Recent Research Reviews Journal (ISSN: 2583-7079)
https://irojournals.com/rrrj

Applications and Analyzes of Artificial Intelligence in Enhancing English Vocabulary

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Abstract

Vocabulary is a fundamental aspect of language proficiency and plays an essential role in the personal and professional lives of people. Vocabulary development is a challenging task in which the learners face various issue such as retaining, recalling, and using the new words after their initial exposure. Learning isolated words without their contextual meaning sometimes leads the learners to boredom. Moreover, difficulties in pronunciation and lack of appropriate usage in everyday contexts can further impede vocabulary development. Artificial Intelligence has the potential to revolutionize vocabulary learning by making it more personalized, engaging, and efficient. AI can improve vocabulary acquisition and retention through techniques like repetition at fixed time intervals, adaptive learning, NLP (natural language processing), contextual examples, and quick feedback AI addresses the diverse needs of learners and helps them acquire and retain vocabulary more effectively. This study tries to explore learning possibilities by incorporating AI technologies in English vocabulary development by comparing different platforms that facilitate enhanced learning outcomes, to address the unique needs of each learner, and provide a more dynamic and engaging learning environment in enthusiastic ways.

Keywords: Artificial Intelligence, English Vocabulary Development, Language Processing

1. Introduction

Artificial intelligence refers to the creation of machines that could execute tasks that typically requires human intelligence, such as decision-making, problem-solving, learning, perception, and language understanding. These tasks may also include acquiring knowledge, comprehending spoken language, and observing the surroundings. To effectively communicate and understand any language, it is essential to learn its vocabulary. A large vocabulary enables people to communicate more accurately and concisely, improving their capacity to explain difficult concepts and feelings. Additionally, it enhances listening and reading comprehension, making it possible to understand written and spoken words more effectively. Gaining more vocabulary makes it easier to grasp and use terms particular to a given subject, which promotes success in both the classroom and the workplace. Furthermore, having a large vocabulary helps develop critical thinking since it gives one the language skills for communicating ideas in both personal and professional settings, increasing its effectiveness and impact.

Developing one's vocabulary can be challenging for several reasons, including learning new words, and remembering and using them after first exposure. Learning vocabulary through traditional approaches can be tedious and ineffective since they frequently require memorization of individual words without any context. For instance, learners often struggle with retaining words learned through rote memorization, and without regular practice, they may forget these words quickly. In addition, without consistent exposure and practice, learners may feel overwhelmed by the sheer volume of words. According to Akdogan, “vocabulary is more important than grammar because we can speak without a correct grammar structure, but we cannot speak without vocabulary. Words are the root of communication and a strong vocabulary enhances all areas of communication, such as listening, speaking, writing and reading.” [1]

Vocabulary development can be delayed by numerous challenges, including limited exposure to diverse contexts, difficulty in remembering new words, lack of tailored learning, and insufficient motivation. Traditional methods often fail to provide contextual understanding, making it difficult for learners to grasp the words. Additionally, the memorization of vocabulary can be monotonous, most important to low commitment and poor retention. AI overcomes these challenges by providing personalized and adaptive learning experiences that address the unique needs of each learner. AI makes sure that learners are exposed to words at

ideal intervals, which improves recall through strategies like spaced repetition. AI solutions can also give instantaneous feedback and examples rich in context, which enhances the effectiveness and engagement of the learning process. There are many different paid options available for vocabulary development, many of which have special features and advantages that are intended to improve language acquisition. Well-known paid vocabulary apps include the following: Duolingo, Memrise, Babbel, ELSA Speak, Lingvist, and WordUp, which provide customized learning experiences, addressing the diverse learning preferences and needs. Quizlet and Anki are accessible, free and affordable applications for vocabulary building because they provide a good number of features that are adequate for the majority of learners. Through a comparison of Quizlet and Anki, this study investigates the potential of AI to improve English vocabulary acquisition and retention. The development of English vocabulary learning and retention has significant promise for artificial intelligence. AI's potential to enhance English vocabulary acquisition and retention is profound. AI adapts lessons to each learner's unique profile through adaptive learning algorithms, maximizing engagement and effectiveness. Artificial intelligence-driven spaced repetition systems strategically reinforce language to ensure long-term retention. Furthermore, natural language processing (NLP) powered by AI enables sophisticated contextual learning by exposing students to a variety of linguistic contexts. By introducing gamification into AI platforms, rote learning is transformed into dynamic, interactive experiences that boost motivation and improve cognitive retention. AI's capacity to evaluate enormous amounts of linguistic data also makes it possible to continuously improve vocabulary training, which over time becomes more accurate and efficient. The Table 1 illustrates the summary of the various AI applications that help in English vocabulary improvement.

