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THE EFFECT OF WORDWALL MEDIA GAME ON VOCABULARY DEVELOPMENT: A QUASI-EXPERIMENTAL STUDY

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Abstract: This study examines the effectiveness of WordWall, a digital game-based learning platform, in improving students' English vocabulary achievement. Conducted at SMP Negeri 4 Kota Pematangsiantar during the 2025/2026 academic year, the research involved 62 seventh-grade students divided into two groups: an experimental group taught using WordWall and a control group taught through traditional textbook-based instruction. Employing a quasi-experimental design with pre-test and post-test procedures for both groups, the study found a notable increase in the vocabulary scores of the experimental group compared to the control group. The experimental group's mean post-test score (85.06) surpassed the school's minimum mastery criterion (KKM) of 72, while the control group's mean score was 71.6. Results from paired and independent sample t-tests indicated a significant difference ($p < 0.05$) between the two groups, validating the positive influence of WordWall on vocabulary acquisition. Moreover, students exposed to WordWall showed improved understanding and retention of word formation, such as recognizing different word classes (nouns, verbs, etc.). These findings highlight that incorporating digital game-based tools like WordWall can enhance both student engagement and learning outcomes. The study concludes that WordWall effectively supports vocabulary development while promoting a more interactive and learner-centered classroom environment, and recommends its adoption by teachers to overcome vocabulary learning challenges in English education.
Keywords: *WordWall; vocabulary development; digital game-based learning; vocabulary achievement; English language teaching.*

INTRODUCTION

In today's era of digital transformation, the use of technology in education has become increasingly widespread. One field that has particularly benefited from these innovations is language learning, especially in the area of vocabulary acquisition. Vocabulary is a key component that underpins learners' ability to comprehend, speak, read, and write effectively in a second language (Nation, 2013; Sinaga et al., 2020; Huang & Lee, 2023; Almuqrin & Alqahtani, 2024; Zhang et al., 2024). For students learning English, building a strong vocabulary base is crucial to attaining language fluency and achieving academic excellence (Astuti, 2017; Ahmad & Mahmood, 2023; Purba et al., 2024). Nonetheless, many junior secondary students continue to struggle with vocabulary learning due to limited language exposure, insufficient contextual comprehension, and the use of ineffective learning methods.

This research originated from the researcher's direct observations during a teaching practice program (PPL) conducted in the first semester of the 2024/2025 academic year at SMP Negeri 4 Kota Pematangsiantar. During the program, it was evident that many students experienced difficulties in distinguishing between different parts of speech, such as nouns and verbs. For instance, students

frequently confused the noun "*beauty*" with the verb "*beautify*," indicating a lack of morphological awareness. Additionally, most students were not accustomed to using dictionaries or reference materials, which hindered their ability to comprehend reading texts and express ideas effectively during speaking activities.

To examine this problem more systematically, the researcher administered a vocabulary test to 27 students. The findings showed a notable deficiency in their vocabulary mastery: 17 students scored below the minimum competency standard of 75, with the lowest score recorded at 21. These results reveal that vocabulary learning remains a significant challenge for students. This situation also mirrors a wider issue in the Indonesian education system, where vocabulary instruction tends to receive less emphasis compared to grammar-focused teaching, leaving learners with limited lexical knowledge (Setiawan, 2015).

Given these challenges, there is a need to explore more engaging and effective methods for vocabulary instruction. One promising approach is digital game-based language learning (DGBLL), which leverages game elements to enhance student motivation, participation, and retention (Bensalem & Hamidi, 2023; Zhang et al., 2023; Nainggolan et al., 2024; Yang et al., 2024; El-Sayed & Mohamed, 2024). Among various educational tools available, WordWall stands out as an interactive platform that allows educators to create customized vocabulary games in formats such as quizzes, match-ups, and word hunts. These activities can make vocabulary learning more appealing and context-rich, especially for young learners (Huang & Soman, 2013).

Webb (2008) defined digital games provide meaningful opportunities for repetitive exposure and usage of target words in a low-stress environment, which is crucial for long-term vocabulary acquisition (Chen & Tsai, 2023; Ma & Chen, 2024; Sinaga et al., 2025). Additionally, games like those found on WordWall offer immediate feedback, visual support, and peer interaction, all of which contribute to deeper cognitive processing of new vocabulary. When implemented effectively, DGBLL tools can support students' lexical development by combining fun and function in language learning (Reinders & Wattana, 2015; Juanda et al., 2025).

