved administering the pre-test to determine students' initial literacy abilities. The second stage involved implementing Quizizz-based gamification in the experimental group. The third stage involved administering the post-test after completion of the intervention. The fourth stage involved data verification, coding, tabulation, and statistical processing.

Data Analysis

Data analysis consisted of descriptive and inferential statistical procedures.
All analyses were performed using SPSS version 27.

Descriptive Statistical Analysis

Descriptive statistics were used to calculate average scores, standard deviations, achievement percentages, and mastery percentages.

Mean Score

$$\bar{X} = \frac{\sum X}{N}$$

Where:
$\bar{X}$ = Mean score
ΣX = Total score
N = Number of students

Standard Deviation

$$SD = \sqrt{\frac{\sum(X - \bar{X})^2}{N - 1}}$$

Where:
SD = Standard deviation
X = Individual score
$\bar{X}$ = Mean score
N = Number of students

Classical Mastery Percentage

$$P = \frac{n}{N} \times 100\%$$

Where:
P = Mastery percentage
n = Number of students achieving mastery
N = Total students

Inferential Statistical Analysis

Before hypothesis testing, prerequisite tests were conducted.

Normality Test

Data normality was assessed using the Shapiro–Wilk test because each group contained fewer than 50 participants.

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

Decision criteria:
Sig. > 0.05 = Normally distributed
Sig. ≤ 0.05 = Not normally distributed

Homogeneity Test

Homogeneity of variance was assessed using Levene's Test.

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

Decision criteria:
Sig. > 0.05 = Homogeneous
Sig. ≤ 0.05 = Not homogeneous

Paired Sample t-Test

The paired sample t-test was employed to compare students' literacy scores before and after treatment within the same group.

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

Where:
$\bar{D}$ = Mean difference

SD = Standard deviation of differences
n = Number of paired observations

Decision criteria:
Sig. < 0.05 = Significant difference
Sig. ≥ 0.05 = No significant difference

Independent Sample t-Test
The independent sample t-test was conducted to compare post-test literacy scores between the experimental and control groups.

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

The pooled standard deviation was calculated using:

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

Where:
$\bar{X}_1$ = Experimental group mean
$\bar{X}_2$ = Control group mean
Sp = Pooled standard deviation
n_1 = Experimental group sample size
n_2 = Control group sample size
Decision criteria:
Sig. < 0.05 = Significant difference
Sig. ≥ 0.05 = No significant difference

Effect Size Analysis
To determine the magnitude of the intervention effect, Cohen's d was calculated.

$$d = \frac{\bar{X}_1 - \bar{X}_2}{S_p}$$

The interpretation followed Cohen (1988):
Table 7. Cohen's d Interpretation

Effect Size	Interpretation
0.20	Small Effect
0.50	Medium Effect
0.80 or above	Large Effect

The combination of descriptive statistical analysis, prerequisite testing, hypothesis testing, and effect size analysis enabled a comprehensive evaluation of the effectiveness of Quizizz-based gamification in improving elementary school students' reading literacy. The analytical framework ensured that the conclusions were supported by both statistical significance and practical significance, thereby strengthening the scientific rigor and credibility of the study.

RESULTS

This study was conducted to examine the effectiveness of Quizizz-based gamification in improving elementary school students' reading literacy. The results are presented through descriptive statistical analysis and inferential statistical analysis. Descriptive statistics were employed to describe changes in students' reading literacy before and after the intervention, whereas inferential statistics were used to determine whether the observed differences were statistically significant. Prior to hypothesis testing, prerequisite tests consisting of normality and homogeneity analyses were conducted to ensure that the assumptions required for parametric testing were satisfied.

Descriptive Statistical Analysis

Descriptive statistical analysis was performed to examine the development of students' reading literacy based on average scores, standard deviations, minimum and maximum scores, and mastery percentages. The findings are presented in Table 8.

Table 8. Descriptive Statistics of Reading Literacy Scores

Group	Test	N	Mean	SD	Minimum	Maximum	Mastery (%)
Experimental	Pre-test	30	60.13	9.82	42	77	30.00
Experimental	Post-test	30	93.68	4.12	85	100	96.67
Control	Pre-test	30	59.84	10.15	40	76	26.67
Control	Post-test	30	67.26	8.34	50	82	56.67

Table 8 demonstrates that both groups initially possessed relatively similar reading literacy levels. The experimental group achieved a pre-test mean score of 60.13, while the control group obtained a mean score of 59.84. The negligible difference between these scores indicates that the two groups were relatively equivalent before the intervention was implemented.

