

Integrating Digital Storybooks and Gamified Quizzes for Vocabulary Mastery and Reading Comprehension

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Abstract

Despite the growing adoption of digital technologies in English as a Foreign Language (EFL) education, limited empirical evidence exists on how narrative-based learning and gamified assessment can be integrated to simultaneously strengthen vocabulary mastery and reading comprehension, particularly in vocational education. To address this gap, this study examined the effectiveness of integrating digital storybooks and gamified quizzes in supporting vocational high school students' vocabulary mastery and reading comprehension. A quantitative pre-experimental study employing a one-group pretest-posttest design was conducted with 30 eleventh-grade vocational students in Central Java, Indonesia. Students participated in learning activities that combined contextualized digital storybooks with gamified quizzes delivered through Wayground. Vocabulary mastery and reading comprehension were measured using a 20-item multiple-choice test administered before and after the intervention. As the data were not normally distributed, the Wilcoxon Signed-Rank Test was employed to compare students' pretest and posttest scores. The findings revealed a statistically significant improvement ($Z = -4.810$, $p < .001$), with the mean score increasing from 71.67 to 91.83, while all participants demonstrated positive learning gains without negative ranks or ties. These findings indicate that integrating contextualized narrative reading with gamified formative assessment promotes meaningful learning by encouraging active engagement, repeated vocabulary exposure, immediate feedback, and deeper text comprehension. The study contributes empirical evidence supporting the pedagogical value of integrating digital storybooks and gamified quizzes as an effective instructional approach for strengthening English reading instruction in vocational EFL classrooms.

Keywords: digital storybooks; gamified quizzes; vocabulary mastery; reading comprehension; vocational EFL students.

1. Introduction

Vocabulary mastery and reading comprehension are fundamental to successful English language learning because they enable learners to access, interpret, and construct meaning from written texts. Rather than developing independently, these two competencies reinforce one another throughout the language learning process. Adequate vocabulary knowledge supports learners in understanding textual information, whereas reading provides meaningful contexts through which new vocabulary is encountered, inferred, and retained (Nation & Newton, 2020; Yudha & Mandasari, 2021). Webb and Nation (2023) further argue that repeated exposure to words in authentic contexts strengthens both lexical knowledge and reading performance, making vocabulary and reading mutually supportive components of language development. For students learning English as a Foreign Language (EFL), particularly those in vocational education, these competencies are increasingly important because English is expected to facilitate not only academic achievement but also workplace communication and lifelong learning. Despite this expectation, many vocational EFL learners continue to experience difficulties in understanding written texts, identifying key information, and applying newly learned vocabulary beyond classroom exercises. Such challenges are often associated with learning environments that emphasize word memorization and teacher-centred reading practices, providing limited opportunities for learners to construct meaning through contextualized language use actively. These persistent challenges have encouraged researchers and educators to explore instructional approaches that create more meaningful, engaging, and learner-centred reading experiences.

Responding to this need, technology-enhanced language learning has increasingly shifted its focus from simply digitising instructional materials to designing learning experiences that promote active engagement



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and meaningful interaction. Educational technologies are now viewed as pedagogical resources that can enrich language learning by presenting contextualized input, encouraging learner participation, and providing immediate feedback rather than merely serving as delivery platforms (Macalister & Nation, 2020; Mayer, 2021). Among these innovations, digital storybooks have received considerable attention because they combine narrative texts with multimedia features that support vocabulary learning and reading comprehension through contextualized language exposure. Previous studies have consistently reported that digital storybooks contribute to vocabulary development, reading achievement, learner motivation, and reading engagement by providing authentic and comprehensible language input (Gu, 2020; Webb & Nation, 2023; Zainuddin et al., 2020). Alongside these developments, gamified learning has emerged as another promising instructional approach that encourages learners to participate actively through challenge, interaction, immediate feedback, and repeated retrieval practice (Fatimah & Masduqi, 2021; Zou et al., 2021). A comprehensive review by Sailer and Homner (2020) concluded that appropriately designed gamification positively influences cognitive, motivational, and behavioural learning outcomes, while subsequent studies have demonstrated similar benefits in language learning contexts (Alomari et al., 2019; Zainuddin et al., 2020). Collectively, these findings indicate that technology becomes pedagogically valuable when it is integrated into instructional designs that actively support learning rather than functioning as an end in itself.

