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The Effect of Using Artificial Intelligence on Learning Vocabulary among Libyan EFL University Students

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Abstract

This study investigates how Artificial Intelligence (AI) can improve English vocabulary acquisition among university students at the Faculty of Languages, University of Benghazi, Libya. Using a true-experimental design, 60 English as a Foreign Language (EFL) students in their first semester were randomly assigned to two groups. The experimental group used the Duolingo app for vocabulary learning, while the control group received traditional instruction. Data analysis were conducted using SPSS, employing methods such as *T*-tests, and ANCOVA. Results indicated that students who used Duolingo significantly outperformed those in the control group in vocabulary acquisition. The study concludes by recommending the incorporation of AI-driven platforms like Duolingo into EFL curricula and suggests further research to assess their long-term impact on language learning.

Keywords: EFL learners, learning vocabulary, AI-Based platforms

ملخص الدراسة

تبحث هذه الدراسة في كيفية مساهمة الذكاء الاصطناعي في تحسين اكتساب مفردات اللغة الإنجليزية لدى طلاب كلية اللغات بجامعة بنغازي، ليبيا. باستخدام تصميم تجريبي حقيقي، تم توزيع 60 طالبًا من طلاب اللغة الإنجليزية كلغة أجنبية في الفصل الدراسي الأول عشوائيًا إلى مجموعتين. استخدمت المجموعة التجريبية تطبيق Duolingo لتعلم المفردات، بينما تلقت المجموعة الضابطة التعليم التقليدي. تم تحليل البيانات باستخدام برنامج SPSS، بتطبيق أساليب مثل اختبارات *T* وتحليل التغاير (ANCOVA). أشارت النتائج إلى تفوق ملحوظ للطلاب الذين استخدموا Duolingo على طلاب المجموعة الضابطة في اكتساب المفردات. تختتم الدراسة بالتوصية بإدراج منصات الذكاء الاصطناعي، مثل Duolingo، في مناهج تعليم اللغة الإنجليزية كلغة أجنبية، وتقترح إجراء المزيد من البحوث لتقييم أثرها طويل الأمد على تعلم اللغة.

الكلمات المفتاحية: متعلمو اللغة الإنجليزية كلغة أجنبية، تعلم المفردات، منصات الذكاء الاصطناعي

Introduction

Libya's education system plays a big role in helping the country's society and economy grow. Knowing English well has become more and more important, especially for Libyans to join in with the world economy. That's why English is taught across the country, starting from primary school all the way up through university (Mohamed, 2016). The idea behind this is to help students get better at speaking and talking, so they're ready for all sorts of conversations, whether they're at school or in their jobs (Ministry of Education, 2018). But even with all these efforts, lots of classrooms are still stuck with traditional teaching styles, and most people aren't satisfied about them (Abosnan et al., 2020; Omar, 2025). These old teaching methods often just make students remember facts and grammar rules, instead of really teaching them how to speak and communicate properly (Wheida, 2023). So, students often struggle to use what they've learned when they're talking in daily life, which then makes it harder for them to actually speak English well (Orafi, 2022).

Moreover, many students find learning vocabulary, a challenging task because the it requires more than just their sound and meaning, as students must also comprehend how the word is used in a particular context (Harmer, 2007). According to Schmitt's (2000) work, the complexity of vocabulary acquisition is evident in the learning of pronunciation, spelling, grammar, and subtle meanings. Hiebert, Scott, Castaneda, and Spichtig (2019) also noted that some vocabulary is difficult due to its own difficulty, making it even more challenging to learn. Furthermore, the absence of opportunities to use new words in contexts can hinder students from reaching their full communication potential (Crossley, Subtirelu & Salsbury, 2013).

Many studies have stressed the importance of overcoming difficulties in learning vocabulary to enhance English learning abilities. A study conducted by Abugharsa and Elamin (2024) at Misurata University in Libya demonstrated a direct correlation between learning vocabulary and comprehension abilities. Other studies by Nurmalasari and Haryudin (1921) and Al-Khasawneh (2019) in Saudi Arabia, found that students' lack of knowledge in English language vocabulary was a significant factor in their learning difficulties. Their research emphasized the need for targeted vocabulary instruction to aid students in overcoming reading difficulties that affect English.

