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ORIGINAL ARTICLE

AI-powered digital tools for vocabulary retention in Foreign Language Learners: A perception-based study

Herramientas digitales impulsadas por inteligencia artificial para la retención de vocabulario en estudiantes de lenguas extranjeras: Un estudio basado en percepciones

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ABSTRACT

This study examines the use of AI-powered digital tools for vocabulary retention. It focuses on students enrolled in the Pedagogía de los Idiomas Nacionales y Extranjeros (PINE) program at Universidad Estatal del Sur de Manabí (UNESUM), Ecuador, where English is taught as a foreign language within the broader framework of language pedagogy. A quantitative, descriptive, and relational approach was used. Data were collected through an online survey. One hundred eleven students participated, all with experience using tools such as ChatGPT, intelligent tutoring systems, and augmented reality. The survey analyzed usage frequency, perceived effectiveness, and the role of multimedia resources in vocabulary learning. Many students reported better long-term retention, improved writing accuracy, and increased motivation. These benefits were linked to instant feedback and interactive features. However, some participants noted occasional errors and a lack of detailed explanations. Others mentioned limited opportunities for actual conversation practice. The findings align with studies emphasizing the importance of adaptive digital environments. While AI tools can enhance vocabulary learning, they still require improvements. Better student training and interface optimization are recommended. Integrating them into a hybrid learning model could maximize their benefits. Further studies are needed to understand their long-term impact. This research highlights the value of artificial intelligence in language teaching and opens the door to new opportunities.

Keywords: Artificial intelligence; digital technology; language acquisition; foreign language teaching; english language.

RESUMEN

Este estudio examina el uso de herramientas digitales potenciadas por inteligencia artificial (IA) para la retención de vocabulario. Se centra en estudiantes matriculados en el programa de Pedagogía de los Idiomas Nacionales y Extranjeros (PINE) de la Universidad Estatal del Sur de Manabí (UNESUM), Ecuador, donde el inglés se enseña como lengua extranjera dentro de un marco más amplio de pedagogía de lenguas. Se empleó un enfoque cuantitativo, descriptivo y relacional. Los datos se recolectaron mediante una encuesta en línea. Participaron 111 estudiantes, todos con experiencia en el uso de herramientas como ChatGPT, sistemas de tutoría inteligente y realidad aumentada. La encuesta analizó la frecuencia de uso, la efectividad percibida y el papel de los recursos multimedia en el aprendizaje del vocabulario. Muchos estudiantes reportaron una mejor retención a largo plazo, mayor precisión en la escritura y un aumento en la motivación. Estos beneficios se vincularon con la retroalimentación instantánea y las funciones interactivas. Sin embargo, algunos participantes señalaron errores ocasionales y una falta de explicaciones detalladas. Otros mencionaron oportunidades limitadas para practicar conversaciones reales. Los hallazgos coinciden con estudios que destacan la importancia de los entornos digitales adaptativos. Si bien las herramientas de IA pueden mejorar el aprendizaje del vocabulario, aún requieren mejoras. Se recomienda una mejor capacitación para los estudiantes y la optimización de las interfaces. Se necesitan más estudios para comprender su impacto a largo plazo. Esta investigación resalta el valor de la inteligencia artificial en la enseñanza de idiomas y abre la puerta a nuevas oportunidades.

Palabras clave: Inteligencia artificial; medios digitales; aprendizaje de idiomas; lengua inglesa.

INTRODUCTION

The rapid integration of artificial intelligenc (AI) is changing how Foreign Language learners (EFL) learners build and keep new vocabulary. Empirical studies show that digital platforms can enrich learning by adapting to individual needs (Infante Rivera et al., 2024). A clear gap exists in the literature regarding how learners perceive and internalize these benefits. Although previous research by Rodríguez Fuentes et al. (2024) and Rebolledo & Gisbert (2021) offers solid quantitative evidence, they pay little attention to learners' subjective experiences. Understanding these perspectives is critical for developing effective and context-sensitive educational technologies.

The role of visual identity in digital contexts has proven to be crucial not only for strengthening brand recognition but also for creating a meaningful user experience. Recent research indicates that a coherent and strategic visual presentation increases user interaction and engagement with content, which has relevant implications in technology-mediated educational environments (Andraus & Ramírez, 2024).

