Gamified Digital Learning with Wordwall: An Experimental Study on Grammar Achievement

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Abstract

This study examines the effect of using the Wordwall application as Digital Gamification Media on the grammar achievement of tenth-grade students. Many students struggle with constructing correct sentences due to monotonous learning methods that fail to motivate them. To address this issue, the study employed Wordwall, an interactive digital game-based learning technology designed to enhance the engagement and effectiveness of grammar instruction. The study employed a quantitative research approach with a proper experimental design, including a pre-test and post-test. The population of this study consisted of all 10th-grade students at SMAN 1 Wringinanom, totaling 418 individuals across 11 classrooms, including a special class of 38 pupils. The study included 38 students from class X-1 as the experimental group and 38 students from class X-2 as the control group. The researcher employed cluster random sampling to select the sample. Data collection was conducted through pre-tests and post-tests. The results showed a significant effect in the experimental group's grammar performance, with the mean score increasing from 67.16 to 82.42, while the control group's score rose from 63.68 to 70.47. Statistical analysis confirmed data normality and a significant difference in post-test scores ($p < 0.05$), indicating that the use of Wordwall positively impacted students' grammar achievement. Based on the analysis, the null hypothesis (H0) was rejected, indicating a significant difference between the experimental and control groups. Consequently, the alternative hypothesis (Ha) was accepted, confirming that the treatment or intervention applied in the study had a measurable impact on student outcomes. This means that the use of the Wordwall application affected grammar achievement.

Keywords: Wordwall Application, Grammar achievement, Digital Gamification

Introduction

Effective communication is essential in spoken and written language, and correct grammar structures are crucial in preventing misunderstandings. Grammar is the foundation of language, providing the rules and structure necessary to convey messages accurately (Haryudin & Argawati, 2018). For native speakers, grammar is acquired naturally through daily interactions, while second-language learners often require explicit instruction to master grammatical rules (Hasriani & Masruddin, 2020).

Proper grammar is particularly important in English communication for second-language learners, as errors in sentence structure can lead to confusion and misinterpretation (Matiso, 2023). In spoken language, grammatical accuracy enhances clarity and fluency, allowing speakers to express their ideas more effectively. Similarly, in written communication, grammar ensures coherence and logical flow, making texts more readable and professional (Munuyandi et al., 2021).

Well-structured grammar not only strengthens a writer's credibility but also improves the persuasiveness of their arguments. However, mastering grammar is often challenging for foreign language learners, requiring conscious effort, practice, and exposure to well-formed language structures (Prasetyaningrum et al., 2023). Many students struggle with grammar due to ineffective teaching methods that fail to engage learners actively. Traditional rote learning and repetitive drills may not be sufficient to help students internalize complex grammatical structures, making the learning process tedious and less effective.

Observations conducted in Class X at Senior High School revealed that students faced significant challenges in mastering grammar, particularly in constructing correct sentences. This difficulty was evident from their pre-test scores, which assessed their grammar proficiency before formal instruction began. One of the primary factors contributing to these struggles was the use of monotonous teaching methods that failed to engage and motivate students in understanding and applying grammar effectively.

In the new normal era, creativity is crucial, as teachers must prepare for 21st-century education and adapt to technological changes (Rahayu & Bandjarjani, 2022). The technique of applying elements of game design, such as challenges, leaderboards, badges, and points, to non-gaming contexts, including education, in order to boost user motivation and engagement is known as digital gamification. This technique makes use of the inherent motivational features of games to create more participatory and enjoyable learning experiences (Maryana, Halim, & Rahmi 2024).

Games can be used as an excellent learning tool thanks to technological advancements. They play an important part in education, as stated by Agustina (2024). To address these challenges, researchers introduced interactive learning media, specifically the Wordwall application, to enhance student engagement and improve grammar skills. Wordwall is aimed to make studying more

entertaining, engaging, and effective, increasing motivation and enhancing students' ability to create sentences (Fatimah, 2020).