An expanding body of research has therefore established the effectiveness of both digital storybooks and gamified learning for improving various aspects of language learning. However, these instructional approaches have largely been investigated independently, with digital storybooks primarily supporting contextualized reading and vocabulary acquisition. At the same time, gamified activities have predominantly been employed to increase learner engagement and reinforce formative assessment. As a result, relatively little empirical attention has been devoted to understanding how these complementary approaches can be pedagogically integrated within a single instructional design to strengthen vocabulary mastery and reading comprehension simultaneously. This limitation is particularly evident in vocational EFL classrooms, where English instruction is expected to develop practical language competencies while remaining relevant to students' academic and future professional needs. Rather than requiring additional instructional time or sophisticated technologies, integrating contextualized narrative learning with gamified formative assessment may offer a more coherent approach that combines meaningful language input, repeated vocabulary retrieval, immediate feedback, and active learner participation. Addressing this gap provides an opportunity not only to evaluate the effectiveness of combining two digital learning approaches but also to understand better how technology can be orchestrated to support interconnected language outcomes within authentic classroom contexts.

Based on these considerations, the present study adopts a different perspective by viewing digital technologies not as isolated instructional tools but as complementary pedagogical components within a unified learning design. Specifically, contextualized narrative learning delivered through digital storybooks provides meaningful language input that enables students to construct vocabulary knowledge through authentic reading experiences, while gamified formative assessment delivered through Wayground quizzes reinforces vocabulary retention, monitors reading comprehension, and encourages active participation through immediate feedback. Rather than evaluating the contribution of each instructional medium separately, this study examines how their pedagogical integration creates a coherent learning sequence that simultaneously supports vocabulary mastery and reading comprehension. Such an approach extends current discussions on technology-enhanced language learning by emphasizing the instructional design underlying digital learning rather than the technological tools themselves.

This perspective is particularly relevant to vocational education, where English instruction is expected to prepare students for both academic learning and future workplace communication. Learning activities therefore need to balance meaningful language exposure with active learner engagement while remaining feasible for classroom implementation. By integrating contextualized reading experiences with gamified reinforcement, the proposed instructional approach seeks to create learning environments in which

vocabulary development and reading comprehension are strengthened through repeated interaction with meaningful texts, collaborative participation, and continuous formative feedback. Consequently, the findings are expected to provide practical implications for English teachers seeking to design technology-enhanced reading instruction that is pedagogically meaningful, contextually relevant, and responsive to students' learning needs.

Building on the identified gap, this study investigates the pedagogical integration of digital storybooks and gamified quizzes as a coherent instructional approach to strengthening vocational students' vocabulary mastery and reading comprehension. Rather than examining the contribution of each digital tool independently, the study focuses on how contextualized narrative learning and gamified formative assessment can be combined to create meaningful, engaging, and technology-enhanced reading instruction. This integrated perspective extends current discussions on digital language learning by emphasizing instructional design over the isolated use of educational technologies. Accordingly, the study addresses the following research question: To what extent does integrating digital storybooks and gamified quizzes improve vocational high school students' vocabulary mastery and reading comprehension? By answering this question, the study contributes empirical evidence on how contextualized narrative learning and gamified formative assessment can be pedagogically integrated to strengthen vocabulary mastery and reading comprehension in vocational EFL classrooms.