Table 1. AI Vocabulary Application

Tool/Platform	Description	Merits	Demerits	References
Quizlet	Flashcard-based learning app with various study modes.	1. User-friendly 2. Varied study modes	1. Limited spaced repetition	Dizon, 2016 [2]
Anki	Flashcard app using spaced repetition algorithms.	1. Effective for long-term retention 2. Customizable	2. Manual card creation required	Nakata, 2011[3]

Duolingo	Gamified language learning app with interactive exercises.	1. Adaptive learning	1. Less focus on deep vocabulary 2. Ads in free version	Vesselinov and Grego, 2012 [4]
Memrise	Uses mnemonics and spaced repetition for language learning.	1. Mnemonics aid memory 2. Extensive content	1. Limited depth in some courses 2. Free version limitations	Richards, 2015 [5]
Babbel	Language learning app with structured courses and practice exercises.	1. Structured lessons 2. Focus on practical vocabulary	1. Subscription required 2. Less emphasis on advanced vocabulary	Bradley, 2020 [6]

1.1. Problem Statement

Acquiring knowledge of vocabulary can be difficult for several reasons, such as the overwhelming number of new terms, the trouble remembering them, and the absence of semantic context. Language learners may also have trouble pronouncing words correctly and using them appropriately in everyday contexts. Traditional methods often fail to address these challenges, leading to frustration and reduced motivation among learners. This study aims to comprehend how artificial intelligence (AI) might be applied to build a more customized and captivating learning environment, which will enhance students' language retention and acquisition using Quizlet and Anki along with other AI-driven tools.

2. Literature Review

Vocabulary development is a important aspect of language acquisition and proficiency. Over the centuries, the methods and tools for enhancing English vocabulary have evolved significantly, particularly with advancements in technology and artificial intelligence (AI). This literature review examines the progression of vocabulary development methods, from traditional approaches to modern AI-driven techniques, highlighting key contributions from various scholars. Traditional Approaches to Vocabulary Development learning Thorndike, E.L. States that vocabulary development is fundamental to literacy and academic success. In his seminal work, Thorndike emphasized the importance of frequent exposure to words and the role of context in understanding and retaining new vocabulary. He developed word frequency

lists that have been widely used in educational settings. [7] Schmitt, N. explores the impact of computer-assisted language learning (CALL) on vocabulary acquisition. Schmitt discusses how digital tools, such as vocabulary software and online resources, can provide personalized and interactive learning experiences that enhance vocabulary retention.[8] AI-Driven Vocabulary Learning Chowdhury, G.G. discusses the role of artificial intelligence in enhancing language learning applications. AI technologies, such as natural language processing (NLP) and machine learning, can analyze learner data to provide customized vocabulary learning experiences and adaptive feedback. [9] Elgort, I. examines the effectiveness of AI-based adaptive learning systems in vocabulary acquisition. These systems use algorithms to adjust the difficulty of vocabulary exercises based on the learner's progress, ensuring optimal challenge and support.[10] Luo, focuses on the application of AI-powered chatbots in vocabulary learning. Chatbots can simulate conversational practice, providing immediate feedback and reinforcement of new vocabulary in a communicative context. [11] Table 2 below summarizes the literature review.

Table 2. Evolution Summary of English Vocabulary Tools

Study	Methodology	Dataset Used	Performance Scores	Challenges Faced
Thorndike (1944)	Word frequency lists, context-based learning	20,000-word frequency list	High retention rates	Limited by lack of technology for adaptive learning
Schmitt (2008)	CALL, digital vocabulary tools	Varies across studies	Improved retention	Limited personalization, fixed learning paths
Chowdhury (2010)	AI, NLP, machine learning	Learner data from AI applications	High adaptability	Initial cost and complexity in implementation
Elgort (2018)	AI-based adaptive learning systems	Large-scale learner datasets	Optimal challenge	Requires continuous data input and system updates
Luo (2023)	AI-powered chatbots	Conversational datasets	Immediate feedback	Limited by chatbot's language processing capabilities

Traditional methods provided a foundation for vocabulary learning, while AI-driven approaches have notably enhanced personalization, adaptability, and engagement in vocabulary acquisition.

