

The Effectiveness of Using The Duolingo Application to Enhance Students' English Vocabulary Mastery

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ABSTRACT

This study aims to evaluate the effectiveness of the Duolingo application in enhancing students' English vocabulary mastery through a pre-experimental design. A total of 26 participants engaged in a two-week intervention using Duolingo to improve their vocabulary skills. The results of the pre-test and post-test assessments demonstrated a significant improvement in vocabulary mastery, with the mean score increasing from 63.42 to 85.08. The standard deviation decreased from 14.711 to 9.169, indicating greater consistency in student performance following the intervention. The paired samples correlation of 0.693 with a significance value of 0.000 indicated a strong positive relationship between the pre-test and post-test scores, supporting the effectiveness of the intervention. Further analysis using a paired samples t-test revealed a mean difference of -21.654 with a t-value of -10.363 ($p < 0.001$), confirming that the intervention had a significant impact on vocabulary acquisition. The effect size calculation (Cohen's $d = -2.032$) indicated a large effect size, demonstrating the substantial impact of Duolingo on students' vocabulary development. The study concludes that Duolingo can serve as an effective supplementary tool for vocabulary acquisition in English language learning. Future research is encouraged to explore the long-term effects of the application, its influence on other language skills, and its potential integration into formal educational contexts.

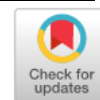
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INTRODUCTION

Vocabulary is a crucial component of mastering the English language, supporting essential skills such as reading, listening, speaking, and writing (Anisa Dwi Tiara, M. Arinal Rahman, 2021). A strong vocabulary foundation enhances learners' ability to comprehend texts, communicate effectively, and engage in meaningful interactions across all four language domains. Without sufficient vocabulary, students may struggle to construct sentences, grasp meaning in context, and build fluency. With the advancement of digital tools, technology has become an essential element in modern education, particularly in language learning. Mobile-Assisted Language Learning (MALL) refers to the use of mobile devices to support language learning processes, offering learners flexibility, accessibility, and personalized instruction. MALL-based applications promote autonomous learning, encourage repeated practice, and facilitate language acquisition through various interactive formats, including games, multimedia, and instant feedback.

As a language-learning application, Duolingo offers an interactive approach through gamification, adaptive exercises, and immediate feedback. The app is designed to make vocabulary learning more engaging, enjoyable, and practical, ultimately helping students expand their English vocabulary consistently. Integrating modern technology presents an innovative solution to address challenges in English language learning. One example is Duolingo, a mobile application platform that provides an interactive and engaging learning experience through digital technology (Ajisoko, 2020). Utilizing Duolingo as a free online English learning tool is crucial in supporting students, particularly in vocabulary acquisition,

and serves as an effective means of gradually improving English proficiency (Apoko et al., 2023).

Previous studies indicate that Duolingo has significant potential to enhance student motivation. For instance, (Andini, 2024) found that Duolingo effectively improves students' vocabulary mastery, offering an engaging and enjoyable learning experience while reinforcing memory retention through structured and contextualized word usage. (Suci, 2022) emphasized that Duolingo facilitates learning and boosts student participation by providing an enjoyable and non-monotonous learning experience. Additionally, (Paepflow, n.d.) highlighted that students perceive Duolingo as an effective tool for English learning, as it enhances their willingness to complete assignments at home and improves their language skills.

Research by (Dhea Anggita Putri Ningtyas & Dian Reftyawati, 2024) demonstrated that Duolingo helps make learning more engaging and less monotonous for students. (Yuwono, 2022) asserts that Duolingo effectively teaches vocabulary, which is fundamental to mastering English's four core language skills. Similarly, (Nita et al., 2023) argued that technological advancements like Duolingo increase motivation, practice frequency, and language proficiency by expanding vocabulary and facilitating grammar and pronunciation learning through interactive features (Irwit Santi et al., 2023) highlighted that Duolingo provides four "lives" per session, where failure requires learners to repeat the session, encouraging consistent progress and skill enhancement.