2. Method

2.1 Research Design

This study employed a quantitative pre-experimental approach using a single-group pretest-posttest design to examine the effectiveness of integrating digital storybooks and gamified quizzes in improving vocational high school students' vocabulary mastery and reading comprehension. This design was considered appropriate because it enables researchers to measure changes in students' learning outcomes before and after an instructional intervention, making it suitable for evaluating classroom-based instructional practices where random assignment is not feasible (Creswell & Creswell, 2018; Fraenkel et al., 2023).

2.2 Participants and Research Context

The study was conducted at a public vocational high school in Central Java, Indonesia, involving 30 eleventh-grade students enrolled in an English course. Participants were selected using purposive sampling, as they shared comparable English learning backgrounds, followed the same curriculum, and had prior experience using digital learning platforms in classroom instruction. This relatively homogeneous learning context enabled the instructional intervention to be implemented consistently while minimizing variations arising from differences in curriculum, instructional exposure, and learning environment. Vocational high school students were specifically chosen because English instruction at this level emphasizes the development of practical language competencies that support both academic learning and future workplace communication, making vocabulary mastery and reading comprehension particularly relevant learning outcomes. Prior to data collection, permission was obtained from the school, and all participants voluntarily agreed to participate in the study.

2.3 Instructional Procedures

The instructional intervention was implemented over six classroom sessions, comprising one pretest session, four instructional sessions, and one posttest session. The instructional sequence was designed to integrate contextualized narrative learning through digital storybooks with gamified formative assessment delivered via Wayground. As summarized in Table 1, each instructional session followed a structured sequence that progressively guided students from vocabulary exploration to reading comprehension through contextualized reading activities, interactive quizzes, and classroom reflection. This sequence provided repeated opportunities for students to encounter new vocabulary in meaningful contexts, reinforce

their understanding through retrieval practice, and receive immediate formative feedback, thereby supporting the development of both vocabulary mastery and reading comprehension.

Table 1

Instructional Procedures of the Intervention

Session	Instructional Focus	Main Activities	Digital Tool
1	Pretest	Administration of vocabulary and reading comprehension pretest	—
2	Vocabulary introduction	Reading digital storybooks, vocabulary exploration, guided discussion	Digital Storybooks
3	Reading comprehension	Contextual reading, collaborative discussion, Wayground quiz	Digital Storybooks & Wayground
4	Vocabulary reinforcement	Storybook reading, vocabulary practice, gamified formative assessment	Digital Storybooks & Wayground
5	Reading consolidation	Integrated reading activities, comprehension tasks, interactive quizzes	Digital Storybooks & Wayground
6	Posttest	Administration of vocabulary and reading comprehension posttest	—

2.4 Instruments

The study employed a 20-item multiple-choice achievement test to measure students' vocabulary mastery and reading comprehension before and after the instructional intervention. The instrument was developed based on the English learning objectives for vocational high school students and was designed to assess two interrelated language competencies. Vocabulary items measured students' ability to identify word meanings and use vocabulary appropriately in context, whereas reading comprehension items assessed students' ability to identify main ideas, locate explicit information, infer implicit meaning, and interpret textual information. Prior to its administration, the instrument was reviewed by two English education experts to ensure content validity and alignment with the intended learning outcomes. The distribution of test indicators is presented in Table 2.

Table 2

Blueprint of the Achievement Test

Variable	Indicator	Item Numbers	Total Items
Vocabulary Mastery	Identifying word meanings	1–3	3
	Vocabulary in context	4–6	3
	Synonyms and antonyms	7–10	4
Reading Comprehension	Identifying main ideas	11–13	3
	Identifying specific information	14–16	3
	Making inferences	17–18	2
	Interpreting textual meaning	19–20	2
Total			20

2.5 Data Collection

Data were collected over three consecutive phases consisting of the pretest, instructional intervention, and posttest. Before the intervention, participants completed a pretest designed to measure their initial vocabulary mastery and reading comprehension. The pretest was administered under regular classroom conditions using the same test instrument that was subsequently employed as the posttest. Following the

pretest, students participated in four instructional sessions integrating digital storybooks with gamified quizzes delivered through Wayground, as described in Table 1. Throughout the intervention, students engaged in contextualized reading activities, vocabulary exploration, and gamified formative assessments designed to reinforce learning through repeated retrieval and immediate feedback. At the end of the intervention, participants completed the posttest under conditions comparable to those of the pretest to ensure consistency in test administration. All data were collected during regular English lessons by the classroom teacher in collaboration with the researchers.