3. Enhancing Vocabulary Proficiency through AI Learning Application

Duolingo is a popular AI-driven language learning app that uses a gamified approach to teach vocabulary and grammar. The app uses artificial intelligence (AI) algorithms to modify courses according to the learner's progress, making sure that vocabulary is covered and repeated at the best possible intervals. The contextual learning and spaced repetition techniques used by Duolingo promote vocabulary retention. The program also offers instant feedback on exercises, enabling users to fix errors and advance their language proficiency. According to Kazu, Duolingo's AI-driven platform offers a highly engaging and effective way to learn vocabulary, particularly for beginners. However, the app's focus on gamification may lead to a lack of depth in vocabulary acquisition for more advanced learners. [12]

Another AI-powered language learning tool is called Memrise, and it concentrates on vocabulary acquisition through multimedia and spaced repetition. With the use of AI, the app generates customized learning routes that improve memory retention by combining audio, video, and graphics. Additionally, Memrise makes use of user-generated content, giving students access to a vast array of vocabulary sets that match their interests. The adaptive learning mechanism built into the program makes sure that vocabulary is revisited at intervals that maximize long-term memory. According to Nuralisah, Memrise is a combination of spaced repetition and multimedia content, making it an effective tool for vocabulary learning, especially for visual and auditory learners. However, the quality of user-generated content can vary, which may affect the learning experience. [13]

Babbel is a subscription-based language learning service that offers individualized lessons centered on practical conversational skills through artificial intelligence. The software helps users apply new words in real-world contexts by emphasizing the useful application of language in context. By adjusting lessons according to the learner's progress, Babbel's AI algorithms make sure that vocabulary is reviewed and reinforced at the right times. To aid students in becoming more proficient pronouncers, the platform also provides speech recognition technology. According to Nushi, Babbel's focus on contextual learning and real-life application makes it a valuable tool for vocabulary acquisition. However, the subscription cost may be a barrier for some learners. [14]

3.1. Enhancing Vocabulary Proficiency through Quizlet

Quizlet works by giving users the option to make their own choice from a sizable library of predefined sets that span a wide range of topics and languages. To accommodate various learning preferences and styles, the site offers a variety of learning modes, such as classic flashcards, matching games, and quizzes. It is an algorithmic approach that incorporates adaptive learning strategies and spaced repetition to improve vocabulary learning.

To maximize learning outcomes, Quizlet's algorithm uses cutting-edge methods to power its interactive platform. Spaced repetition, technique that arranges flashcards according to the user's level of familiarity with each subject, guarantees effective memorization. With this adaptive strategy, study sessions are customized to each student's needs, with a greater emphasis on challenging cards. Furthermore, Quizlet uses machine learning to examine user behaviour and preferences to provide tailored study sets and learning tasks. It also promotes a community-driven learning environment by incorporating collaborative filtering, which suggests popular study resources to users with similar preferences. The Quizlet's algorithmic structure blends collaborative filtering, personalized suggestions, and spaced repetition to enhance engagement and efficacy in learning everything from vocabulary to difficult concepts. Rahma Pitria et al. mentioned the impact of Quizlet as: Quizlet Learn's artificial intelligence (AI) technology optimizes learning by analysing data from millions of anonymous sessions and generate an adaptive study plan. When used with timed activities, Learn is expected to maintain students' interest for a longer duration compared to traditional flashcards. Additionally, students can enjoy competing against their peers for high scores in timed study activities and Quizlet Live. [15]

3.2. Enhancing Vocabulary Proficiency through Anki

Anki is a powerful, free open-source that uses spaced repetition to help users effectively learn and remember language and other kinds of information. The word "memorization" in Japanese is "Anki," which reflects its main purpose. To improve the learning process, users can design personalized flashcards with text, photos, audio, and video. Anki's main feature is its advanced algorithm, which is customized to each user's performance to arrange review sessions at ideal intervals that greatly improves long-term retention. Anki also offers an extensive library of pre-made decks that users may download and customize to their specifications. These decks are available for a variety of subjects and languages. Because of its versatility and flexibility, the app is a great resource for language learners, professionals, and students who

want to increase their vocabulary and knowledge base quickly. Michael M. Gilbert states the impact of Anki as, "Anki, an open-sourced software flashcard system, is continuing to evolve with feedback-rich statistics for the user as well as many choices of community-developed flashcard decks. A very popular one is the Anki deck, with over 30,000 flashcards covering almost all required medical school material. This was the most utilized deck by medical students." [16]