Furthermore, incorporating digital games into the classroom aligns with the learning preferences of 21st-century students, who are often more responsive to interactive and technology-driven learning environments (Silva & Nogueira, 2023; Park & Kim, 2023; Nguyen & Nguyen, 2024). The use of WordWall also supports differentiated instruction, as teachers can adapt content and game formats based on students' proficiency levels and learning styles. This personalization not only boosts learners' engagement but also helps build their confidence in using English vocabulary accurately and appropriately (Yip & Kwan, 2006).

In light of the challenges observed during teaching practice and the potential of digital game-based solutions, this study seeks to investigate the use of WordWall media game as a tool for vocabulary development. Specifically, it aims to assess whether integrating WordWall into classroom instruction can improve students' understanding and usage of vocabulary in meaningful ways. The study also explores students' responses to the use of such digital tools and whether their motivation toward vocabulary learning increases as a result. Ultimately, this research contributes to the growing body of knowledge on innovative vocabulary teaching strategies and the application of educational technology in language classrooms. By focusing on the context of junior secondary learners in Indonesia, the study highlights both the urgency and the opportunity to reform vocabulary instruction through engaging and interactive methods.

Recent literature from 2023 to 2025 increasingly emphasizes the positive impact of digital game-based learning (DGBLL) on vocabulary acquisition. Studies highlight that gamification strategies such as points, leaderboards, and immediate feedback not only increase learner motivation but also promote deeper engagement and retention of vocabulary (Vnucko & Klimova, 2023; Farid & Rafiq, 2023; Chowdhury et al., 2023; Othman & Zulkifli, 2023; Pan & Zhang, 2023; Hwang & Chang, 2024; Jiang & Song, 2024; Qian & Xu, 2024). Meta-analyses and systematic reviews confirm the efficacy of such approaches, especially when implemented through interactive platforms tailored for language learning (Park & Kim, 2023; Pérez-Sabater & Vilar, 2024). Furthermore, specific platforms like WordWall have been shown to facilitate contextualized vocabulary learning through diverse game formats, such as quizzes, match-ups, and word hunts, which provide repeated exposure and multisensory engagement (Mohammadi & Rezaei, 2023; Lu & Li, 2023; Safar & Al-Harthy, 2023; Hafifah & Hanifa, 2024; Alfiah et al., 2024). However, while WordWall is widely used, most studies focus on student engagement and

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perceptions rather than robust, quasi-experimental designs assessing actual vocabulary gains. There is also limited investigation into which game mechanics within WordWall contribute most effectively to vocabulary retention and usage.

Although research increasingly supports digital game-based language learning (DGBLL), several gaps remain. Few quasi-experimental studies have examined WordWall's impact on vocabulary learning among junior secondary students in rural Indonesia, where digital literacy and access differ from urban areas (Rumapea et al., 2025; Sinaga et al., 2025). Existing studies often focus on motivation rather than analyzing types of vocabulary knowledge (productive vs. receptive) or long-term retention. Moreover, the effects of specific WordWall templates like Match Up or Random Wheel on different aspects of vocabulary learning remain underexplored.

To address these gaps, this study applies a quasi-experimental design to examine WordWall's effectiveness in enhancing vocabulary acquisition and retention among rural junior secondary students. Its novelty lies in analyzing how distinct game mechanics influence vocabulary outcomes, measured through immediate and delayed post-tests. The findings aim to offer practical insights for teachers on using educational technology effectively in diverse learning contexts.

METHOD

This study employs a quasi-experimental design with a non-equivalent control group to investigate the effect of WordWall digital games on vocabulary development. This design was chosen because it allows researchers to compare outcomes between two groups—experimental and control—without randomly assigning participants (Gall, Gall, & Borg, 2007; Herman et al., 2025). The experimental group received instruction using the WordWall media game, while the control group followed a conventional textbook-based approach. Both groups completed a vocabulary pre-test before the treatment and a post-test afterward to measure learning outcomes. Quasi-experimental designs are widely used in educational settings due to the practical and ethical constraints of randomization (Cook & Campbell, 1979). This design enables the researcher to determine causal relationships between the use of WordWall and vocabulary acquisition, while accounting for the naturally existing classroom groups.