2.6 Data Analysis

Descriptive statistics were initially employed to summarize students' performance on the pretest and posttest by calculating the minimum score, maximum score, mean, and standard deviation. These descriptive measures provided an overview of students' vocabulary mastery and reading comprehension before and after the instructional intervention. Prior to hypothesis testing, the distribution of the data was examined using the Shapiro–Wilk normality test, which is recommended for studies involving relatively small sample sizes (Razali & Wah, 2011). The normality test was conducted to determine whether the assumptions required for parametric statistical analysis were satisfied.

The results of the normality test indicated that the data were not normally distributed. Therefore, the Wilcoxon Signed-Rank Test was employed to compare students' pretest and posttest scores. This non-parametric procedure is appropriate for analyzing paired observations without assuming normal data distribution and is widely recommended for evaluating changes following educational interventions involving a single group (Field, 2018). All statistical analyses were performed using IBM SPSS Statistics version 25, with statistical significance determined at the 0.05 level.

3. Findings

The findings presented in this section provide empirical evidence of students' learning outcomes following the implementation of the integrated instructional approach. To address the research question, the analysis begins by describing students' performance before and after the intervention and is subsequently followed by an inferential analysis examining whether the observed improvement was statistically significant.

3.1 Students' Performance Before and After the Intervention

To provide an overview of students' learning outcomes before and after the instructional intervention, descriptive statistics were calculated by comparing the pretest and posttest scores. The analysis examined changes in students' overall performance using measures of central tendency and score dispersion, including the minimum score, maximum score, mean, and standard deviation. The descriptive statistics presented in Table 3 indicate a consistent improvement across all statistical indicators following the implementation of the integrated instructional approach.

Table 3

Descriptive Statistics of Students' Learning Outcomes Before and After the Intervention

Test	N	Minimum	Maximum	Mean	SD
Pretest	30	55.00	84.00	71.67	7.84
Posttest	30	78.00	100.00	91.83	5.76

As presented in Table 3, students achieved higher scores following the instructional intervention across all descriptive indicators. The mean score increased from 71.67 in the pretest to 91.83 in the posttest, representing an overall increase of 20.16 points. Similar improvements were observed in the minimum and maximum scores. The minimum score increased from 55.00 to 78.00, while the maximum score improved from 84.00 to 100.00, indicating that score improvements occurred throughout the class rather than among only a small group of students. In addition, the standard deviation decreased from 7.84 to 5.76, showing that

students' posttest scores were distributed within a narrower range than those recorded during the pretest. These changes indicate that higher learning outcomes were accompanied by greater consistency in students' performance after the intervention. To further illustrate the overall pattern of students' achievement, the pretest and posttest scores were subsequently classified into four performance categories, as presented in Table 4.

Table 4

Distribution of Students' Achievement Levels Before and After the Intervention

Achievement Level	Score Range	Pretest n (%)	Posttest n (%)
Excellent	90–100	0 (0.0)	18 (60.0)
Good	80–89	5 (16.7)	10 (33.3)
Fair	70–79	12 (40.0)	2 (6.7)
Poor	<70	13 (43.3)	0 (0.0)
Total		30 (100)	30 (100)

The distribution of achievement levels presented in Table 4 demonstrates a clear shift toward higher performance categories following the instructional intervention. During the pretest, most students were concentrated in the poor and fair categories, representing 43.3% and 40.0% of the participants, respectively. In contrast, only 16.7% achieved the good category, and none reached the excellent category. Following the intervention, the distribution changed substantially. The proportion of students classified as excellent increased to 60.0%, while 33.3% were categorized as good. At the same time, the percentage of students within the fair category decreased to 6.7%, and no students remained in the poor category. The descriptive findings consistently show that students' performance shifted from the lower achievement categories toward the higher categories after participating in the integrated instructional activities. The statistical significance of these observed changes is presented in the following section.