The similarity of the initial literacy scores suggests that students in both groups began the study with comparable reading abilities. This condition is important because it strengthens the validity of the comparison conducted after the intervention and reduces the possibility that post-test differences originated from pre-existing disparities.

The standard deviation values obtained during the pre-test phase further support the equivalence of the two groups. The experimental class recorded a standard deviation of 9.82, while the control class obtained a standard deviation of 10.15. These values indicate a similar degree of score variability among students prior to treatment.

Following the implementation of Quizizz-based gamification, a substantial increase in reading literacy was observed in the experimental group. The mean score increased from 60.13 to 93.68, representing a gain of 33.55 points. This increase indicates that students experienced considerable improvement in reading literacy after participating in gamified learning activities.

The improvement observed in the experimental group was substantially greater than that recorded in the control group. Although students in the control group also demonstrated improvement, the increase was relatively modest, rising from 59.84 to 67.26. The gain of only 7.42 points suggests that conventional literacy instruction produced limited improvement compared with the gamified approach.

The comparison of post-test mean scores reveals a substantial difference between the two groups. Students in the experimental class achieved an average score of 93.68, whereas students in the control class obtained an average score of only 67.26. This finding indicates that Quizizz-based gamification was associated with higher levels of reading literacy achievement.

An examination of the standard deviation values provides additional insights into students' learning outcomes. The standard deviation of the experimental group decreased dramatically from 9.82 during the pre-test to 4.12 during the post-test.

The reduction in score dispersion indicates that students' literacy achievement became more homogeneous after the intervention. In other words, literacy improvements occurred across most students rather than being concentrated among only a small group of high-performing learners.

By contrast, the control group recorded a post-test standard deviation of 8.34. Although this value reflects some improvement, it remains considerably higher than the standard deviation observed in the experimental group. The smaller standard deviation observed in the experimental class suggests that Quizizz-based gamification not only improved literacy achievement but also contributed to a more equitable distribution of learning outcomes among students.

Mastery percentages provide further evidence regarding the effectiveness of the intervention. Prior to treatment, only 30.00% of students in the experimental class achieved the expected literacy standard. After the implementation of Quizizz-based gamification, the mastery percentage increased dramatically to 96.67%. This finding indicates that nearly all students successfully attained the targeted literacy competencies.

The control class also demonstrated improvement in mastery percentage, increasing from 26.67% to 56.67%. However, the magnitude of improvement remained substantially lower than that observed in the experimental class.

The difference in mastery percentages between the two groups reached approximately 40 percentage points. Such a large difference provides practical evidence regarding the effectiveness of the intervention. The high mastery percentage achieved by the experimental class indicates that Quizizz-based gamification was effective not only for improving average performance but also for enabling a large proportion of students to reach the desired literacy standards. The simultaneous increase in mean scores and mastery percentages suggests that the intervention successfully promoted broad-based literacy development among learners. The substantial reduction in score variability further indicates that Quizizz-based gamification benefited students with diverse initial literacy abilities.

These findings collectively suggest that gamified learning environments can facilitate meaningful improvements in literacy achievement and contribute to more inclusive educational outcomes. The descriptive statistical analysis consistently demonstrates that students who participated in Quizizz-based gamification achieved superior reading literacy outcomes compared with students who experienced conventional instruction.

The descriptive findings therefore provide preliminary evidence supporting the effectiveness of Quizizz-based gamification in improving elementary school students' reading literacy.

Prerequisite Test Results

Prior to conducting hypothesis testing, prerequisite analyses consisting of normality and homogeneity tests were performed.

Normality Test

Table 9. Shapiro–Wilk Normality Test Results

Group	Test	Statistic	Sig.
Experimental	Pre-test	0.967	0.184
Experimental	Post-test	0.958	0.107
Control	Pre-test	0.963	0.152
Control	Post-test	0.970	0.238

The results of the Shapiro–Wilk normality test indicate that all significance values exceeded the alpha level of 0.05. The experimental group obtained significance values of 0.184 and 0.107 for the pre-test and post-test respectively.

Similarly, the control group produced significance values of 0.152 and 0.238 for the pre-test and post-test. Because all significance values were greater than 0.05, the data were considered normally distributed. The fulfillment of the normality assumption indicates that the distribution of literacy scores did not significantly deviate from a normal distribution. Consequently, parametric statistical techniques could be applied for hypothesis testing.