The data for this research were obtained from two intact seventh-grade classes at SMP Negeri 4 Kota Pematangsiantar during the 2025/2026 academic year. The experimental class (VII-6) consisted of 32 students who received vocabulary instruction through WordWall, while the control class (VII-7), also with 32 students, was taught using traditional methods. These students served as the primary data sources, providing information through their test performance. However, due to student absenteeism during either the pre-test or post-test, only 30 students from each group were included in the final analysis. This discrepancy between the initially assigned 32 students and the analyzed sample of 30 per group is due to incomplete data from two students in each class. This selection was based on the observed vocabulary difficulties among students in these classes, including struggles with differentiating word forms and low confidence in using English vocabulary. Such issues make them suitable participants for examining the potential impact of interactive vocabulary tools.

The main research instrument was a vocabulary test developed by the researcher. It comprised multiple-choice questions tailored to the vocabulary syllabus taught during the semester. The test was administered in two phases—pre-test and post-test—to both groups. The pre-test measured baseline vocabulary knowledge, while the post-test assessed the learning outcomes after the treatment.

The test consisted of 25 multiple-choice items covering vocabulary topics aligned with the students' English curriculum. Each item had four options, with only one correct answer. An example item is: "Choose the correct verb form: She usually ___ breakfast at 7 a.m." (Options: a) eat, b) eats, c) ate, d) eating). The target vocabulary included high-frequency verbs, nouns, adjectives, and word forms commonly found in junior high school texts.

To ensure reliability and content validity, the test items were reviewed and validated by two English language teaching experts. The structure of the test was designed according to Bloom's revised taxonomy (Anderson & Krathwohl, 2001), focusing on remembering, understanding, and applying vocabulary. The scoring system awarded one point for each correct answer, and final scores were converted to a 0–100 scale.

The data collection process followed three main stages: pre-testing, treatment, and post-testing. First, a pre-test was conducted in both experimental and control groups to evaluate students' initial vocabulary knowledge. The treatment for the experimental group consisted of four sessions, each lasting 40 minutes, conducted over two weeks. Each session involved different

WordWall game types such as "Match-up," "Whack-a-mole," "Anagram," and "Quiz" formats, designed to reinforce vocabulary from their textbook units. Students interacted with the games individually and in pairs, with the teacher facilitating and offering feedback. These games were projected on a screen, and students either participated directly at the front or answered from their seats using printed answer sheets. In contrast, the control group received vocabulary instruction via teacher explanation and textbook exercises, without any digital or game-based intervention.

After the treatment, a post-test identical in structure to the pre-test was administered to both groups. This approach allowed for the comparison of learning gains attributable to the use of WordWall media. During both testing sessions, instructions and timing were standardized to reduce bias and ensure consistency in data collection (McMillan & Schumacher, 2010).

Although the study describes increases in engagement and enthusiasm in the experimental group, these observations were anecdotal and based on informal classroom notes taken by the researcher. No formal instrument, such as a questionnaire or structured observation checklist, was used to systematically collect data on student engagement. Therefore, no statistical analysis was conducted for engagement levels.

The data obtained from the pre-test and post-test were analyzed using descriptive and inferential statistical methods. Descriptive statistics (mean, standard deviation, and percentage scores) were used to summarize students' performance. Inferential statistics included a paired sample t-test and an independent sample t-test, conducted using SPSS version 25, to determine the significance of differences within and between the two groups.

Before hypothesis testing, assumptions of normality and homogeneity of variance were tested using the Kolmogorov-Smirnov test and Levene's Test, respectively. According to Field (2013), checking these assumptions is critical for ensuring the validity of parametric tests. A significance level (α) of 0.05 was used throughout the analysis. The effectiveness of the WordWall media game was determined based on whether the improvement in vocabulary scores in the experimental group was statistically greater than in the control group.

RESULTS AND DISCUSSION

The findings of this study are presented based on the data collected through pre-tests and post-tests administered to both the control and experimental classes. These results reflect the students' vocabulary achievement before and after the implementation of the WordWall media game, and include analysis based on descriptive statistics, normality and homogeneity tests, as well as hypothesis testing. As noted in the Method section, 30 students from each class were included in the analysis due to complete pre- and post-test data.

