

The Effect of Duolingo Games as Extramural English on Vocabulary Mastery

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ABSTRACT

Vocabulary mastery plays a crucial role in English language learning as it supports learners' ability to comprehend and produce language across listening, speaking, reading, and writing skills. However, many EFL students struggle to acquire sufficient vocabulary because of limited exposure to English beyond the classroom. This study investigated the effect of Duolingo games as Extramural English on the vocabulary mastery of eleventh-grade students at Mu'allimin Boarding School Bangkinang. A quantitative quasi-experimental design was employed, involving an experimental group and a control group. The participants consisted of 50 students selected through random sampling. The experimental group learned vocabulary through Duolingo games as Extramural English, while the control group received conventional instruction. Data were collected using pre-tests and post-tests in the form of multiple-choice vocabulary questions and analyzed through descriptive statistics, normality and homogeneity tests, and an independent sample t-test. The results showed that the experimental group achieved significantly greater improvement in vocabulary mastery than the control group. Statistical analysis confirmed a significant difference between the post-test scores of both groups ($p < 0.05$). These findings indicate that Duolingo games used as Extramural English have a significant positive effect on students' vocabulary mastery. Therefore, integrating Duolingo games can be considered an effective and engaging strategy for enhancing vocabulary learning in EFL contexts

Keywords: *Duolingo, Extramural English, Vocabulary Mastery, Online Games, EFL Learning*

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INTRODUCTION

Recent research has highlighted the role of Extramural English (EE) in second and foreign language development. EE refers to learners' engagement with English beyond formal instruction through activities such as gaming and digital media. Research has linked out-of-school English exposure, particularly computer gaming, with vocabulary development and language proficiency (Sundqvist, 2009; Sundqvist & Sylven, 2012, 2016). However, the learning outcomes may vary according to learners' engagement and the activities they undertake.

Meanwhile, Mobile-Assisted Language Learning (MALL) offers flexible opportunities for independent language practice. Reviews of mobile-assisted vocabulary learning report promising learning outcomes while also identifying limitations in research design and implementation (Dağdeler, 2023; Ishaq et al., 2021; Lin & Lin, 2019). More recently, Zhou & Zhou (2025) synthesized experimental evidence on mobile applications for vocabulary learning, further demonstrating the relevance of this research area.

Gamified applications such as Duolingo combine structured exercises with game-like features. Loewen et al. (2019) examined Duolingo as a mobile-assisted language-learning tool, while Indonesian studies have investigated its relationship with vocabulary mastery and learners' experiences (Andini & Salmiah, 2024; Anggraeni & Degeng, 2024). Nevertheless, further research is needed to understand Duolingo specifically as an independently undertaken EE activity. Evidence concerning senior high school students in Indonesian Islamic boarding schools remains an important area for investigation, particularly given the

distinctive learning conditions and opportunities for out-of-class English exposure in these settings.

METHOD

Research Design

This study employed a quantitative approach using a quasi-experimental non-equivalent control group pretest-posttest design. This design was appropriate for examining the effect of an educational intervention when participants were assigned to existing classes rather than individually randomized (Shadish et al., 2002). The study involved an experimental group that used Duolingo games as an Extramural English (EE) activity and a control group that received conventional vocabulary instruction. The effectiveness of Duolingo for vocabulary learning has also been investigated in previous experimental research (Sari et al., 2023).

Participants

The population consisted of all eleventh-grade students at Mu'allimin Boarding School Bangkinang. A total of 50 students from two intact classes participated in the study. The classes were selected through cluster random sampling, with one class assigned as the experimental group and the other as the control group. The experimental group practiced English vocabulary using Duolingo outside formal classroom instruction, while the control group received conventional vocabulary instruction. This out-of-class learning approach reflects the concept of Extramural English, which concerns engagement with English beyond the classroom (Sundqvist & Sylven, 2016).

