International Journal of Peer-Reviewed Multidisciplinary Research

IJPRMR-ISSN (O)-0000-0000

The Effectiveness of Using Artificial Intelligence on Learning Vocabulary among Libyan EFL University Undergraduates at Zawia University

Mohamed Hmouma[1], Abdusalam Benarose[2]
m.hmouma@zu.edu.ly, abdusalambenarose@aju.edu.ly
Abu-Isa Faculty of Education, Zawia University[1]
Espiaa Faculty of Education, Ajafara University, Libya[2]

ARTICLE INFORMATION
RECEIVED: 17/03/2026 **ACCEPTED:** 22/03/2026 **PUBLISHED:** 23/03/2026

Abstract

This study investigates the effectiveness of using artificial intelligence (AI) in enhancing vocabulary learning among Libyan EFL undergraduate students at Zawia University. The research adopts a quasi-experimental design involving an experimental group exposed to AI-based vocabulary learning tools and a control group taught through traditional methods. Data were collected using pre-test and post-test instruments to measure vocabulary acquisition. Statistical analysis revealed a significant improvement in the experimental group compared to the control group. The findings suggest that AI-based learning environments provide interactive, adaptive, and personalized learning experiences that enhance vocabulary retention and usage. The study concludes that AI integration in EFL classrooms significantly improves vocabulary learning outcomes and recommends its incorporation into higher education curricula in Libya.

Keywords: Artificial Intelligence, Vocabulary Learning, EFL, Libya, Language Technology

1. Introduction

Vocabulary knowledge is widely recognized as a fundamental component of language proficiency and a key determinant of learners' ability to communicate effectively. Without sufficient vocabulary, learners struggle to comprehend texts and express their ideas clearly. As emphasized by Nation (2001), vocabulary plays a central role in second language acquisition and is essential for the development of all language skills.

In recent years, artificial intelligence has emerged as a transformative force in education. AI technologies provide innovative learning environments that support personalization, immediate feedback, and adaptive instruction. These features are particularly beneficial in language learning contexts, where learners require continuous practice and individualized support (Holmes et al., 2019).

Despite global advancements, the integration of AI in Libyan higher education remains limited. Traditional teaching methods continue to dominate EFL classrooms, often resulting in low engagement and limited vocabulary development. Previous research in the Libyan context, such as Mohamed Hmouma (2014) and (2024) have shown that learners face persistent grammatical challenges due to interlingual and intralingual factors. However, little research has explored how emerging technologies such as AI can address these challenges, particularly in vocabulary learning.

This study seeks to fill this gap by examining the effectiveness of AI-based tools in enhancing vocabulary acquisition among EFL undergraduate students at Zawia University. It aims to provide empirical evidence on the role of AI in improving language learning outcomes in the Libyan context.

2. Literature Review and Theoretical Framework

Vocabulary acquisition has been extensively studied within the field of second language acquisition. Nation (2001) argues that effective vocabulary learning requires repeated exposure, meaningful use, and contextualized practice. Similarly, Schmitt (2000) highlights that vocabulary development involves both receptive and productive knowledge, requiring diverse learning strategies.

The integration of technology into language learning has evolved from Computer-Assisted Language Learning to more advanced AI-driven systems. Chapelle (2001) emphasizes that technology enhances language learning by providing authentic input and interactive opportunities. With the advancement of artificial intelligence, language learning has become more personalized and adaptive, allowing learners to receive immediate feedback and customized instruction (Russell & Norvig, 2021).

Artificial intelligence in education is grounded in several theoretical perspectives. From a constructivist viewpoint, learning is an active process in which learners construct knowledge through interaction and experience (Vygotsky, 1978). AI tools support this process by enabling learners to engage actively with language content and receive real-time feedback. Additionally, Mayer's (2009) cognitive theory of multimedia learning suggests that combining visual, auditory, and textual information enhances learning, which is a common feature of AI-based applications.

In the Libyan EFL context, Mohamed Hmouma (2014) demonstrated that learners' errors are influenced by interlanguage development and the interaction between Arabic and English structures. This highlights the need for innovative instructional approaches that provide continuous feedback and adaptive learning environments, which AI technologies can offer.