Research has also highlighted the positive role of multimedia elements in language learning. For example, Núñez Olmedo & Ramírez Lozada (2023) found that digital quizzes and interactive videos activate multiple cognitive channels to improve vocabulary acquisition. Studies on augmented reality, such as the VocabulARy project (Weerasinghe et al., 2022), suggest that visual cues and real-world associations boost memory retention. This study occurs during a broad digital transformation in education. Traditional teaching methods are now often supplemented or replaced by innovative technologies. The primary goal is to assess how AI tools affect vocabulary retention. It aims to identify the most frequently used tools, evaluate their effectiveness, and analyze overall attitudes toward integrating AI into English learning. The findings contribute to theoretical knowledge and practical enhancements in EFL teaching strategies.

To better understand the current educational landscape, recent studies have explored the role of AI-powered tools in vocabulary instruction.

Recent studies reveal that AI-driven systems reshape language instruction by delivering adaptive and personalized learning experiences. Infante Rivera et al. (2024) demonstrate that these applications offer real-time feedback and interactive practice sessions. These features are particularly valuable for EFL learners. Likewise, Rodríguez Fuentes et al. (2024) argue that AI tools effectively bridge the divide between traditional teaching methods and the digital needs of modern learners. They adjust dynamically to individual learning profiles, which increases engagement and promotes more efficient vocabulary acquisition.

Digital platforms now blend interactive videos, gamified exercises, and mobile apps to support vocabulary learning. Núñez Olmedo & Ramírez Lozada (2023) observed that engaging different senses helps students link words to their meanings more strongly. Many of these tools also include hands-on activities that allow learners to use new vocabulary in everyday situations. This practical use makes the learning experience more relevant and helps ensure the vocabulary sticks over time.

Empirical research supports the implementation of structured techniques—such as spaced repetition and task-based learning—to counteract the natural decline in vocabulary retention. Vidal Montaño et al. (2024) document that contextualized, task-based interventions significantly improve vocabulary retention among learners. Complementing these findings, Zaidi et al. (2020) demonstrate that adaptive models based on forgetting curves and optimized revision schedules reinforce long-term retention by ensuring that vocabulary is reviewed at ideal intervals.

Understanding how learners view digital interventions is key to measuring their success in vocabulary learning. Rebolledo & Gisbert (2021) found that students who view AI-powered applications as engaging and supportive show a boost in motivation. This heightened motivation is directly linked to better vocabulary retention. Positive reactions to these tools indicate that matching digital resources with students' learning styles and preferences is critical. Aligning instructional technologies in this way can significantly enhance the overall benefits of technology-enhanced language learning.

Augmented Reality (AR) changes vocabulary learning by placing abstract words into real-life settings. Weerasinghe et al. (2022) note that AR apps like VocabulARy add digital labels and visual hints to everyday environments. This process creates a learning setting that feels real and engaging. Learners can see words in context, which helps them remember immediately and later on. The approach also increases interest and deepens memory by linking new terms to familiar, tangible scenes.

Recent developments in artificial intelligence have given rise to various interactive learning tools, including ChatGPT and similar innovative tutoring systems, that are increasingly used in language education. Chicaiza et al. (2023) point out that ChatGPT-based applications work as digital conversation partners. They offer quick feedback, correct mistakes immediately, and provide personalized learning suggestions.

Rebolledo & Gisbert (2024) observed that these systems can tailor the instructional content on the fly based on how individual students perform. This adaptability improves both vocabulary learning and overall language skills. Moreover, research by Awalin et al. (2023) shows that when students find these tools engaging

and supportive, their motivation increases, leading to better language outcomes. Yawiloeng (2020) also demonstrated that integrating multimedia—such as video lessons that teach vocabulary—adds contextual clues that further aid memory retention. Altogether, these studies indicate that merging conversational agents, adaptive tutoring systems, and multimedia resources creates a robust, synergistic learning environment that offers comprehensive support for language development.

AI-powered digital tools have great promise for language education, yet several challenges remain (Chicaiza et al., 2023). Some issues, like algorithmic bias and data privacy, need urgent attention. Digital content also requires regular updates to stay culturally and contextually relevant. Rebolledo & Gisbert (2024) point out that a solid technological infrastructure and ongoing teacher training are essential for success.