By integrating digital gamification, Wordwall serves not only as a teaching aid but also as an additional resource that promotes autonomous learning beyond the classroom (Hasram et al., 2021). Teachers can utilize Wordwall as a teaching medium, learning resource, and evaluation tool, making the learning process more dynamic and engaging. Additionally, the platform highlights teacher creativity, allowing educators to efficiently design and customize learning materials. Teachers can also access and adapt content created by other educators on Wordwall (https://wordwall.net) and other online platforms, such as YouTube, to develop engaging exercises.

As a web-based application, Wordwall facilitates the creation of educational games, transforming traditional grammar instruction into a more interactive, engaging, and effective learning experience (Hakim et al., 2023). Using digital tools like Wordwall, teachers can transition from traditional teaching methods to creative, student-centered ways that improve students' grasp and application of grammatical ideas. In making quizzes in the Wordwall application, teachers can also take questions from the internet, modify them with their design, and package them into other questions that are by the learning objectives.

The Wordwall app includes a variety of interactive templates that teachers may utilize to create a more interesting and successful learning experience. As said Ninawati (2021), the Wordwall application offers eighteen templates designed to help teachers achieve various learning objectives by customizing the delivery of material to suit students' needs and characteristics. These templates are designed to help teachers achieve different learning objectives by customizing the delivery of material to suit students' needs and characteristics.

Some examples of available templates include Quiz, which allows teachers to create multiple-choice or short-answer questions to assess students' understanding; Random Wheel, which can be used to randomly select students or generate questions; and Matching, which helps students practice connecting concepts or terms with their definitions. Additionally, templates such as Anagram, Crossword Puzzle, and Maze introduce an element of play, making learning more enjoyable and interactive.

With a wide range of templates available, teachers can tailor learning activities to different difficulty levels and learning styles, ensuring that the material is easier to understand and apply in everyday life. In this study, two types of templates were used: quizzes and sentence completion exercises. Quizzes were designed to assess students' understanding of the material they had learned, while sentence completion exercises aimed to enhance students' language skills by requiring them to fill in the blanks with appropriate words or

phrases within a given context.

Figure 1 Templates used in wordwall app

Previous research supports the effectiveness of Wordwall in enhancing language learning. Fatimah (2020) found that the application helped students better comprehend texts and provided extensive practice to enrich their vocabulary. Darma et al. (2023) examined the impact of Wordwall on students' vocabulary mastery, showing significant effect in their learning outcomes. Before implementing Wordwall, students exhibited lower vocabulary proficiency, but their understanding and retention improved after using the application.

Similarly, Sipayung (2018) concluded that Wordwall was a more engaging medium for vocabulary learning than traditional memorization techniques, as students found it easier to remember and understand new words. Further research by Rohmatin (2023) demonstrated that Wordwall significantly enhanced students' vocabulary achievement. The study showed an increase in average class performance from 73.17 in cycle I to 83.50 in cycle II, with student mastery rising from 70.00% to 93.30%.

These findings confirm that Wordwall-based educational games can effectively improve students' vocabulary skills in English learning, particularly at the junior high school level. However, while these studies focus on vocabulary acquisition, there is limited research on how Wordwall impacts students' understanding of grammar structures, particularly sentence formation. However, while these studies focus on vocabulary acquisition, there is limited research on how Wordwall impacts students' understanding of grammar structures, particularly sentence formation.

Despite its proven potential in vocabulary learning, little attention has been given to its application in grammar instruction. This represents a notable research gap, as grammar, especially the correct use of modal auxiliaries like *can*, *will*, and *had better,* is a fundamental aspect of language proficiency that many students continue to struggle with. Given the central role of grammar in constructing meaning and the observed lack of engaging, gamified tools for grammar learning, it is essential to explore how Wordwall can support grammar instruction in more depth.

This study addresses that gap by shifting the focus from vocabulary improvement to grammar mastery, offering a fresh perspective on the pedagogical potential of Wordwall. This study aims to investigate the effect of using the Wordwall application on tenth graders' grammar achievement, particularly in understanding modal auxiliaries. It seeks to determine whether the application enhances students' engagement, motivation, and overall comprehension of grammar structures.