Empirical studies have confirmed the effectiveness of AI in vocabulary learning. Chen et al. (2020) found that AI-based systems significantly improved vocabulary retention through adaptive learning mechanisms. Similarly, Li (2021) reported that AI chatbots enhanced vocabulary acquisition by providing interactive and contextualized practice opportunities. These findings suggest that AI has the potential to address challenges faced by EFL learners, particularly in vocabulary development.

3. Methodology

This study employed a quasi-experimental design to examine the effectiveness of AI-based vocabulary learning. The research involved two groups: an experimental group that used AI-based tools and a control group that received traditional instruction.

The participants consisted of 40 undergraduate students from the English Department at Zawia University. The students were randomly assigned to two groups of equal size to ensure validity and reliability. Both groups were tested using a standardized vocabulary test administered as a pre-test and post-test.

The experimental group used AI-based applications that provided personalized vocabulary exercises, immediate feedback, and interactive learning experiences. These tools included AI-powered language learning platforms and chatbot-based practice systems. The control group followed traditional teaching methods, including textbook-based instruction and teacher-led explanations.

Data analysis was conducted using statistical methods. Mean scores and standard deviations were calculated, and an independent samples t-test was performed to determine the significance of differences between the two groups (Creswell, 2014). The level of significance was set at 0.05.

4. Results

The results of the study indicate a clear and statistically significant improvement in vocabulary learning among students who were exposed to artificial intelligence–based instruction. A comparison between the experimental and control groups reveals notable differences in both performance gains and overall achievement, suggesting that AI-based learning tools had a substantial impact on vocabulary acquisition.

Table 1: Pre-Test and Post-Test Scores

Group	Pre-Test Mean	Post-Test Mean	Gain Score
Experimental	45.2	78.6	33.4
Control	44.8	60.3	15.5

The data presented in Table 1 illustrate the performance of both groups before and after the instructional intervention. At the pre-test stage, the experimental group obtained a mean score of 45.2, while the control group scored 44.8. The minimal difference between these two scores indicates that both groups were relatively homogeneous in terms of their initial vocabulary knowledge. This similarity is important, as it confirms that any subsequent differences in performance can be attributed to the instructional treatment rather than pre-existing disparities between the groups.

Following the intervention, both groups showed improvement in their post-test scores; however, the extent of improvement varied considerably. The experimental group achieved a mean score of 78.6, reflecting a substantial increase of 33.4 points. In contrast, the control group reached a post-test mean of 60.3, with a gain of 15.5 points. Although the control group did demonstrate progress, the magnitude of improvement was significantly lower than that of the experimental group.

The difference in gain scores between the two groups is particularly noteworthy. The experimental group's gain score is more than double that of the control group, which strongly suggests that the use of artificial intelligence tools had a pronounced effect on vocabulary development. This improvement can be attributed to several features of AI-based learning, including personalized feedback, adaptive learning pathways, and increased opportunities for interaction and practice. These features enable learners to engage more deeply with vocabulary items and reinforce their understanding through repeated exposure and contextualized use.

Furthermore, the substantial increase in the experimental group's post-test scores indicates not only improved recognition of vocabulary but also enhanced retention and application. This aligns with the view that effective vocabulary learning requires meaningful engagement and repeated practice, which are facilitated by AI-driven learning environments (Nation, 2001).

Table 2: t-Test Results

Comparison	**t-value**	**p-value**
Experimental vs Control	3.85	0.001

The statistical analysis presented in Table 2 provides further evidence of the effectiveness of AI-based instruction. The independent samples t-test yielded a t-value of 3.85 with a corresponding p-value of 0.001. Since the p-value is significantly lower than the conventional threshold of 0.05, the difference between the experimental and control groups is considered statistically significant.

This result indicates that the observed improvement in the experimental group is unlikely to have occurred by chance and can be confidently attributed to the use of artificial intelligence in vocabulary learning. The relatively high t-value also suggests a strong effect size, reflecting a meaningful difference in performance between the two groups.