Student engagement may be influenced by social media habits, which can impact vocabulary learning (Wilson & Anam, 2024). Research by Vidal Montaño et al. (2024) and other task-based studies (2024) shows that combining interactive, context-rich tasks with AI systems can boost learning outcomes. More long-term studies are needed to understand the lasting effects on vocabulary retention and overall language skills. A blended strategy appears to be the most promising path forward. This strategy should integrate conversational agents, intelligent tutoring systems, video-based lessons, and augmented reality applications. Such an adaptive ecosystem would bridge traditional teaching methods with modern digital innovations and meet the diverse needs of language learners. Overcoming these challenges is critical to fully realizing the benefits of AI in language education.

This investigation examines the use of AI-powered digital tools for vocabulary retention. It focuses on students enrolled in the *Pedagogía de los Idiomas Nacionales y Extranjeros (PINE)* program at Universidad Estatal del Sur de Manabí (UNESUM), Ecuador, where English is taught as a foreign language within the broader framework of language pedagogy.

METHODS

This study used a quantitative, descriptive, and relational design to evaluate students' perceptions of the impact of AI-powered digital tools on vocabulary retention. The research was observational and cross-sectional. Participants were drawn from the Pedagogía de los Idiomas Nacionales y Extranjeros (PINE) career at Universidad Estatal del Sur de Manabí. A purposive sampling method was employed to select 111 students with previous experience using AI-based tools such as ChatGPT, intelligent tutoring systems, and augmented reality applications. Among these participants, 31 were male and 80 were female. Their ages ranged from 18 to 55 years, and most came from low- to medium-income backgrounds. All participants were distributed nationwide and engaged in the study via an online platform, reflecting the growing trend toward digital education and remote learning environments.

Data were collected exclusively through an online survey adapted from instruments validated in similar studies. The survey featured close-ended questions with Likert scales. It aims to capture details on tool usage frequency, perceived effectiveness, motivation, and overall satisfaction with these digital tools. Open-ended questions were also included so that participants could provide in-depth qualitative insights into their experiences and perceptions.

Ethical considerations were rigorously observed throughout the study. Informed consent was obtained from every participant, and all responses were kept strictly confidential and anonymous. Only students with previous experience using at least one AI-powered digital tool for English learning were included, while those without such experience were excluded. The study has limitations, including its cross-sectional design, which restricts causal inference, and potential self-report biases inherent in survey methodologies.

RESULTS

Table 1 summarizes the responses of 111 students regarding their perceptions of AI-powered digital tools for vocabulary acquisition. A majority of participants expressed positive views, particularly on aspects such as multimedia integration (72.9%), timely feedback (67.6%), and willingness to recommend the tools (67.6%). Other key factors—such as appreciation of interactive features (64.8%), ease of use (63.0%), and contribution to long-term retention (57.6%)—also received favorable ratings. Although perceived benefit (54.0%) and frequency of use (39.7%) were rated slightly lower, the overall trend indicates a generally positive reception toward these tools.

Table 1. *Survey Results on AI-Powered Digital Tools for Vocabulary Acquisition (N = 111)*

Question	Survey Aspect	Response Type	% Agree/Strongly Agree
Q1	Frequency of tool usage	Quantitative	39.7%
Q2	Perceived benefit for vocabulary retention	Quantitative	54.0%
Q3	Effectiveness of timely feedback	Quantitative	67.6%
Q4	Appreciation of interactive features	Quantitative	64.8%
Q5	Ease of use of digital tools	Quantitative	63.0%
Q6	Contribution to long-term vocabulary retention	Quantitative	57.6%
Q7	Willingness to recommend these tools	Quantitative	67.6%
Q8	Recognition of multimedia integration as beneficial	Quantitative	72.9%

Note. Percentages represent respondents who selected "agree" or "strongly agree." Neutral and negative responses are not shown.

As summarized in Table 2, qualitative feedback from Questions 9 and 10 provides deeper insight into users' experiences with AI-powered digital tools. Participants emphasized key benefits such as improvements in writing accuracy, grammar, vocabulary development, and oral skills, which they attributed to multimedia support, immediate feedback, and flexible, self-paced learning. However, several challenges were also noted, including occasional tool errors, insufficient contextual explanations, and limited opportunities for authentic conversational practice. Suggestions for improvement included the inclusion of contextualized examples, enhanced interactivity, diversified content across proficiency levels, and more accessible advanced features. These findings underscore the importance of integrating digital tools with traditional language-learning methods to support more balanced and meaningful learning experiences.