Table 1. *Pre-test and post-test mean scores*

Group	N	Pre-test Mean	Post-test Mean	Minimum	Maximum
Experimental	30	42.33	85.06	28	98
Control	30	39.16	71.60	25	86

Before the treatment was conducted, both the control and experimental groups displayed similar levels of vocabulary achievement. In the control group, the pre-test results indicated that 25 out of 30 students (83.33%) fell into the "Low" category, while only 4 students (13.33%) reached the "Enough" level. One student (3.34%) was categorized as having "Failed", and no students achieved scores within the "Good" or "Very Good" ranges. Similarly, in the experimental class, 24 students (80%) were categorized as "Low", and only 6 students (20%) reached the "Enough" level. No students in the experimental class fell into the "Failed," "Good," or "Very Good" categories. These results indicate that students in both groups initially had limited vocabulary knowledge.

Table 2. *Score category distribution*

Score Category	Range	Experimental (n = 30)	Control (n = 30)
Very Good	85–100	15 (50%)	4 (13.33%)
Good	72–84	10 (33.33%)	8 (26.67%)
Enough	60–71	5 (16.67%)	10 (33.33%)
Low	<60	0	8 (26.67%)

Following the treatment, which involved the use of WordWall media games in the experimental class, a significant improvement in vocabulary achievement was observed. The mean pre-test

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score in the control group was 39.16, while the post-test score increased to 71.6. Although there was an improvement, this score still did not meet the school's minimum passing standard of 72, which means the students in the control group did not complete the vocabulary competency criteria. In contrast, the experimental group had a pre-test mean score of 42.33, and after the WordWall intervention, the mean post-test score increased substantially to 85.06. This demonstrates that the experimental group surpassed the minimum passing standard and successfully completed the vocabulary competency criteria.

Table 3. *Normalized gain scores*

Group	N	N-Gain Score (%)
Experimental	30	42.83
Control	30	32.43

The gain scores further emphasize the effectiveness of the intervention. The control group achieved a normalized gain (N-Gain) score of 32.43, while the experimental group achieved a higher N-Gain score of 42.83, indicating a more substantial improvement in vocabulary performance among students who used the WordWall media game. These differences were also reflected visually in the comparison of pre-test and post-test scores, highlighting the effectiveness of interactive learning tools in enhancing vocabulary mastery.