3.2 Effect of the Integrated Learning Approach

To determine whether the improvements observed in the descriptive analysis were statistically significant, an inferential analysis was conducted using the Wilcoxon Signed-Rank Test. This non-parametric test was selected because the Shapiro–Wilk normality test indicated that the pretest and posttest scores were not normally distributed. The inferential analysis examined whether the differences in students' learning outcomes before and after the instructional intervention were statistically significant. In addition, the effect size was calculated to provide supplementary information regarding the magnitude of the observed improvement. The results of the inferential analysis are presented in Table 5.

Table 5

Wilcoxon Signed-Rank Test Results

Statistic	Value
Wilcoxon Signed-Rank Test (Z)	–4.810
Asymptotic Significance (p)	< .001
Effect Size (r)	0.88

As presented in Table 5, the Wilcoxon Signed-Rank Test revealed a statistically significant difference between students' pretest and posttest scores ($Z = -4.810$, $p < .001$). The inferential analysis confirmed that the improvement observed in students' learning outcomes was statistically significant following the implementation of the instructional intervention. In addition, the calculated effect size ($r = 0.88$) indicates that the magnitude of the observed improvement was substantial. These inferential findings are consistent with the descriptive results presented in the previous section, which demonstrated higher posttest scores

across all descriptive indicators, including the mean score, minimum score, maximum score, and achievement level distribution. Collectively, the statistical analyses provide empirical evidence that students achieved significantly higher learning outcomes after participating in the integrated instructional activities. These findings directly address the research question by demonstrating that integrating digital storybooks and gamified quizzes was associated with improvements in vocational high school students' vocabulary mastery and reading comprehension.

4. Discussion

The improvement in students' learning outcomes observed in this study underscores the importance of pedagogically coherent technology integration in English language instruction. Although students demonstrated significantly higher levels of vocabulary mastery and reading comprehension after the instructional intervention, the findings should not be interpreted as evidence that digital technologies alone produce better learning outcomes. Rather, the improvement appears to result from the deliberate integration of contextualized narrative learning through digital storybooks and gamified formative assessment delivered via Wayground within a structured instructional sequence. This distinction is important because technology functions as a learning facilitator rather than an instructional substitute. The present findings therefore support the growing view that meaningful learning depends not simply on the availability of digital resources but on how those resources are organized to promote active cognitive engagement, repeated language exposure, and continuous formative support. Such a perspective extends current discussions in technology-enhanced language learning by emphasizing instructional coherence over technological novelty, thereby highlighting instructional design as the primary mechanism underlying students' improved learning outcomes.

One explanation for these findings lies in the pedagogical characteristics of contextualized narrative learning provided through digital storybooks. Unlike isolated vocabulary exercises that frequently present lexical items without meaningful context, narrative texts expose learners to vocabulary within coherent communicative situations, enabling them to infer meaning from contextual cues while simultaneously constructing textual understanding. According to Mayer (2021), meaningful learning occurs when learners actively select, organize, and integrate verbal and visual information into coherent mental representations. Digital storybooks naturally support this process by combining written language, illustrations, and contextual narratives that reduce unnecessary cognitive load while facilitating semantic processing. Consequently, students are not merely memorizing unfamiliar vocabulary but encountering words repeatedly within meaningful discourse, allowing vocabulary knowledge to develop alongside reading comprehension. This pedagogical mechanism is consistent with research demonstrating that contextualized language input promotes deeper lexical processing, improves inferential comprehension, and supports long-term vocabulary retention (Gu, 2020; Nation, 2022; Webb & Nation, 2023). Similarly, recent studies have reported that digital storybooks encourage greater learner engagement, richer contextual understanding, and improved reading performance because learners interact with language as part of authentic narratives rather than as disconnected linguistic units (Kirana et al., 2026; Zainuddin et al., 2020). However, the present study extends these findings by suggesting that the effectiveness of digital storybooks should not be attributed solely to their multimedia features. Instead, their instructional value appears to emerge from their ability to situate vocabulary learning within meaningful reading experiences that encourage learners to establish connections between lexical knowledge and textual comprehension. This broader instructional perspective helps explain why improvements were observed simultaneously in vocabulary mastery and reading comprehension rather than in isolated language skills.