One strategy to improve teaching vocabulary was the introduction of AI tools in language teaching. These tools are becoming a helpful way to address many challenges in English language teaching and learning as well. They can create learning plans that fit each student and change based on their needs. Ng, Leung, Su, Ng, and Chu (2023) explained that AI tools could give students feedback right away and adjust lessons to their level. This can increase students' motivation and improve learning results. AI learning is different from traditional teaching because it is more flexible and reacts to students as they learn (Abu Qbeita, 2024). A study y Jomaa *et al*. (2024) revealed that AI tools like Google Translation, Dictionary Application, ChatGPT, Chat Bot, and Duolingo have helped EFL Omani students in various learning tasks. However, using AI in education also brings concerns, especially about student data privacy, unfair bias in algorithms, and how teachers' roles may change (Haroon & Hussian, 2025). Further, autonomous learning using AI tools raises significant concerns that when students learn on their own using AI tools, teachers (and sometimes parents) may not be able to monitor them well (Jomaa, 2024). Because of these issues, it is important to closely consider how AI is used to make sure it supports learning instead of harming it.

AI educational apps such as Duolingo use several learning theories to support vocabulary learning. Constructivist theory (Piaget, 1954; Vygotsky, 1978) is reflected in Duolingo's interactive and adaptive activities, which let learners study actively and at their own pace. Behaviorism (Skinner, 1953) is shown through game features like points, rewards, and badges, which provide reinforcement through fast feedback and encourage students to keep learning. The apps also apply cognitive load theory (Sweller, 1988) by breaking complex tasks into smaller steps and using different formats (text, images, audio) to reduce mental effort. This connects to dual-coding theory (Paivio, 1986), which supports learning by combining verbal and non-verbal information. Finally, self-determination theory (Ryan & Deci, 2000) appears in the way Duolingo offers learner control and supportive feedback that builds confidence, helping to maintain intrinsic motivation for longer-term engagement.

According to this study, Duolingo's AI app is expected to play a role in the vocabulary development of Libyan EFL university students. Specifically, this research will explore whether AI-powered vocabulary teaching is more effective than conventional vocabulary instruction and whether there are differences in outcomes between men and women. These points are utilized in the study to generate useful insights into the use of AI tools and its application in English classes in Libya.

Many research in EFL reading indicated that the majority of Libyan EFL teachers relied on traditional teaching methods in presenting English in classrooms (Belazi & Ganapathy, 2021; Omar, 2020; Omar, 2025). Most EFL teachers in Libya focused on finishing the syllabus and giving lessons mainly aimed at tests (Ahmed, 2018). Their main responsibility was to explain information to students who mainly wanted to get high grades and pass exams (Alhmali, 2007). Furthermore, many teachers were not well informed about the most effective methods to support and improve students' learning (Abushafa, 2014; Wheida, 2023). As a result, many Libyan EFL students did not develop strong English language communicative skills (Omar, 2025). Hence; there is an urgent need to revolutionize these methods by incorporating AI tools that assist teachers in the process of teaching and presenting English in classrooms.

Considering these challenges, many people now see AI tools as helpful for ELT. AI tools can make vocabulary learning more personal and engaging by giving students instant feedback and activities that match their needs (Abu Qbeita, 2024). However, even though interest in AI is growing, more real research is still needed to check how well it works and how it can be used in practice in Libya's education system. Investigating the use of AI tools in classrooms and whether they have a positive impact on students' vocabulary acquisition is crucial. Thus, this study aimed to offer practical recommendations to teachers and educational leaders in Libya to enhance the effectiveness of vocabulary instruction in this context. The significance of this study lies in its contribution to resolving vocabulary problems in Libyan EFL classrooms and advocating for the wider adoption of AI as a means towards educational technology. Overall, the study has the potential to enhance teaching methods, create learning experiences that are adaptable to diverse students and reduce achievement gaps to improve learning outcomes. Thus, this research seeks to explore whether there are statistically significant differences in the rate of vocabulary acquisition between control group (which was taught using traditional methods) and experimental groups (which was taught using Duolingo AI application) among Libyan EFL university students.

Methodology of the Study

This study used a true-experimental design to see how the Duolingo AI app affects vocabulary learning for university students in Libya who study English as a foreign language. A true-experimental design was chosen because it gives researchers the opportunity to compare two groups while still working within real classroom settings (Creswell & Creswell, 2018).

This study is experimental in nature. The purpose for this was that new teaching methods should be tested with real results and have clear reasons, so they can be used in language teaching in practice (Grabe, 2009). The experiment was conducted with two distinct groups. Vocabulary was learned by the experimental group through the use of the Duolingo app, whereas the control group used other traditional methods to learn vocabulary without the app. Each group participated in both a pre and post-test evaluation. Before the study, each group's vocabulary level was assessed at a pre-test point, and after the analysis, the post-test measured progress. The primary concern was to determine if the use of AI technology results in superior vocabulary acquisition over traditional methods.