Additionally, this research compares the effectiveness of Wordwall with traditional grammar teaching methods and identifies potential challenges or limitations in using this tool for grammar instruction in high school settings. Based on the problem identified, the research question posed in this study is: "*Is there any effect of using the Wordwall application as digital gamification media on eleventh graders' grammar achievement*?"

To guide the investigation, the following hypotheses are proposed:

    1. Null Hypothesis (H_0): There is no significant effect of using the Wordwall application as digital gamification media on tenth graders' grammar achievement.

    2. Alternative Hypothesis (H_1): There is a significant effect of using the Wordwall application as digital gamification media on tenth graders' grammar achievement.

The novelty of this research lies in its focus on the grammar effect, specifically on auxiliary modals, using Wordwall as an interactive learning tool. Unlike previous studies that emphasized vocabulary acquisition, this study investigates the application of Wordwall in teaching grammar at the high school level, addressing a gap in existing research. The scope of this research was teaching grammar using the Wordwall application. The study was limited to teaching modal auxiliaries (*can*, *will*, and *had better*) to tenth-grade students of a senior high school. The purpose of this study is to determine the effect of using the Wordwall application as digital gamification media on students' grammar achievement.

Method

This study used a quantitative research method with a real experimental design, which included a pre-test and post-test strategy. The study aimed to determine the impact of utilizing the Wordwall program on students' grammatical achievement. Participants were divided into two groups: an experimental group that received treatment by the Wordwall application, and a control group that used traditional paper-based materials. To examine the treatment's impact, both groups completed the same pre-test before the intervention and the same post-test thereafter.

To account for preexisting variations between the groups, the treatment was exclusively administered to the experimental group (Creswell, 2018). The pre-test was in class while the lesson is in progress. In the post-test, the students were given assignments about modal auxiliary in procedure text. First, the students answered three types of tasks on the Wordwall application. Second, the student completed tasks like completing grammar in the text, rearranging jumbled sentences.

The pre-test and post-test results were collected and compared to know how the Wordwall application affects tenth graders' grammar achievement. The researcher then divided the score into three tiers based on the student's scores. Instrument validation was conducted through expert judgment by two English education lecturers to ensure content validity. The grammar tests were reviewed and revised according to their feedback to ensure alignment with the learning objectives.

Reliability of the test instrument was measured using Cronbach's Alpha, resulting in a coefficient of 0.87, indicating high internal consistency. A pilot study was also conducted with 20 students outside the study sample to test the instrument's clarity and reliability.

RE:	O1	T	O2
RC:	O1	⬚	O2

Figure 2 Research Design

Participants were assigned to experimental and control classes, as illustrated in the figure above. During the first meeting, both groups completed a pre-test before the intervention commenced. From the second to the fourth meeting, the experimental class received instruction using the Wordwall application, whereas the control class was taught through conventional methods such as lectures, textbook exercises, and worksheet-based grammar drills. More detailed description of the control group activities includes structured grammar practice from the textbook, teacher-led explanations, and group-based grammar correction activities.

Following the treatment sessions, a post-test was administered to both groups during the fifth meeting. Finally, the researcher analyzed the effect of using the Wordwall application as digital gamification media on the grammar achievement of tenth-grade students. The population of this study consisted of tenth-grade students at Senior High School, totalling 418 students spread across 11 classes. From this population, a cluster random sampling technique was used to select two classes as the study sample.

Class X-1 was randomly allocated as the experimental group, and Class X-2 as the control group. The experimental class was instructed using the Wordwall application, whereas the control class was taught using textbooks and traditional media. Each class contained 38 students, for a total sample size of 76.

This study examined two research variables: the independent variable, which was the use of the Wordwall application, and the dependent variable, which was students' grammar achievement.