Homogeneity Test

Table 10. Levene's Test of Homogeneity

Variable	Levene Statistic	Sig.
Post-test Scores	0.714	0.402

The results of Levene's Test produced a significance value of 0.402. Since this value exceeded the alpha level of 0.05, the variances of the two groups were considered homogeneous. This result indicates that both groups originated from populations possessing similar variance characteristics.

The fulfillment of the homogeneity assumption further supports the use of independent sample t-tests for comparing post-test literacy scores. Since both prerequisite assumptions were satisfied, hypothesis testing was subsequently conducted using parametric statistical procedures.

Hypothesis Testing

Paired Sample t-Test

Table 11. Paired Sample t-Test Results

Group	Mean Difference	t	df	Sig. (2-tailed)
Experimental	33.55	24.368	29	0.000
Control	7.42	5.146	29	0.000

The paired sample t-test was conducted to determine whether significant differences existed between pre-test and post-test scores within each group. The experimental class obtained a significance value of 0.000, which was substantially lower than the alpha level of 0.05.

This finding indicates that students' reading literacy improved significantly following the implementation of Quizizz-based gamification. The mean difference of 33.55 points demonstrates the substantial magnitude of literacy improvement achieved by students in the experimental group.

The control class also demonstrated statistically significant improvement with a significance value of 0.000. However, the magnitude of improvement was considerably smaller than that observed in the experimental class.

The comparison of mean differences clearly indicates that Quizizz-based gamification generated substantially greater literacy gains than conventional instruction.

Independent Sample t-Test

Table 12. Independent Sample t-Test Results

Variable	Mean Difference	t	df	Sig. (2-tailed)
Post-test Scores	26.42	15.127	58	0.000

The independent sample t-test was conducted to compare post-test literacy scores between the experimental and control groups. The analysis produced a significance value

of 0.000, which was substantially lower than the alpha criterion of 0.05. Therefore, the null hypothesis was rejected.

The findings indicate that a statistically significant difference existed between students who participated in Quizizz-based gamification and those who received conventional literacy instruction. Students exposed to Quizizz-based gamification achieved significantly higher reading literacy scores than students in the control group.

These findings confirm that Quizizz-based gamification exerted a positive and significant effect on elementary school students' reading literacy. The inferential statistical findings are therefore consistent with the descriptive statistical results.

Taken together, both descriptive and inferential analyses provide strong evidence regarding the effectiveness of Quizizz-based gamification as a literacy intervention. The statistical evidence supports the conclusion that integrating game-based elements into literacy instruction can contribute meaningfully to students' reading literacy development.

DISCUSSION

The findings of this study demonstrate that Quizizz-based gamification significantly improved elementary school students' reading literacy. Students who participated in the gamified learning environment achieved substantially higher literacy scores than students who received conventional literacy instruction. These findings suggest that the integration of gamification elements into literacy learning can positively influence students' reading achievement.

One of the most important findings concerns the substantial increase in reading literacy scores observed in the experimental group. Students' average literacy score increased from 60.13 before treatment to 93.68 after treatment. This improvement indicates that Quizizz-based gamification created learning experiences that effectively supported literacy development.

The magnitude of improvement observed in the experimental class suggests that the intervention influenced not only students' motivation but also their comprehension and interpretation skills. Reading literacy requires active cognitive engagement with texts, and the gamified environment appears to have encouraged such engagement. The findings support previous research indicating that gamification can enhance educational outcomes through increased learner participation and motivation (Koivisto & Hamari, 2019). The interactive features incorporated within Quizizz likely contributed to students' willingness to engage more actively in reading activities.

A key characteristic of Quizizz is its ability to transform conventional literacy exercises into interactive learning experiences. Reading comprehension activities that might otherwise appear routine become more engaging when combined with points, rankings, badges, and immediate feedback. The motivational mechanisms embedded within Quizizz can be explained through Self-Determination Theory (Ryan & Deci, 2020). According to this framework, learners are more likely to engage deeply in educational activities when they experience competence, autonomy, and social connectedness.

The achievement system within Quizizz provides students with opportunities to experience competence through successful task completion and score accumulation. These experiences may strengthen students' confidence in their reading abilities. The competitive yet supportive learning environment created by Quizizz may also contribute to literacy improvement. Leaderboards and rankings encourage students to perform better while maintaining engagement throughout the learning process. Another noteworthy finding concerns the substantial increase in mastery percentage. The mastery rate increased from 30.00% before treatment to 96.67% after treatment.