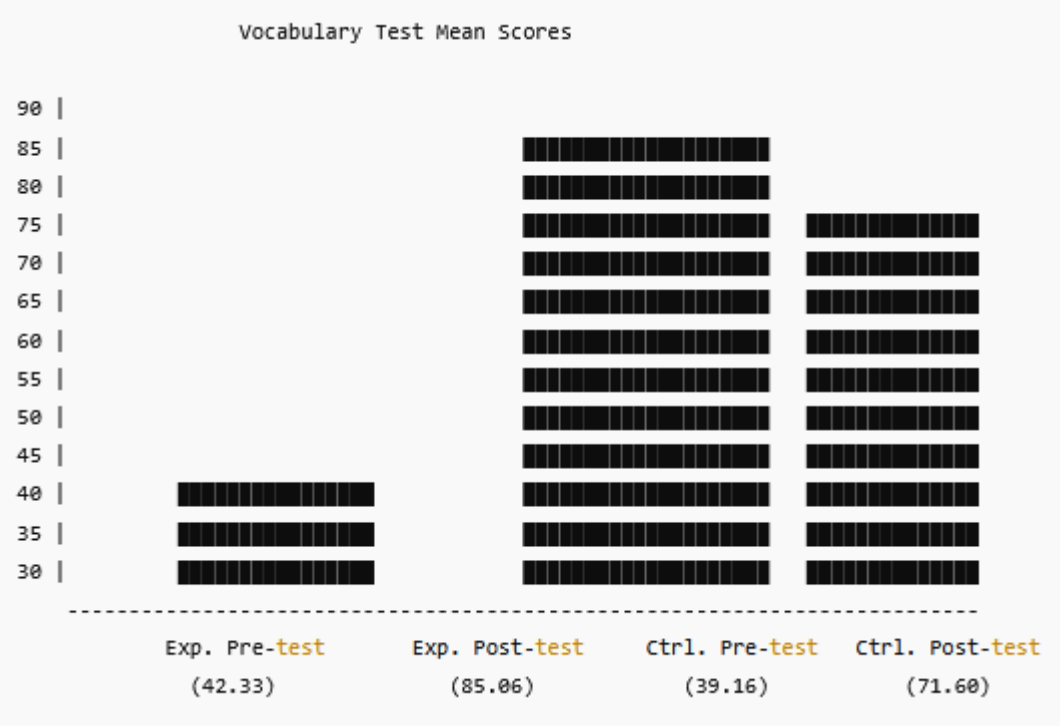


Figure 1. *Bar chart of pre-test and post-test mean scores*

To ensure the validity of the statistical comparisons, a normality test was conducted using the Kolmogorov-Smirnov method. The results showed that both the pre-test and post-test scores in the control and experimental groups were normally distributed, with all significance values above 0.05. Additionally, the homogeneity test confirmed that the data had equal variance, with significance levels above 0.05 for both pre-test and post-test results. These findings indicate that the data met the assumptions necessary for conducting further parametric testing, specifically the t-tests.

Table 4. *Normality and homogeneity tests*

Test	Group	Sig. (p-value)
Kolmogorov-Smirnov (Pre-test)	Experimental	0.200
Kolmogorov-Smirnov (Post-test)	Experimental	0.183
Kolmogorov-Smirnov (Pre-test)	Control	0.156
Kolmogorov-Smirnov (Post-test)	Control	0.174
Levene's Test (Post-test)	Both Groups	0.207

The hypothesis testing was carried out using a paired sample t-test to assess the differences in the experimental group before and after using WordWall. The result showed a mean difference of

-42.733, with a t-value of -21.752 and a p-value of 0.000, which is less than the alpha level of 0.05. This means that the improvement in vocabulary achievement in the experimental group was statistically significant. Furthermore, an independent samples t-test comparing the post-test scores of the control and experimental groups also revealed a significant difference. The t-value was -5.520, with a p-value of 0.000, indicating that the vocabulary achievement of the experimental group was significantly higher than that of the control group. Although students in the experimental group appeared more engaged and enthusiastic during instruction, no formal data were collected to measure this variable. Therefore, while classroom observations support the positive learning atmosphere, these anecdotal impressions were not included in the quantitative analysis.

The findings of this study clearly demonstrate that the use of WordWall media games has a significant positive effect on students' vocabulary achievement. Students who engaged with WordWall performed significantly better in the post-test than those who received conventional instruction. These results suggest that integrating interactive and game-based learning platforms like WordWall into English language instruction can effectively enhance vocabulary learning among junior high school students.

Effectiveness of WordWall in vocabulary development

The most notable finding is the considerable increase in the post-test scores of the experimental group, who received instruction through the WordWall media game. The average score in this group increased from 42.33 (pre-test) to 85.06 (post-test), surpassing the school's minimum mastery criterion (KKM) of 72. In contrast, although the control group also showed an increase from 39.16 to 71.6, their improvement did not meet the standard for competency. This suggests that WordWall was not only more effective but also more efficient in helping students internalize and retain vocabulary. This result aligns with previous research on the benefits of digital game-based learning (DGBL).

According to Hung (2015), digital games offer interactive and engaging experiences that motivate students, increase attention span, and facilitate better retention of vocabulary. Similarly, Al-Ali (2019) found that using digital games in language classes enhances students' willingness to participate, which in turn improves language outcomes. More specifically, the mechanisms of WordWall such as interactive repetition and immediate feedback align closely with cognitive theories of memory, which emphasize the importance of retrieval practice and reinforcement for long-term retention. The repeated exposure to vocabulary in varied formats—via matching games, quizzes, or time-limited challenges—supports the encoding and retrieval processes, thus enhancing memory consolidation. The use of WordWall in this study supports these conclusions, as students were observed to be more enthusiastic, collaborative, and engaged during the learning process.

The role of engagement and motivation

Another key factor contributing to the success of the WordWall game is its ability to boost student motivation and classroom engagement. Traditional vocabulary instruction methods often rely on rote memorization and textbook-based exercises, which can be demotivating and monotonous for students. In contrast, WordWall offers a dynamic, visual, and interactive learning environment. This aligns with Deci and Ryan's (2000) Self-Determination Theory, which emphasizes the role of autonomy, competence, and relatedness in promoting intrinsic motivation. WordWall fosters a sense of autonomy by allowing students to make choices within the game environment, such as selecting activities or working at their own pace. It also enhances feelings of competence through clear success indicators and real-time feedback, helping students see their progress immediately. The collaborative elements in class—such as team-based games or peer support—promote relatedness, making the learning process socially engaging. This motivational aspect is particularly important given the researcher's initial observation during the PPL teaching practice, where students showed difficulty differentiating word forms (e.g., noun vs. verb: beauty vs. beautify) and lacked confidence in using dictionaries or interpreting texts. The introduction of WordWall helped alleviate these challenges by making learning more interactive and accessible.