4. Comparative Analysis of Quizlet and Anki

The research illustrates how AI can completely transform vocabulary learning by contrasting these two apps. Quizlet and Anki show how effective, efficient, and personalized learning environments may greatly improve vocabulary learning and recall. Quizlet and Anki both use artificial intelligence (AI) to improve vocabulary acquisition, although they serve distinct learner types and preferences. With a range of learning modes and gamified aspects, Quizlet excels at offering an interactive, user-friendly learning experience. Its spaced repetition algorithms and adaptive learning work well to increase word retention. Anki, on the other hand, provides a learning environment that is incredibly adaptable and adjustable, emphasizing spaced repetition and data-driven insights. For students who would like to take a more direct, customized approach, its effectiveness and customization choices are appropriate. ERSOY OZER and Kocoglu conducted various studies regarding the similarity of the apps and stated that the Quizlet application, which is similar to Anki App, is proven to enhance student's vocabulary mastery [17].

4.1. Discussion and Findings

A study was conducted with a group of 20 randomly selected students to assess the impact of using the vocabulary apps Quizlet and Anki on their vocabulary proficiency. Initially, the students were asked to write a small paragraph of 150 words of their choice and the papers were evaluated for vocabulary levels which were categorized as Poor, Average, Above Average, and Efficient. The students were evaluated out of a total of 25marks based on the criteria tabulated below in Table 3.

Table 3. Criteria for Evaluating Student Paragraphs

S.No	Students Category Level	Marks
1	Poor	0-10
2	Average	10-15
3	Above Average	15-20
4	Efficient	20-25

Four categories comprised the grading criteria for the paragraphs written by the students: The paragraphs in the "Poor" group (0–10) had a limited vocabulary, repeated phrases, improper word choice, numerous grammatical errors, and weak coherence, all of which contributed to an unclear meaning. The "Average" category (10–15marks) showed simple, straightforward paragraphs with a basic vocabulary, occasional repetition, and little grammatical faults. "Above Average" (15–20 marks) required a larger vocabulary with few mistakes, well-formed sentences, and understandable, cohesive content. Rich vocabulary, perfect grammar, intricate sentence structures, and outstanding coherence were all present in the "Efficient" category (20–25 marks), which effectively and precisely communicated the information. After the pre-test, the students were again split into two groups of 10 students each. Group 1 was asked to use Quizlet vocabulary builder app and Group 2 was asked to use Anki vocabulary builder app for 10 days. They used the app every day for 1 to 1.5 hours. After10 days, the students were tested to write another paragraph of 150 words. A significant improvement was observed in the vocabulary proficiency of the students who used Quizlet and Anki. The findings are illustrated in Table 4 and 5 respectively. The Figures 1 and 2 depicts results obtained in graphical form.

Table 4. Results of Students using Quizlet

Proficiency Level	**Before Using Quizlet**	**After Using Quizlet**
Poor	4	1
Average	3	2
Above Average	2	4
Efficient	1	3