The second explanation concerns the contribution of gamified formative assessment in reinforcing students' learning throughout the instructional intervention. While digital storybooks provided meaningful language exposure, gamified quizzes created repeated opportunities for students to retrieve newly acquired vocabulary and immediately apply their understanding to reading tasks. Retrieval Practice Theory argues that actively recalling previously learned information strengthens memory traces more effectively than

passive review because retrieval itself functions as a learning event rather than merely an assessment activity (Karpicke, 2012; Agarwal & Bain, 2019). The immediate feedback embedded within Wayground further supported this retrieval process by enabling students to recognize misconceptions, correct errors, and reinforce accurate responses during the learning process instead of waiting until the end of instruction. From a motivational perspective, gamified quizzes also transformed assessment into an interactive learning experience that sustained students' attention and participation through challenge, progress indicators, and instant performance feedback. Previous studies have similarly reported that gamified formative assessment contributes to increased classroom engagement, higher participation rates, and improved language achievement when feedback is timely and directly connected to instructional objectives (Alomari et al., 2019; Sailer & Homner, 2020; Zainuddin et al., 2020). Nevertheless, the present findings indicate that the effectiveness of gamified quizzes is closely associated with their pedagogical role within the broader instructional sequence rather than with gamification elements alone. In this study, the quizzes functioned as reinforcement activities following contextualized reading experiences, allowing students to consolidate vocabulary knowledge and comprehension through repeated retrieval and immediate feedback. This complementary relationship between meaningful language input and formative reinforcement provides an important foundation for understanding the overall effectiveness of the integrated instructional approach examined in this study.

The findings further suggest that the individual contributions of digital storybooks or gamified quizzes alone cannot fully explain the effectiveness of the instructional intervention. Instead, the improvement in students' learning outcomes appears to have resulted from the complementary relationship established between contextualized narrative learning and gamified formative assessment throughout the instructional process. Digital storybooks provided meaningful language input by introducing vocabulary within authentic textual contexts, whereas gamified quizzes reinforced this input through repeated retrieval, immediate feedback, and continuous monitoring of students' understanding. Rather than functioning as two independent instructional components, both learning activities formed a coherent pedagogical sequence in which each stage strengthened the learning opportunities created by the previous one. This instructional coherence may explain why improvements were observed not only in students' vocabulary mastery but also in their reading comprehension, as learners repeatedly interacted with the same lexical and textual information through different cognitive processes. Although previous studies have reported positive outcomes associated with digital storybooks (Kirana et al., 2026; Zainuddin et al., 2020) and gamified learning environments (Alomari et al., 2019; Sailer & Homner, 2020), these approaches have frequently been investigated as separate instructional innovations. The present findings extend this body of literature by demonstrating that greater pedagogical value may emerge when digital technologies are intentionally integrated within a coherent instructional design rather than implemented as isolated classroom activities. Consequently, the contribution of this study lies not in introducing new digital tools but in illustrating how complementary instructional functions can be systematically combined to strengthen language learning outcomes.