The research was carried out at the Faculty of Languages at the university of Benghazi. A total of 60 university students participated in this research. A total of 60 university students participated. The experimental group as the control one comprised 30 participants. Participants were divided into the experimental group, which engaged with Duolingo for learning English vocabulary, or the control group, which continued with conventional traditional vocabulary teaching methods.

Instruments of the Study

A. The Duolingo Application: This study incorporated the Duolingo application, which was first introduced in 2012 (Portnoff *et al*, 2021). There are 27 language courses available through this app, which also has a mobile app for Android, iOS, and Windows. Duolingo is a platform that allows students to practice their languages like an individual language tutor. Those who are not fluent in English and seeking education for reasons such as education, employment, or business operations can also make use of it. Additionally, Despite the existence of paid Duolingo, you can save your progress by signing up. By selecting a language and difficulty level, the app adjusts the challenge to suit individual abilities. The interactive nature of Duolingo lessons makes it easy to learn vocabulary and grammar. The teaching method used by Duolingo is structured. "Trees" or levels are commonly used to divide the language lessons into different levels, each of which covers a specific area of language usage such as vocabulary, grammar, idioms and cultural topics. This permits students to practice their language completely. The use of Duolingo by educators enables them to create assignments, manage learning, and monitor student progress, while also promoting interaction and organization in learning.

Despite its benefits, Duolingo app has some drawbacks (Cunningham, 2015). Although it provides a level of play and shows the progress of learners, it does not offer enough opportunities to hear their language as native speakers do. Why is this so? It is unable to accurately represent spoken language because its listening sounds are automated.'". As a result, their output isn't entirely automated. A thorough comprehension of grammar is essential for language learning, but Duolingo does not provide it. These problems can cause some learners to not fully understand the workings of the language, and may even create problems on assignments (Cunningham, 2015).

B. Pre/Posttest: A test was conducted before the study. The experimental and control groups were tested by the researcher before the lessons to determine their vocabulary proficiency. After completing 8 lectures (with each lasting 2 hours), the researcher conducted an experiment to determine whether the Duolingo app had aided or hindered the students' vocabulary acquisition. The post-test phase included tests on various vocabulary skills including spelling, connotation, collocation, denotations, and word derivation. The test consisted of multiple-choice questions and a score of 25 points. Five questions were included in the assessment of vocabulary skills.

For the security and legitimacy of these assessments. To evaluate the research tools' quality, experts in TEFL and linguistics were called upon for this task. The equipment was inspected by these professors to ensure that the articles were accurate, concise, and suitable for research. Their feedback was carefully used. Researchers examined the arrangement of test marks, question structure and format, and grammatical correctness. They also weighed how long students have to spend answering the questions. A test-retest approach was used in the study to ensure the instruments' reliability. To ensure consistency, the same test is administered to the identical group twice. Both groups were subjected to different types of tests. They utilized their responses to improve the test. Two weeks later, those same pupils took the test again. Pearson's formula yielded a reliability coefficient of 85%. Much percentage indicates that the test is reliable and consistent in meeting its goals within this study.

Results and Discussion

The study used several statistical methods, including mean scores, standard deviations, a two-way ANOVA, and t-tests, to analyze all the variables. It also compared the two teaching methods, Duolingo versus traditional instruction, between the experimental and control groups. This comparison was done in terms of overall vocabulary and its different parts.

First, descriptive statistics were calculated to summarize the characteristics of the experiment's sample.

Table 1

Descriptive Statistics of the Final Scores for Both Groups

Group	Test	N	M	SD
Control group	Pre-test	30	7.50	5.710
	Post-test	30	13.07	3.850
Experimental group	Pre-test	30	7.67	4.908
	Post-test	30	20.87	5.947

Along with the average (mean) and standard deviation for each test, a table is presented that displays the number of students who took the tests. No two groups had the same number of students. Before the experiment commenced, there were very similar pre-test scores of 7.50 and 7.67 for both control groups. Due to the slight difference, both groups started with similar level of vocabulary proficiency. Hence, any subsequent variations in post-test scores can be more confidently associated with the treatment rather than early changes. The post-test data reveals more significant differences, as shown in Table one above, with the control group having a mean of 13.07 and the experimental group's average of 20.87. The results indicate that both groups improved, and the experimental group achieved more.

To reveal the significant mean difference between the two groups in the experiment, a t-test statistical analysis was conducted.

Table 2

The Groups Differences Using T-Test

	N	M	T	DF	P
Pre-test	30	.167	.121	58	.904
Post-test	30	.167	6.031	58	.000

Note. P-value was set on 0.05 (2-tailed).

The results of the t-test statistical analysis revealed that there was a statistically significant difference between both groups (t (58) = 6.031, p <0.05).