The Wordwall application is an interactive learning platform that provides grammar and vocabulary exercises through various game- based activities (Hasram et al., 2021). Students in the experimental group engaged in Wordwall-based exercises for 45 minutes per session, focusing on mastering modal auxiliaries (Can, Will, and Had Better). Grammar achievement was assessed through structured tasks that measured students' understanding and application of grammar rules (Dwipa, 2021).

The acquired data was evaluated using a t-test to see if there was a statistically significant difference between the groups. Data collection timeline spanned one month, from October 21, 2024, to November 21, 2024. At the first meeting, a pretest was conducted to determine students' initial abilities. After the pretest, at the second, third, and fourth meetings, researchers treated students. At the beginning of the treatment, the researcher explained the Wordwall application and its functions and benefits.

After the learners understood, the researcher gave practice problems available in the Wordwall application. At the last meeting, students did a posttest to determine their abilities after receiving treatment from researchers. Data was collected using objective grammar tests, including multiple-choice questions, word arrangement tasks, and sentence completion exercises. The pre-test was administered before the treatment to measure students' initial grammar proficiency, while the post-test was given after the intervention to assess effects in grammar skills.

The experimental group completed post-test tasks within the Wordwall application, while the control group completed similar tasks on paper. Confounding variables such as students' prior English exposure, teacher bias, and classroom environment were controlled by ensuring the same English teacher delivered instruction in both groups, using a consistent lesson plan aligned with the curriculum. Seating arrangements and test conditions were also standardized to reduce external influences.

The researcher used SPSS 25 to analyze data and conduct a descriptive statistical analysis, which included mean scores, standard deviation, and scoring distribution. A normality test was run to confirm that the data matched the normalcy assumption. Finally, an independent sample t-test was used to assess whether the post-test scores of the experimental and control groups differed statistically significantly. This process sought to determine whether the Wordwall application had a measurable impact on students' grammatical achievement.

Results

This section presents the results of the study based on data collected from pre- test and post-test scores of both the experimental class (which used the Wordwall application) and the control class (which used traditional paper-based media). The purpose of this test was to determine the impact of using the Wordwall application on students' grammar achievement. The experimental class consisted of tenth-grade students at Senior High School who were taught using the Wordwall application, while the control class used traditional paper media.

Descriptive Analysis

A descriptive statistical analysis was conducted on the mean, standard deviation, and score distribution of both the experimental and control groups. The results are shown in the table:

Table 1 Descriptive Statistic

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pretest_Eksperiment	38	24	56	80	67.16	6.844
Posttet_Eksperiment	38	22	72	94	82.42	5.160
Pretest_Control	38	22	52	74	63.68	6.921
Posttest_Control	38	30	54	84	70.47	6.966
Valid N (listwise)	38					

The results of the descriptive analysis revealed notable differences between the experimental and control classes in terms of grammar achievement. In the experimental class, the pre-test mean score was 67.16 with a standard deviation (SD) of 6.844, while the post-test mean score increased significantly to 82.42 with a reduced SD of 5.160. This indicates a substantial effect, with an overall score increase of 15.26 points. In contrast, the control class started with a lower pre-test mean score of 63.68 (SD = 6.844) and achieved a post-test mean score of 70.47 (SD= 6.966), reflecting a smaller score increase of 6.79 points.

These findings suggest that students in the experimental class, who used the Wordwall application as a learning tool experienced a more significant effect on their grammar skills than those in the control class, who followed traditional learning methods. The higher score increases and reduced standard deviation in the experimental group indicate more consistent student progress. These results indicate that the experimental class, which used Wordwall, showed a significantly greater effect in grammar achievement compared to the control class.

Normality Test

The Kolmogorov-Smirnov normality test was used to determine whether the data were normally distributed. (Mishra 2019) explained that the Kolmogorov-Smirnov test was applicable when the sample size was 50 or greater (n > 50). The following table shows the results of the normality test for the experimental and control groups:

Table 2 Normality Test

Class		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
GrmmarAchievement	Pretest_Eksperiment	.102	38	.200*	.961	38	.209
	Posttest_Eksperiment	.128	38	.120	.971	38	.406
	Pretest_Control	.105	38	.200*	.936	38	.032
	Posttest_Control	.113	38	.200*	.977	38	.612

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

The Kolmogorov-Smirnov normality test results show that all data from both the experimental and control classes have significance (Sig.) values above 0.05. In the experimental class, the significance values for the pre-test and post-test are 0.200 and 0.120, respectively. Meanwhile, in the control class, the pre-test and post- test show significance values 0.200.