This research explores students' perceptions of Duolingo, including both its strengths and weaknesses: strengths include 1) Duolingo expands English vocabulary, 2) Duolingo provides enjoyable learning experiences, 3) students are motivated by the rewards given, 4) it improves vocabulary pronunciation, and 5) it sharpens memory and listening skills. However, weaknesses include 1) the lack of a discussion forum among users, 2) advertisements, and 3) limited focus on grammar instruction (Solihah, 2024).. Additional challenges include an internet connection to access materials (Nurshiyam et al., 2022) and supplementary guidance to ensure deep comprehension and alignment with students' varying abilities (Sakina & Astuti, 2024)

The study further indicates that while Duolingo holds significant potential to enhance students' motivation and English proficiency, it encounters challenges such as limited insight into its long-term effectiveness and difficulties in differentiating its application for independent learning versus classroom use (Empati et al., 2024). Also highlighted is the absence of direct interaction with instructors and the high level of self-discipline required from students, which present notable barriers, as the lack of interaction limits opportunities for immediate and comprehensive feedback (Hidayati et al., 2021).

This study aims to thoroughly examine the effectiveness of using the Duolingo application to improve students' mastery of English vocabulary. It will analyze how the application impacts students' ability to understand and master vocabulary effectively. Additionally, this study seeks to identify Duolingo's various strengths and weaknesses based on students' perceptions and direct experiences. The findings of this study are expected to provide comprehensive insights into the potential optimization of Duolingo as a technology-based learning tool to support more effective and efficient English vocabulary acquisition.

METHOD

This study employed a pre-experimental research design, specifically the one-group pre-test and post-test design, to evaluate the effectiveness of the Duolingo application in enhancing students' English vocabulary mastery. In this design, a single group of participants was observed before and after the intervention, allowing the researchers to compare vocabulary performance without the use of a control group. The design enabled a direct measure of improvement attributable to the intervention by assessing students' vocabulary knowledge both before and after using Duolingo.

Respondents

The respondents of this study were 30 students enrolled in the English Department, Faculty of Education, Universitas Muhammadiyah Mataram. These students, aged between 20 and 22 years, were randomly selected and represented varying levels of English proficiency, ranging from beginner to intermediate.

Instruments

Two instruments were employed in this research: a vocabulary proficiency test and a perception questionnaire.

Vocabulary Proficiency Test

This test comprised 30 items designed to evaluate the students' understanding of vocabulary items practiced through Duolingo. It was administered before (pre-test) and after (post-test) the two-week intervention.

Perception Questionnaire

A set of questions was distributed to gather students' feedback and attitudes regarding the use of Duolingo in vocabulary learning.

Procedures

Prior to the intervention, participants completed a vocabulary pre-test to determine their baseline knowledge. They then engaged in a two-week vocabulary learning program using the Duolingo application. After the intervention, a post-test with the same structure as the pre-test was conducted to assess learning outcomes. Additionally, the students filled out a perception questionnaire to evaluate their experiences with the application.

Data Analysis

The collected data were analyzed using both descriptive and inferential statistics. Descriptive statistics were used to present the mean, standard deviation, and consistency of scores. To assess the significance of the vocabulary improvement, a paired sample t-test was applied. Furthermore, the correlation between pre-test and post-test scores was examined, and effect size (Cohen's *d* and Hedges' *g*) was calculated to determine the magnitude of the intervention effect.

FINDINGS AND DISCUSSION

This study aims to evaluate the effectiveness of the Duolingo application in enhancing students' English vocabulary mastery using a pre-experimental design. The findings are based on the analysis of pre-test and post-test scores from a single group of students who participated in a two-week learning program utilizing the Duolingo application. The results are presented in three structured parts: descriptive statistics, inferential statistics, and interpretation.

Result Paired Samples Statistics

Table 1 T-Test of the Pre-Test and Post-Test

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre_test	63.42	26	14.711	2.885
	Post_test	85.08	26	9.169	1.798

The mean pre-test score was 63.42, while the post-test mean increased to 85.08. This shows an improvement of 21.66 points after the use of Duolingo. The standard deviation decreased from 14.711 in the pre-test to 9.169 in the post-test, indicating that students' post-test scores were more consistent. The lower standard error in the post-test (1.798 compared to 2.885 in the pre-test) suggests a more accurate estimate of the group mean after the intervention.

Result Paired Samples Correlation

Table 2 Test-Test of the Pre-Test and Post-Test

Paired Samples Correlations				
		N	Correlation	Sig.
Pair 1	Pre_test & Post_test	26	.693	.000

The correlation between pre-test and post-test scores was 0.693, indicating a strong positive relationship, with a significance level of 0.000. This suggests that students who performed well

in the pre-test tended to do well in the post-test, with the improvement not occurring by chance.