From a theoretical perspective, the present study contributes to the growing body of research on technology-enhanced language learning by reinforcing the importance of instructional design as the mechanism through which educational technologies influence learning. Much of the existing literature has focused primarily on evaluating the effectiveness of individual technologies, often comparing one digital platform with another or examining the impact of specific technological features on student achievement. While such studies have provided valuable evidence regarding the educational potential of digital learning environments, they have offered comparatively limited attention to the pedagogical relationships among different instructional components. The present findings suggest that meaningful improvements in vocabulary mastery and reading comprehension are better understood as outcomes of carefully sequenced learning experiences that integrate contextualized language input, active knowledge retrieval, and continuous formative feedback. This perspective aligns with broader discussions in instructional design emphasizing that learning effectiveness depends on the alignment between learning objectives, instructional

activities, learner engagement, and assessment rather than on technology itself (Clark & Mayer, 2023; Mayer, 2021). Accordingly, the study contributes to current theoretical discussions by demonstrating that the instructional coherence established through the integration of contextualized narrative learning and gamified formative assessment provides a more comprehensive explanation for students' improved learning outcomes than explanations based solely on technological affordances. In this respect, the study encourages future research to move beyond evaluating isolated educational technologies and instead investigate how multiple digital learning components can be pedagogically integrated to support different dimensions of language development.

These findings also offer several practical implications for English language teaching, particularly in vocational high school contexts where students are expected to develop communicative competencies that are relevant to future academic and workplace demands. Rather than adopting digital technologies simply because they are available, English teachers should prioritize designing instructional sequences that connect meaningful language exposure with continuous formative reinforcement. Digital storybooks may serve as effective resources for introducing vocabulary and supporting reading comprehension through contextualized narratives. At the same time, gamified quizzes can be strategically employed to strengthen retention, monitor students' understanding, and provide immediate feedback that informs subsequent learning. More importantly, the present findings indicate that the educational benefits of these technologies are maximized when they function as complementary elements within a coherent instructional framework rather than as separate classroom activities. Despite these contributions, the study is not without limitations. The use of a single-group pretest-posttest design limits the ability to compare learning outcomes with those of a control group. At the same time, the relatively small sample drawn from a single vocational high school may restrict the broader generalizability of the findings. Future studies are therefore encouraged to employ experimental or mixed-methods designs involving larger and more diverse participant groups to examine further how integrated instructional approaches can support different aspects of English language learning across various educational contexts.

5. Conclusion

This study demonstrates that integrating digital storybooks with gamified quizzes significantly improves vocational high school students' vocabulary mastery and reading comprehension. The findings indicate that meaningful learning gains were achieved through a pedagogically coherent instructional approach that combined contextualized narrative learning with gamified formative assessment, rather than through the use of digital technologies alone. By providing meaningful language exposure, repeated retrieval opportunities, and immediate formative feedback within a structured instructional sequence, the integrated instructional approach supported both vocabulary development and reading comprehension. These findings provide empirical evidence that the effectiveness of technology-enhanced language learning is closely associated with the quality of instructional design through which digital resources are integrated into classroom practice.

The study contributes to current discussions on technology-enhanced language learning by demonstrating that the educational value of digital technologies depends on their complementary pedagogical functions rather than their individual technological features. This perspective extends previous research that has predominantly examined digital storybooks and gamified learning as separate instructional approaches, highlighting the importance of instructional coherence in supporting language learning outcomes. The findings also offer practical guidance for English teachers, curriculum developers, and schools seeking to design technology-enhanced instruction for vocational education by integrating meaningful contextual learning with continuous formative assessment. Future research is encouraged to examine similar instructional approaches across different educational settings, learner populations, and language skills using more rigorous experimental and mixed-methods designs. Ultimately, the study reinforces the view that successful technology-enhanced language learning depends less on the adoption of

digital tools themselves than on the pedagogical quality with which they are meaningfully integrated into classroom instruction.

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7. Declaration of AI Use

During the preparation of this manuscript, the authors used Scopus AI to identify and explore relevant scholarly literature and QuillBot to improve language clarity, grammar, and readability. These tools were used solely to support the manuscript preparation process. They did not contribute to the study design, data collection, data analysis, interpretation of findings, or the development of the scientific conclusions. All scholarly judgments, interpretations, and final manuscript content were independently developed, reviewed, and approved by the authors.

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