Through the comparison of post-test data and pre-tested data, it was determined whether Duolingo app helped participants improve their vocabulary. The results were mixed. The post-test mean scores were found to be higher than those of the control and experimental groups, as evidenced by Table one. It suggests that both parties are enhancing their vocal abilities. Nevertheless, the study's primary aim was to gauge the extent to which the Duolingo app enhances one's vocabulary. T-test analysis revealed a larger gap in post-tested scores (control 0.121; experimental 6.031), and the experimental group outperformed their control subjects by .121 (Table 2).

The percentage-based analysis calculations for the pre-test and post-est results are graphically presented to make the results of the data analysis more understandable.

Figure 1: Percentages of the Scores of Groups in Pre-and Post-Tests

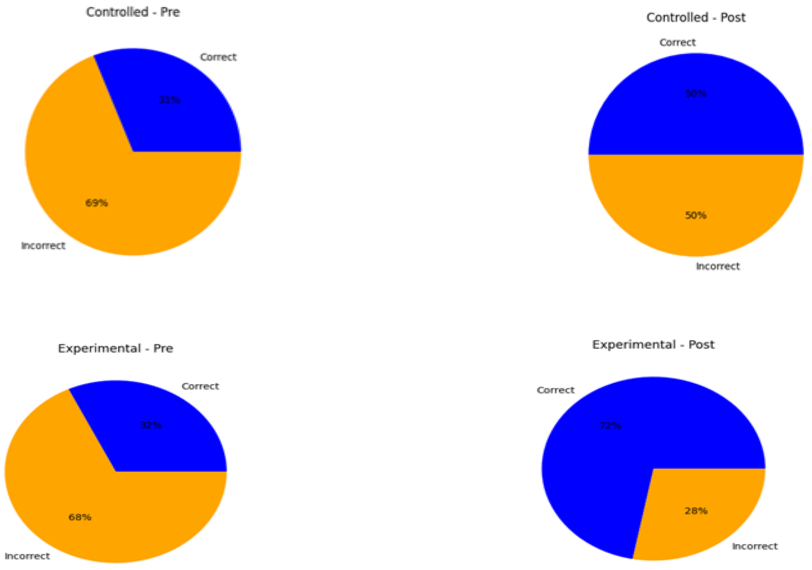

Figure 1 features graphs on the left that demonstrate pre-tests for both groups (control and experimental). In comparison to the experimental group, the error rates (in orange) of the control group were almost identical to those of the experimental one (69% and 68% respectively). The data is available for both groups. 31% of the control and 32% of those in the experimental group had accurate responses (depicted in blue). All results were almost similar. Thus, both groups began with an equal degree of literacy. The experiment's methodology is responsible for any variations in post-test scores, rather than any other factors. The graphs on the right of Figure 1 above shows that the experimental group's wrong responses decreased to 28% from 50% for the control group. In contrast, their correct answers (depicted in blue) increased to 72%, while the control group remained at 50%.

Findings

Discussions on the results of the experiment found that both control and experimental groups have improved vocabulary proficiency. While the control group was taught using the traditional method, they were instructed to use Duolingo with AI tools. In spite of this, the students who were taught using Duolingo's AI tools achieved better grades than those who had to do so through traditional teaching methods. The outcomes indicate that Duolingo and its artificial intelligence systems are capable of assisting EFL learners in conquering their vocabulary challenges using AI. The study found that Duolingo's smart learning system generates a learning plan for students that is modified based on the learner's level and speed of their learning. This corresponds to Portnoff et al. (2021), who found that Duolingo vocabulary retention helps students stay interested, but with only a moderate level of challenge when learning vocabulary. Students can maintain their motivation and study for an extended period with the help of this flexibility. Jomaa *et al.*'s (2024) research found that Omani EFL students were fond of using Duolingo AI application for learning English vocabulary. In the same manner, Ma and Chiu (2024) reported that the majority of those surveyed reported using AI applications on mobile devices to enhance their vocabulary acquisition. To determine the meaning of new words or assess their understanding of the text, they made use of these applications. The outcomes of this research offer fresh perspectives on the impact of AI on personalized learning. It was found in a study that the Duolingo AI app can establish diverse educational settings.

Recommendations

The study suggests that universities should use AI learning tools, like the Duolingo app, in their English classes. This is because these tools can help students learn in a more personal and faster way. The study also recommends doing more research to see if AI tools can help with other skills, such as grammar, reading, and speaking, not only vocabulary. Teachers should also get training so they can use AI tools correctly in their lessons and make learning more interesting for students. Finally, the study recommends that AI tools should fit Libyan students' culture and learning needs, by using content that matches local preferences.

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