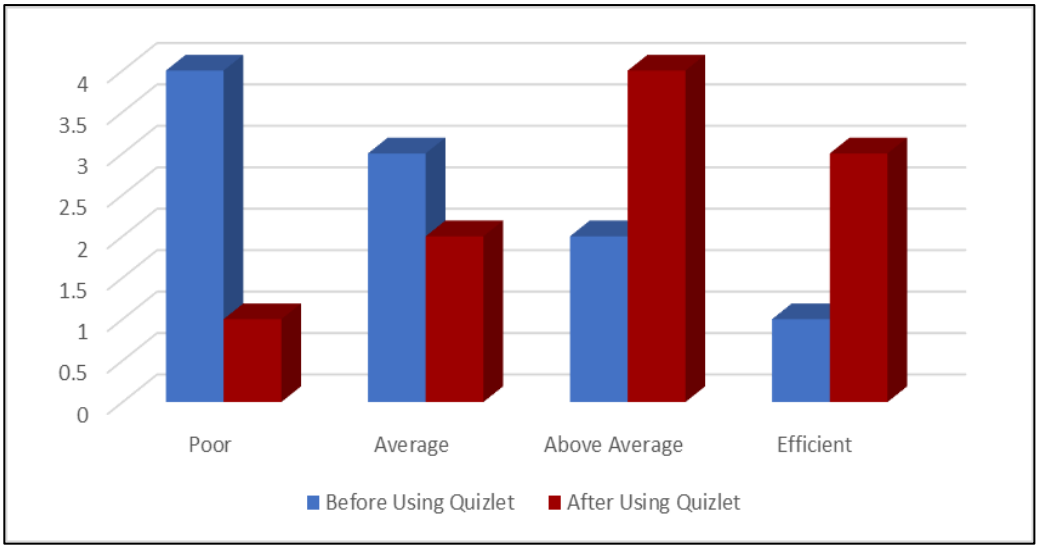

Figure 1. Results of Students using Quizlet

Table 5. Results of Students using Anki

Proficiency Level	Before Using Anki	After Using Anki
Poor	3	1
Average	4	2
Above Average	1	3
Efficient	2	4

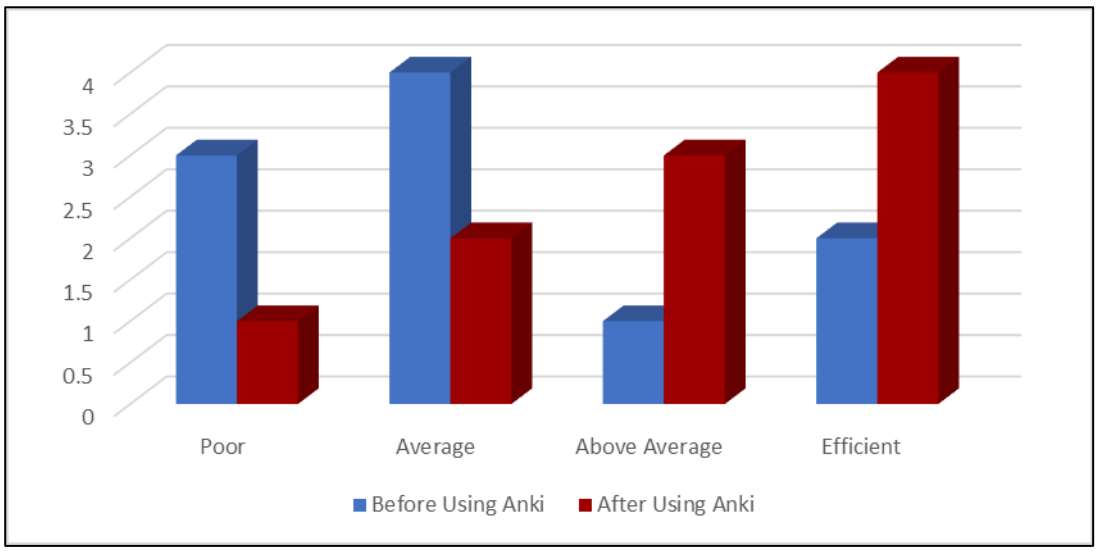

Figure 2. Results of Students using Anki

Both Quizlet and Anki demonstrated their effectiveness in improving students' vocabulary proficiency over the 10-day period. The reduction in the number of students in the "Poor" and "Average" categories, along with the increase in those classified as "Above Average" and "Efficient," highlights the positive impact of these AI-powered tools on vocabulary acquisition.

5. Conclusion

Artificial intelligence provides fast, personalized, and entertaining study experiences that greatly improve vocabulary learning. While Quizlet and Anki serve different purposes, they both show the potential of AI in this field. While Anki's methodical and focused approach is more appropriate for students preparing for standardized exams, Quizlet's dynamic and varied learning modes make it the perfect tool for improving one's overall vocabulary. Future research may examine the long-term effects of artificial intelligence (AI) in language acquisition and the development of hybrid models that integrate the advantages of both apps. When it comes to helping people learn language, Quizlet and Anki have proven to be incredibly successful and economical. This study emphasizes the value of artificial intelligence (AI) in educational technologies in improving vocabulary without facing any financial difficulties.

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