Digital games as tools for differentiated instruction

The use of WordWall also demonstrated potential in supporting differentiated instruction. The tool allowed teachers to tailor the game content to various difficulty levels, and provide diverse vocabulary practice activities such as "match-up," "whack-a-mole," and "anagram challenges." This supports the findings of Kaur & Kaur (2023), who

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noted that good digital games offer built-in scaffolding and adaptive challenges, catering to both struggling learners and high achievers. These customizable features also reflect principles from Vygotsky's Zone of Proximal Development (ZPD), where learners benefit most from tasks slightly beyond their current level, provided there is appropriate support (1978). WordWall's flexible design allows for the scaffolding needed to move learners through their ZPD efficiently. In this study, although students entered with varying vocabulary knowledge levels, most of them progressed significantly when supported by appropriate digital game activities.

Statistical evidence supporting effectiveness

The effectiveness of WordWall was not only apparent in descriptive results but also confirmed through inferential statistical tests. The independent sample t-test showed a statistically significant difference between the post-test scores of the control and experimental groups ($p < 0.05$). Additionally, the paired sample t-test revealed significant improvement in the experimental group's performance before and after the intervention. These results confirm that WordWall is not just a supplementary tool but a statistically valid instructional strategy for vocabulary development.

Moreover, the normality and homogeneity tests ensured that the data met the assumptions required for valid t-test analysis, strengthening the credibility of the conclusions drawn.

Addressing vocabulary challenges in the classroom

The research was initially motivated by observed problems in vocabulary learning, such as limited word knowledge, low usage of dictionaries, and confusion between word classes. The findings indicate that WordWall directly addresses these issues. One key mechanism is immediate corrective feedback, which enables students to learn from mistakes without delay, reinforcing the correct forms and meanings. This is consistent with the behaviorist concept of reinforcement, as well as cognitive feedback loops that enhance learning efficiency. By repeatedly exposing students to vocabulary items in varied contexts and formats, WordWall helps reinforce understanding and memory retention. The game format also encourages trial-and-error learning, which is beneficial in language acquisition, as students learn from immediate feedback without fear of formal evaluation. This supports the work of Nation (2013), who emphasized that vocabulary learning requires multiple exposures and the use of meaningful context. WordWall provides both of these through its interactive quizzes and visually engaging games.

Implications for language teaching

These findings have important implications for English language teaching, especially in junior high schools with similar classroom conditions to SMP Negeri 4 Kota Pematangsiantar. First, they suggest that incorporating digital game-based tools can substantially enhance vocabulary teaching outcomes. Second, teachers may benefit from professional development or training in utilizing DGBL tools effectively. Lastly, curriculum developers might consider integrating digital media games like WordWall into formal teaching materials and lesson plans to improve student outcomes and learning engagement.

CONCLUSION

Based on the results of this study, it can be concluded that the use of WordWall media games has a significant and positive effect on students' vocabulary achievement. The experimental group, which received instruction through WordWall, showed a substantial improvement in their post-test scores compared to the control group, which was taught using traditional methods. The statistical analysis—including normality, homogeneity, and both paired and independent t-tests—confirmed that this difference was statistically significant, proving the effectiveness of WordWall as a digital game-based learning tool. The study also revealed that WordWall increased students' engagement, motivation, and participation during vocabulary lessons. Its interactive and visual format helped students better understand and retain vocabulary items, especially in word formation areas such as affixation. These findings support the integration of digital media games into English language instruction to enhance learning outcomes, particularly in vocabulary acquisition.

However, it is important to acknowledge that the generalizability of these findings may be limited by factors such as the sample size, specific school context, and short duration of the intervention. Future research could explore long-term effects, different learner populations, or comparisons with other digital tools. Nonetheless, the practical significance of the findings remains strong. WordWall media games can serve as an innovative and effective teaching strategy for

English vocabulary development, especially in junior high school settings. Teachers are encouraged to incorporate such digital tools into their instructional practices to address students' learning difficulties and promote a more enjoyable and meaningful classroom experience.

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