The statistical significance of these findings reinforces the conclusion that AI-based learning environments are more effective than traditional instructional methods in promoting vocabulary acquisition. This can be explained by the ability of AI systems to provide immediate corrective feedback, adapt to individual learners' needs, and create interactive learning experiences that enhance motivation and engagement (Holmes et al., 2019).

In addition, the findings support theoretical perspectives on learning, particularly constructivist theory (Vygotsky, 1978), which emphasizes the importance of active engagement and interaction in knowledge construction. AI tools facilitate this process by allowing learners to actively participate in their learning and receive continuous feedback. The results also align with Mayer's (2009) cognitive theory of multimedia learning, as AI applications typically integrate visual, auditory, and textual elements that support deeper cognitive processing and improve retention.

Overall, the statistical analysis confirms that artificial intelligence has a significant and positive impact on vocabulary learning among EFL students. The combination of substantial gain scores and statistically significant differences provides strong empirical support for the effectiveness of AI-based instructional approaches.

5. Discussion

The findings of this study demonstrate that artificial intelligence significantly enhances vocabulary learning among EFL students. The experimental group's superior performance can be attributed to the interactive and adaptive nature of AI tools, which provide personalized learning experiences and immediate feedback (Holmes et al., 2019).

These findings are consistent with previous research (Chen et al., 2020; Li, 2021), which emphasizes the effectiveness of AI in language learning. The results also support constructivist learning theory (Vygotsky, 1978), as AI tools encourage active engagement and knowledge construction. Furthermore, the findings align with Mayer's (2009) theory, as AI applications integrate multimedia elements that enhance retention.

In relation to the Libyan context, the results extend the findings of Mohamed Hmouma (2014) by demonstrating that technological interventions can help address persistent linguistic challenges. AI tools

provide opportunities for repeated practice and individualized feedback, which are essential for overcoming vocabulary learning difficulties.

6. Conclusion

This study set out to investigate the effectiveness of artificial intelligence in enhancing vocabulary learning among Libyan EFL undergraduate students at Zawia University. The findings clearly demonstrate that AI-based instruction has a significant and positive impact on students' vocabulary acquisition. The experimental group, which was exposed to AI-supported learning environments, showed substantially higher gains in vocabulary knowledge compared to the control group, both in terms of overall performance and rate of improvement.

The results confirm that artificial intelligence is not merely a supplementary tool but a powerful instructional approach that can transform vocabulary learning. The significant difference in gain scores, supported by statistical analysis, indicates that AI-based learning environments provide conditions that are more conducive to language acquisition than traditional methods. These conditions include personalized learning pathways, immediate and continuous feedback, adaptive content delivery, and increased opportunities for meaningful interaction with vocabulary items.

From a theoretical perspective, the findings reinforce key principles of second language acquisition and educational psychology. The effectiveness of AI tools supports constructivist learning theory, which emphasizes active learner engagement and knowledge construction (Vygotsky, 1978). Students using AI were able to interact with content dynamically, test their understanding, and receive feedback in real time, thereby facilitating deeper learning. In addition, the results align with Mayer's (2009) cognitive theory of multimedia learning, as AI applications typically present information through multiple modes, enhancing both comprehension and retention.

Furthermore, the findings extend previous research in the Libyan context, particularly the work of Mohamed Hmouma (2014), which highlighted persistent linguistic difficulties among EFL learners due to interlanguage development. The present study demonstrates that AI-based tools can play a crucial role in addressing such challenges by providing learners with repeated exposure, individualized support, and opportunities for self-regulated learning.

In practical terms, the study highlights the urgent need to reconsider traditional approaches to vocabulary instruction in Libyan universities. While conventional methods can produce some level of improvement, they appear insufficient in comparison to the dynamic and interactive nature of AI-based learning. Therefore, integrating artificial intelligence into EFL instruction is not only beneficial but necessary for improving learning outcomes in contemporary educational settings.

Overall, this study provides strong empirical evidence that artificial intelligence significantly enhances vocabulary learning among EFL students. It contributes to the growing body of research on technology-enhanced language learning and offers valuable insights for educators, curriculum designers, and policymakers.