Table 2 *Qualitative Feedback on AI-Powered Digital Tools*

Question	Survey Aspect	Key Themes from Open-Ended Responses
Q9	**Perceived Benefits**	- Improved writing accuracy, grammar, and vocabulary expansion - Enhanced pronunciation and listening skills - Immediate corrective feedback - Personalized and flexible learning
Q10	**Challenges & Suggestions**	- Occasional tool errors and lack of contextualized explanations - Overreliance on AI tools, limiting real conversation practice - Need for more interactive features and contextual examples - A better balance between digital tools and traditional methods

Note. Responses are summarized based on thematic analysis of open-ended survey data.

Integrating the quantitative and qualitative findings, it is evident that while AI-powered digital tools are generally perceived as beneficial for vocabulary acquisition, there remains a need for further refinement in content delivery, contextualization, and user interaction. Enhanced training, improved interface design, and a hybrid approach that incorporates both digital and traditional learning methods could help address the observed challenges, ultimately optimizing the impact of these technologies on language learning outcomes.

DISCUSSION

Survey results combined with classic and recent studies on AI tools in EFL settings reveal varied user experiences. About 39.7% of students reported frequent use of these tools. Meanwhile, 35.1% remained neutral and 25.2% disagreed on their effectiveness. This variation points to the need for better training and more intuitive interfaces.

Recent research by Chen & Wang (2021) and Zhang & Li (2020) shows that adaptive digital platforms offer personalized and interactive learning. Such platforms can significantly improve vocabulary retention. Evaluations during the COVID-19 pandemic (Pichugin et al., 2022; Nainggolan, 2021) confirmed that robust infrastructure and adequate user support are vital, mainly when immediate corrective feedback is provided.

The importance of authentic and engaging content has been highlighted in recent studies on social media, where it has been shown that interaction with visual posts directly influences user participation and retention in digital environments. For instance, an analysis of the official Instagram account of a driving school revealed that metrics such as reach and interactions fluctuated depending on the type of content published, underscoring the effectiveness of strategies based on reels, stories, and educational videos (Andraus et al., 2025).

Nation (2001) theoretical framework supports a systematic and multimodal approach to vocabulary acquisition. Early studies in computer-assisted language learning (Warschauer & Healey, 1998; Chapelle, 2001) noted a shift from drill-and-practice methods to integrative, technology-mediated strategies. This shift is evident in the current findings.

Despite overall positive perceptions, challenges remain. Occasional tool errors and insufficient contextualization of vocabulary mirror concerns found in meta-analyses of mobile-assisted language learning (Sung et al., 2016). Emerging research on AI text generation (Motlagh et al., 2023) also points to ethical and practical issues that must be addressed.

These insights suggest that the full benefits of AI-powered tools can only be achieved through targeted training, improved interface design, and integration into a comprehensive multimodal framework. Future research should use longitudinal and mixed-method approaches to refine digital interventions that meet the diverse needs of language learners.

Several studies have highlighted the need to balance informative content with audiovisual elements that capture users' attention on digital platforms. This premise is confirmed in the analysis conducted by Andraus et al. (2025), who concluded that audiovisual content, although less frequent, generated greater reach and interaction on a university's institutional account. In the context of language learning, this evidence suggests that visual and multimedia resources should not be regarded as mere complements, but rather as strategic components to enhance vocabulary retention and facilitate meaning acquisition in AI-mediated environments.

CONCLUSIONS

This study confirms that AI-powered digital tools enhance vocabulary acquisition in EFL contexts. Features such as timely feedback, interactivity, and multimedia integration improve learner engagement and retention. However, neutral responses indicate limitations, suggesting that AI tools require further optimization to maximize their effectiveness. Variability in user perceptions highlights the need for better instructional integration and user training.

While findings align with prior research, several gaps remain. The factors influencing user uncertainty and the long-term effects of AI on vocabulary retention require further exploration. Since this study relies on self-reported data, future research should incorporate performance-based assessments to measure actual learning outcomes.

Future studies should expand participant diversity across different institutions and proficiency levels. Longitudinal research is needed to assess sustained learning impacts, and hybrid models should be examined to determine AI's role in blended instruction. Addressing over-reliance, digital distractions, and accessibility barriers will ensure that AI tools are more effective and adaptable for language learning.

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Conflicts of Interest:

The authors declare that they have no conflicts of interest.

Author Contributions:

Vladimiro Xavier Jácome Paredes, Steven Mauricio Espinoza Romero and Cesar Enrique Andraus Quintero: Conceptualization, data curation, formal analysis, investigation, methodology, supervision, validation, visualization, drafting the original manuscript and writing, review, and editing.

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