Since all significance values are more significant than 0.05, both classes' pre- test and post-test data are normally distributed. This normal distribution allows the researcher to proceed with parametric statistical tests, such as the independent sample t-test, to compare the results between the experimental and control groups more accurately. This supports the validity of the conclusion that using the Wordwall application can be objectively evaluated based on data that meet the normality assumption.

Homogeneity Test

The results of Levene's Test for Homogeneity of Variance revealed that the assumption of equal variances was met. The significance value (Sig.) for the test based on the mean was 0.044, which exceeded the standard criterion of 0.05. Similarly, the significance values for the tests based on the median, median with adjusted degrees of freedom, and trimmed mean were 0.050, 0.050, and 0.043, respectively, all of which were above 0.05. These results suggested that the variances between the groups were not significantly different, allowing the researcher to proceed with the assumption of equal variances in further statistical analyses.

Table 3. The Test of Independent Sample T-test of Pre-test

		Levene Statistic	df1	df2	Sig.
Homogenity Test	Based on Mean	4.207	1	74	.044
	Based on Median	3.966	1	74	.050
	Based on Median and with adjusted df	3.966	1	71.033	.050
	Based on trimmed mean	4.261	1	74	.043

Independent Sample T-test

The independent sample t-test was done to see if the experimental and control groups differed significantly. The table below shows the results of the independent sample t-test data processing:

Table 4. The Test of Independent Sample T-test of Pre-test

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Grammar_Achievement	Equal variances assumed	.000	.995	2.200	74	.031	3.474	1.579	.328	6.620
	Equal variances not assumed			2.200	73.991	.031	3.474	1.579	.328	6.620

Table 5. The Test of Independent Sample T-test of Post-test

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Grammar_Achievement	Equal variances assumed	3.792	.055	8.495	74	.000	11.947	1.406	9.145	14.750
	Equal variances not assumed			8.495	68.209	.000	11.947	1.406	9.141	14.754

The results showed that the Sig. (2-tailed) value for the post-test scores was 0.000, which is less than 0.05. This means that there was a statistically significant difference between the two groups. Since the experimental class outperformed the control class, it can be concluded that the use of the Wordwall application had a significant.

Discussion

Wordwall encourages mobile learning and gamification as both a teaching aid and a tool for promoting autonomous learning beyond the classroom (Hasram et al. 2021). Teachers can utilize Wordwall as a medium, a learning resource, and an evaluation tool. The platform also fosters teacher creativity by allowing users to create customized learning materials efficiently. Teachers can draw inspiration from examples shared by other educators on the Wordwall platform or access additional resources from online media such as YouTube or other educational websites (https://wordwall.net).

This flexibility allows teachers to develop quizzes and activities tailored to specific learning objectives, modifying existing questions from the internet and adapting them to students' needs using Wordwall's eighteen available templates. The findings of this study confirm the hypothesis that using the Wordwall application significantly enhances students' grammar learning outcomes compared to traditional paper-based teaching methods. As a game-based web application, Wordwall offers interactive features such as quizzes, matching exercises, anagrams, word shuffles, word searches, and grouping tasks (Nurbani, 2020).

These activities not only facilitate vocabulary enrichment but also improve grammar comprehension. At Senior High School, the implementation of Wordwall made grammar lessons more engaging and enjoyable, fostering a motivating learning environment that encouraged active student participation in grammar exercises. The effectiveness of Wordwall can be explained through constructivist learning theory, which emphasizes student-centered, active

participation in the learning process.