Research Instrument

The research instrument was a vocabulary mastery test consisting of 25 multiple-choice items. The test measured students' knowledge of word meanings, spelling, pronunciation, and contextual usage. It was administered to both groups before and after the intervention. The same test was used for the pretest and posttest to maintain consistency in score comparisons. Vocabulary testing is also a common approach in experimental research examining the effectiveness of Duolingo for English vocabulary learning (Sari et al., 2023).

Research Procedures

The study was conducted in three stages. First, both groups completed a pretest to establish their initial vocabulary mastery. Second, the experimental group used Duolingo for two weeks, with three sessions per week lasting approximately 15–20 minutes each. Students completed activities independently outside classroom hours using their personal mobile devices. The activities included translation, listening, and pronunciation exercises. This procedure positioned Duolingo as an out-of-class English learning activity rather than a teacher-led classroom intervention (Sundqvist & Sylven, 2016). Meanwhile, the control group continued learning vocabulary through conventional instruction. Finally, both groups completed the posttest to measure changes in vocabulary mastery following the intervention.

Data Analysis

The data were analyzed using descriptive and inferential statistics. Descriptive statistics summarized the pretest and posttest scores for both groups. Normality and homogeneity tests were conducted to assess the assumptions for parametric analysis. An independent-samples t-test was used to compare the posttest scores of the experimental and control groups, with the significance level set at .05. Because the study used a non-equivalent control group design, the findings were interpreted with consideration of possible pre-existing differences between the classes (Shadish et al., 2002).

FINDINGS AND DISCUSSIONS**Finding****Table 1. The Analysis Statistics of Pre-test & Post-test in Experimental Class**

N	Pre-Test		Post-Test	
	Valid	25	Post-Test	25
	Missing	0		0
Mean		65.84		75.84
Median		66		70
Std. Deviation		4.997		4.085
Variance		24.973		16.693
Range		16		18
Minimum		58		62
Maximum		74		80
Sum		1646		1896

The data in table 1, shows that the students in class XI. Pl. 1 had a pre-test score of 1646, with a mean score of 65.84 and a median score of 66, while the total score the experimental class was 1896, with a mean score of 75.84 and a median score of 70. The scores of duolingo games before and after therapy show a noticeable difference, as may be inferred.

Table 2. The Analysis Statistics of Pre-test & Post-test in Control Class

N	Pre-Test		Post-Test	
	Valid	25	Post-Test	25
	Missing	0		0
Mean		61.04		70.88
Median		60		70
Std. Deviation		3.747		4.085
Variance		14.040		16.693
Range		12		18
Minimum		56		62
Maximum		68		80
Sum		1526		1772

From table 2, The students in class XI. Pl. 2 scored 1526 in the pre-test overall, with a mean of 61.04 and a median of 60, according to the statistics in Table 4.3. The total post-test score was 1772, with a mean of 70.88 and a median of 70. It is reasonable to infer that there is a large variation in the scores of duolingo games played before therapy and after therapy. I mean mean that the students have little increasing of their vocabulary mastery. Besides, the mean of pre-test and post test of control group and experimental group also have a significant different.

Table 3. The Mean & Standard Deviation of Pre-test & Post-test of Experimental Group

	Mean	Std. Dev
Pre-test	65.84	4.997
Post-test	75.84	4.651

According to table 3 inform the experimental class results, the mean score of the pre-test (65.84) is a lowest than in the post-test (75.84). And the standard deviation of pre-test (4.997) is lowest than the post-test (4.651).

Table 4. The Mean & Standard Deviation of Pre-test & Post-test of Control Group

	Mean	Std. Dev
Pre-test	61.04	3.747
Post-test	70.88	4.085

According to table 4 inform the control class results. The pre-test had a lower average score (61.04) than the post-test (70.88). Moreover, the pre-test's standard deviation (3.747) is lower than that of the post-test (4.085).



Figure 1. The Diagram of Pre-test and Post-test from Experimental Class

Based to the following graphic, The maximum and minimum scores in the pre-test of the experimental class were 74 and 58, respectively, as shown in the figure above. Additionally, the post-test results showed that the highest grade was 80 and the lowest grade was 62. The student's vocabulary greatly improved as a result of the duolingo games.