Result Paired Samples Test

Table 3 T-Test of the Pre-Test and Post-Test

		Paired Samples Test			95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper			
Pair 1	Pre_test - Post_test	-21.654	10.654	2.089	-25.957	-17.350	-10.363	25	.000

The paired samples t-test revealed a mean difference of -21.654, with a t-value of -10.363 and a significance level of 0.000 ($p < 0.001$). The 95% confidence interval for the mean difference does not include zero, which confirms that the change in scores is statistically significant.

Result Paired Samples Effect Sizes

Table 4 T-Test of the Pre-Test and Post-Test

Paired Samples Effect Sizes						
			Standardizer ^a	Point Estimate	95% Confidence Interval	
					Lower	Upper
Pair 1	Pre_test - Post_test	Cohen's d	10.654	-2.032	-2.705	-1.346
		Hedges' correction	10.818	-2.002	-2.664	-1.326

The denominator used in estimating the effect sizes. Cohen's d uses the sample standard deviation of the mean difference. Hedges' correction uses the sample standard deviation of the mean difference, plus a correction factor.

Effect sizes were calculated to evaluate how much influence the treatment had on the test results. The two effect sizes calculated were Cohen's d and Hedges' correction, with the following results:

Cohen's d yielded an estimated value of -2.032 with a 95% confidence interval between -2.705 and -1.346.

Hedges' correction yields an estimated value of -2.002 with a 95% confidence interval between -2.664 to -1.326.

Cohen's d value of -2.032 indicates a large effect size. Based on Cohen's (1988) guidelines, a Cohen's d value above 0.8 indicates a significant effect. Therefore, this result suggests that the treatment enormously improved participants' learning outcomes.

This study aimed to evaluate the effectiveness of the Duolingo application in enhancing students' English vocabulary mastery using a pre-experimental design. The analysis of pre-test and post-test results revealed a significant improvement in students' vocabulary mastery after using the application for two weeks. Descriptive statistics showed that the mean pre-test score was 63.42, while the mean post-test score increased to 85.08, reflecting a positive change of 21.66 points. The standard deviation decreased from 14.711 in the pre-test to 9.169 in the post-test, indicating greater consistency in participants' performance following the intervention. Additionally, the standard error of the mean was more minor in the post-test (1.798) compared to the pre-test (2.885), suggesting a more accurate estimation of the post-test mean. The paired samples correlation between pre-test and post-test scores was 0.693, with a significance value of 0.000, indicating a strong positive relationship and statistically significant change, suggesting that the improvement was likely due to the treatment rather than random chance.

Further statistical analysis revealed that the paired samples t-test showed a significant difference between pre-test and post-test mean scores, with a mean difference of -21.654 and a t-value of -10.363 ($p < 0.001$). The 95% confidence interval for the mean difference did not include zero, confirming that the treatment had a significant effect. Using Cohen's d and Hedges' correction, the effect size calculations indicated a significant effect, with Cohen's d at

-2.032, well above the threshold of 0.8, indicating a strong impact of the intervention on vocabulary improvement. These results suggest that the Duolingo application had a substantial and positive effect on student's vocabulary mastery, further supporting its potential as an effective tool for language learning.

CONCLUSION

This study examined the effectiveness of the Duolingo application in improving students' mastery of English vocabulary through a pre-experimental design involving 26 undergraduate students over a two-week intervention period. The results demonstrated a statistically significant enhancement in vocabulary acquisition, as evidenced by the increase in the mean test scores from 63.42 (pre-test) to 85.08 (post-test). Additionally, the reduction in standard deviation from 14.711 to 9.169 indicated more uniform performance among participants following the intervention. The statistical analyses further supported the effectiveness of the application. A strong positive correlation ($r = 0.693$, $p < 0.001$) between pre-test and post-test scores was observed, confirming the reliability of the improvement. The paired samples t-test showed a significant mean difference of -21.654 ($p < 0.001$), while the effect size, measured by Cohen's d (-2.032), suggested a substantial impact of the intervention on vocabulary learning. In summary, the findings underscore that Duolingo significantly enhanced students' English vocabulary mastery. The application's engaging, interactive, and user-centered features contributed to improved learning outcomes, suggesting that Duolingo can serve as a valuable complement to traditional teaching methods, especially in fostering learner autonomy and motivation.

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