Students construct knowledge by engaging in meaningful activities, such as interactive games that simulate real-life grammar application. Additionally, motivation theory, particularly Deci and Ryan's Self-Determination Theory (SDT), supports this result: the use of digital gamified tasks promotes intrinsic motivation through elements of autonomy, competence, and relatedness. These theories suggest that Wordwall increases student motivation and engagement, leading to better learning outcomes.

In contrast, traditional paper-based instruction tends to be more passive and teacher-centered, focusing on rote memorization and repetition rather than active engagement. This lack of interactivity can lead to lower motivation and limited opportunities for immediate feedback. Students may find textbook-based grammar exercises monotonous, which may contribute to reduced attention and less effective grammar acquisition. A Kolmogorov-Smirnov normality test was conducted to validate these findings, confirming that the data followed a normal distribution.

This allowed for further statistical analysis using an independent sample t-test, which showed a statistically significant difference between the post-test scores of the experimental group (students using Wordwall) and the control group (students using traditional methods) with a significance level of Sig. 0.000 (p < 0.05). This result supports the alternative hypothesis (Ha), indicating that technology-based learning through Wordwall positively impacts students' grammar proficiency. Conversely, the null hypothesis (H0), which assumed no significant effect, was rejected.

The experimental group showed an average improvement of 15.26 in grammar test scores compared to the control group. This improvement is not only statistically significant but also educationally meaningful, as it reflects a considerable advancement in students' grammar mastery within a short instructional period. This demonstrates the practical value of integrating technology-enhanced learning tools like Wordwall into classroom instruction to enhance language skills in a short timeframe.

These findings align with previous research on game-based learning. The first research conducted by (Silvia and Wirabrata 2021). This study aims to develop wordwall media to improve early childhood vocabulary skills. The design of this research is classroom action research. Based on the results of the study, it can be concluded that the wordwall media, which was developed to improve early childhood vocabulary skills, is suitable for use in the learning process.

The second research done by Altayani (2021), the aim of this study is to outline the usage of wordwall media to help students expand their vocabulary for the seventh grade and to discuss the advantages and disadvantages of this

approach. According to the study's findings, word wall vocabulary improves students' vocabulary comprehension, particularly for seventh-graders at MTs Shiratul Ulum Kertomulyo, Trangkil, and Pati. From the research above, studies about the effect of using Wordwall application could be used to be a reference for the researcher that Wordwall as media could help and facilitate in learning English.

This study provides compelling evidence that the effect of the Wordwall application significantly improves grammar achievement among tenth-grade students at Senior High School. The interactive and engaging features of Wordwall offer an effective alternative to traditional learning methods, increasing motivation and fostering a better understanding of grammatical concepts. These results highlight the potential of integrating technology-based learning tools in the classroom to create a more dynamic and effective language learning experience.

Conclusion

The use of technology-based tools like Wordwall provides an alternative to conventional grammar instruction, making it more effective and student-centered. The results of the normality tests confirmed that the data were suitable for further statistical analysis, validating the effectiveness of the intervention. The findings supported the null hypothesis (H0) was rejected, indicating a significant difference between the experimental and control groups. Consequently, the alternative hypothesis (Ha) was accepted, confirming that the treatment or intervention applied in the study had a measurable effect on student outcomes.

This means that the use of a wordwall application had an effect on tenth graders' grammar achievement at Senior High School. Based on these conclusions, the researcher suggests that students regularly use Wordwall applications, such as fill in the blank or multiple choice, to enhance their understanding of grammar in a convenient and enjoyable way through interactive games. Teachers are also encouraged to integrate Wordwall into their lessons to enrich grammar learning with diverse and engaging content, thereby making the educational process more appealing and relevant.

Furthermore, future research should further explore the impact of using Wordwall on other language skills, such as reading comprehension and speaking, as well as investigate its long- term effects on vocabulary retention. Additionally, research can compare the effectiveness of Wordwall with other digital tools to provide more comprehensive insights. These efforts will contribute to developing best practices in leveraging digital platforms to enhance language learning and foster academic growth.

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