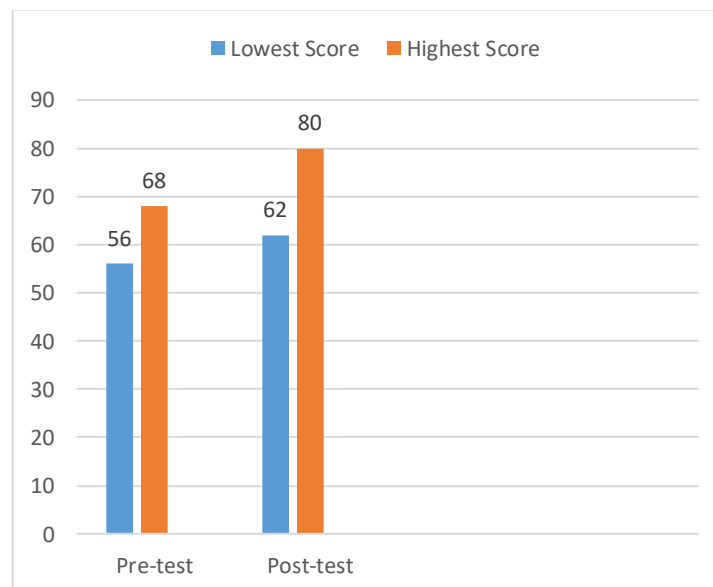


Figure 1. The Diagram of Pre-test and Post-test from Control Class

As seen in the illustration above, the control group's pre-test produced the highest score of 68 and the lowest score of 56. The post-test had the highest score of 80 and the lowest score of 62.

Table 5. Normality Test

	Class	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
		Statistic	Df	Sig.	Statistic	df	Sig.
Pre-test	Experimental Class	169	25	.063	927	25	.073
	Control Class	139	25	.200	929	25	.082
Post-test	Experimental Class	152	25	140	945	25	196
	Control Class	134	25	200	948	25	226

a. Lilliefors Significance Correction

From table 5, The value of Post-Test of experimental class is rejected because the sign $(0,063) > \alpha (0,05)$, according to the important asymptote in the table above. Due to the fact that the post-test of control classes yields a value greater than a $(0,05)$, H_0 is rejected. The post-test data sample taken from both the experimental class and the controlled class at MA PP Mu'allimin Muhammadiyah Bangkinang does not originate from a population that is normally distributed.

Table 6. Homogeneity Test

		Levene Statistic	df1	df2	Sig.
Pretest	Based on Mean	.4.013	1	48	.051
	Based on Median	.3.986	1	48	.052
	Based on Median and with adjusted df	.3.986	1	47.918	.052
	Based on trimmed mean	.4.072	1	48	.049
	Based on Mean	1.161	1	48	.287
Post-test	Based on Median	1.319	1	48	.256
	Based on Median and with adjusted df	1.319	1	47.067	.257
	Based on trimmed mean	1.183	1	48	.282

From table 6, The value of significance (Sig) is known from the aforementioned output. The variance of the post-test experimental class and Post-test data of the control class is the same or homogeneous since Mean is equal to 0.051 & ≤ 0.05 . As a result, one of the (not absolute) requirements for the independent sample t-test has been met.

Table 7. T-Test

		Levene's Test for Equality of Variances		T	Df	t-test for equality of Means				
		F	Sig.			Sig. (2-tailed)	Mean Difference	Std Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Pre-test Score	Equal variances assumed	4.013	.051	-3.842	48	.000	-4.80000	1.24921	-7.31171	-2.28829
	Equal variances not assumed			-3.842	44.505	.000	-4.80000	1.24921	-7.31682	-2.28318
Post-test Score	Equal variances assumed	1.161	.287	-4.006	48	.000	-4.96000	1.23828	-7.44973	-2.47027
	Equal variances not assumed			-4.006	47.214	.000	-4.96000	1.23828	-7.45080	-2.46920

From table 7, The Null hypothesis (H_0) is rejected, and the alternative hypothesis (H_a) is accepted if the independent test above shows a significant difference in students' scores between students taught using conventional strategies at the eleventh grade students of MA Muallimin Muhammadiyah Bangkinang at a significance level (2-tailed) of 0,000 & It; 0,05.