7. Recommendations

In light of the findings of this study, several important recommendations can be made to improve vocabulary instruction and language learning outcomes in Libyan higher education.

First, it is strongly recommended that universities integrate artificial intelligence technologies into EFL curricula. AI-based tools should not be treated as optional supplements but as core components of language instruction. Their ability to provide personalized, adaptive, and interactive learning experiences makes them particularly effective for vocabulary development. Curriculum designers should consider incorporating AI platforms, applications, and chatbot systems into course structures to enhance student engagement and learning efficiency.

Second, there is a clear need for professional development and training programs for instructors. Teachers play a crucial role in the successful implementation of AI in education, and therefore they must be equipped with the necessary skills and knowledge to use these technologies effectively. Training programs should focus on both the technical aspects of AI tools and their pedagogical applications in language teaching. This will enable teachers to integrate AI into their instructional practices in a meaningful and effective way.

Third, students should be encouraged to adopt AI tools as part of their independent learning strategies. Since AI applications support self-paced and personalized learning, they can significantly enhance students' autonomy and motivation. Educators should guide students in selecting appropriate tools and using them effectively to maximize learning outcomes.

Fourth, educational institutions should invest in the necessary technological infrastructure to support the implementation of AI-based learning. This includes providing access to reliable internet connections, digital devices, and licensed educational software. Without adequate infrastructure, the potential benefits of AI in education cannot be fully realized.

Fifth, further research is needed to explore the long-term effects of artificial intelligence on language learning. While this study demonstrates the short-term effectiveness of AI in vocabulary acquisition, future studies should investigate its impact over extended periods and across different language skills, such as reading, writing, listening, and speaking. In addition, future research could examine the effectiveness of specific AI tools or compare different types of AI-based interventions.

Finally, it is recommended that policymakers in the field of education recognize the importance of integrating emerging technologies into teaching and learning processes. Strategic planning and policy development should support the adoption of AI in education, ensuring that institutions are prepared to meet the demands of modern language learning environments.

In conclusion, the integration of artificial intelligence into EFL instruction represents a promising direction for improving vocabulary learning and overall language proficiency. By adopting the recommendations outlined above, educational institutions can enhance the quality of language education and better prepare students for the demands of a rapidly evolving global context.

References

Chapelle, Carol A. (2001). *Computer applications in second language acquisition*. Cambridge University Press.

Chen, X., Chen, T., & Lin, C. (2020). The effectiveness of AI-based vocabulary learning systems. *Computers & Education*, 150, 103842. https://doi.org/10.1016/j.compedu.2020.103842

Creswell, John W. (2014). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research* (4th ed.). Pearson.

Holmes, Wayne, Bialik, Maya, & Fadel, Charles. (2019). *Artificial intelligence in education: Promises and implications for teaching and learning*. Center for Curriculum Redesign.

Hmouma, M. (2014). Interlanguage syntax of the noun phrase in English: An error analysis of third-year secondary students in Zawia, Libya. *IOSR Journal of Humanities and Social Science, 19*(5), 36–43. https://doi.org/10.9790/0837-19543643

Hmouma, M. (2024). Exploring Libyan EFL undergraduates' attitudes towards AI-driven English learning applications. *University of Zawia Journal of Educational and Psychological Sciences (UZJEPS)*, *13*(2), 473–486. https://journals.zu.edu.ly/index.php/UZJEPS/article/view/1064

Li, Jian. (2021). The role of AI chatbots in vocabulary acquisition. *Language Learning & Technology*, 25(3), 45–63.

Mayer, Richard E. (2009). *Multimedia learning* (2nd ed.). Cambridge University Press.

Nation, I. S. Paul. (2001). *Learning vocabulary in another language*. Cambridge University Press.

Russell, Stuart, & Norvig, Peter. (2021). *Artificial intelligence: A modern approach* (4th ed.). Pearson.

Schmitt, Norbert. (2000). *Vocabulary in language teaching*. Cambridge University Press.

Vygotsky, Lev. (1978). *Mind in society*. Harvard University Press.