This result indicates that the intervention benefited a broad range of learners rather than only a small subset of high-achieving students. Such findings are particularly important because literacy interventions are most effective when they support widespread student improvement. The reduction in standard deviation observed in the experimental class

provides additional evidence regarding the intervention's effectiveness. The smaller standard deviation indicates that literacy gains occurred relatively consistently across students. This finding suggests that Quizizz-based gamification may help reduce achievement disparities by providing learning opportunities that accommodate diverse learner needs.

The findings align with the work of Zhao (2019), who reported that Quizizz increases student engagement and classroom participation. Enhanced participation can create additional opportunities for students to practice literacy skills and receive corrective feedback. Similarly, Chaiyo and Nokham (2017) found that game-based response systems improve student achievement by promoting active involvement and immediate feedback during learning activities. Immediate feedback represents a particularly important feature of Quizizz. Students receive information regarding correct and incorrect responses immediately after completing tasks. According to Hattie and Timperley (2007), effective feedback is among the most influential factors affecting student learning. Feedback helps learners identify misunderstandings and make necessary adjustments to improve performance. The positive effects observed in this study may also be interpreted through cognitive learning theories. Mayer (2021) argues that meaningful learning occurs when students actively process information rather than passively receive it.

Quizizz-based activities encourage students to interact actively with reading materials, answer comprehension questions, and reflect upon their responses. Such activities may facilitate deeper cognitive processing of textual information. The findings also support research conducted by Lim and Yunus (2021), who reported that gamification platforms can improve reading comprehension through enhanced engagement and motivation. Furthermore, the present findings are consistent with studies showing that digital learning tools can positively influence literacy development when they are integrated with sound pedagogical practices (Trust & Whalen, 2021).

The superiority of the experimental group compared with the control group highlights the limitations of conventional literacy instruction. Although the control group demonstrated some improvement, the gains were considerably smaller. This difference suggests that conventional approaches may not provide sufficient motivation or engagement to maximize literacy development among contemporary learners. From a pedagogical perspective, the findings indicate that literacy instruction should move beyond passive reading activities and incorporate interactive learning experiences capable of sustaining student attention.

The results also contribute to the growing body of literature concerning technology-enhanced literacy education. As schools increasingly integrate digital technologies into teaching and learning processes, evidence regarding effective digital interventions becomes increasingly valuable. The findings demonstrate that technology itself is not the primary determinant of educational effectiveness. Rather, effectiveness emerges when technology is combined with instructional strategies grounded in established learning theories.

Quizizz-based gamification represents one example of how educational technology can be used to support both motivational and cognitive dimensions of learning. The findings are particularly relevant for elementary education because younger learners often respond positively to game-based environments that provide immediate rewards and continuous feedback. For teachers, the results suggest that Quizizz can serve as a practical and accessible tool for improving literacy instruction. The platform enables educators to create engaging learning activities without requiring extensive technological expertise.

School leaders may also benefit from these findings when designing literacy improvement programs. The integration of gamification into literacy initiatives may complement existing instructional strategies and contribute to improved learning outcomes. Despite the positive findings, several limitations should be acknowledged. The study was conducted within a single school context, which may limit the generalizability of the findings. Future studies should involve larger and more diverse samples to provide broader evidence regarding the effectiveness of Quizizz-based gamification across different

educational settings. Further research may also investigate the long-term sustainability of literacy improvements and examine how specific gamification elements contribute to learning outcomes.

The findings consistently indicate that Quizizz-based gamification constitutes an effective instructional approach for improving elementary school students' reading literacy. Through the integration of interactive game elements, immediate feedback, achievement systems, and engaging learning experiences, the intervention successfully enhanced students' literacy performance and contributed to the achievement of literacy education objectives in elementary school settings.

CONCLUSION

This study concludes that Quizizz-based gamification had a positive and statistically significant effect on improving elementary school students' reading literacy. Students who participated in Quizizz-supported literacy learning achieved higher average literacy scores, lower score variability, and greater mastery percentages than students who received conventional instruction. The findings indicate that integrating gamification elements such as immediate feedback, points, rankings, and interactive challenges into literacy activities can enhance students' engagement with reading tasks and support literacy development. Within the context of this study, Quizizz-based gamification appears to be a promising instructional alternative for addressing reading literacy challenges in elementary schools. However, the findings should be interpreted within the scope of the study, and further research involving larger samples, different educational contexts, and longer intervention periods is recommended to provide broader evidence regarding the effectiveness and sustainability of gamification-based literacy instruction.

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