The findings of this study indicate that the use of Duolingo games as extramural English had a positive effect on students' vocabulary mastery. The descriptive statistical analysis showed a substantial increase in the mean score of the experimental group from the pretest to the posttest. In contrast, although the control group also demonstrated improvement, the increase was relatively smaller. The results of the independent sample t-test revealed a statistically significant difference between the posttest scores of the experimental and control groups ($p < 0.05$). This result confirms that students who engaged in Duolingo games as extramural English activities achieved significantly higher vocabulary mastery than those who learned through conventional classroom-based methods. These findings suggest that the implementation of Duolingo as an extramural English activity contributed positively to students' vocabulary learning outcomes.

Discussions

The improvement in students' vocabulary mastery can be attributed to several key features of Duolingo as a digital game-based learning application. Duolingo provides repeated exposure to vocabulary items, interactive learning tasks, and immediate feedback, which are essential factors in effective vocabulary acquisition. Repetition and contextualized practice help learners strengthen word retention, while instant feedback allows learners to correct errors and reinforce correct usage.

From a theoretical perspective, these results align with the concept of Extramural English, which emphasizes language learning that occurs outside formal classroom settings through enjoyable and meaningful activities. [Reinders \(2012\)](#) highlights that motivation plays a crucial role in extramural learning, as learners tend to be more engaged when participating in activities they find enjoyable, such as digital games. Duolingo's gamification elements such as points, levels, and rewards enhance learners' motivation and encourage sustained engagement with English.

The findings of this study are consistent with previous research on game-based and online vocabulary learning. [Yip & Kwan \(2006\)](#) reported that students who learned vocabulary through online games showed better retention and higher motivation compared to those using traditional methods. Similarly, [Yip & Kwan \(2006\)](#) found that Duolingo effectively supports independent language learning by increasing learner motivation and providing flexible learning opportunities.

Furthermore, the role of extramural English in enhancing vocabulary exposure is evident in this study. Duolingo enabled students to practice English beyond classroom hours, increasing the frequency and duration of their exposure to English input. According to [Sundqvist & Sylven \(2012\)](#), frequent exposure to English outside the classroom plays a significant role in developing language proficiency, particularly vocabulary knowledge. Encountering vocabulary items repeatedly in varied contexts helps learners internalize meaning and usage more effectively.

[Murray \(2015\)](#) also argues that extramural English is not limited to academic activities but includes everyday experiences that enrich vocabulary and cultural understanding. Although Duolingo is a structured application, it simulates informal learning experiences by allowing learners to engage with English autonomously and at their own pace, which contributes to deeper vocabulary retention.

Overall, the findings support the view that digital game-based applications such as Duolingo can serve as effective extramural English tools. By combining motivation, repeated exposure, and learner centered activities, Duolingo enhances vocabulary acquisition and retention in EFL contexts. Therefore, integrating Duolingo into vocabulary learning can be a

valuable pedagogical strategy to complement classroom instruction and promote independent language learning.

CONCLUSIONS

This study examined the effect of Duolingo games as an extramural English activity on students' vocabulary mastery. The findings showed that students using Duolingo achieved significantly better vocabulary mastery than those receiving conventional instruction, confirming its positive effect on vocabulary learning. Therefore, Duolingo can serve as a supplementary learning medium for EFL students, providing meaningful English exposure beyond classroom instruction. However, this study had several limitations, including a relatively small sample size, a short treatment period, and a focus on only one digital application, which may limit the generalizability of the findings. Future research should involve larger samples and longer treatment periods to examine the sustained effects of extramural English activities. Further studies could also investigate their effectiveness in developing other language skills, including speaking, listening, reading, and grammar. Additionally, mixed-methods approaches are recommended to provide deeper insights into students' learning experiences, engagement, and perceptions of digital language-learning activities. These investigations could contribute to a more comprehensive understanding of technology-supported language learning beyond formal educational settings.

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