

## EVALUATING THE IMPACT OF THE AI “WORD-BOT” ON TERTIARY - LEVEL ENGLISH VOCABULARY LEARNING

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### Abstract

This study investigates the role of AI-based “Word-Bot” chatbot in enhancing the English Vocabulary of undergraduate students. It is underpinned by Nation’s (2001) Vocabulary Learning Theory, which advocates for balanced approaches involving meaning-focused inputs and output along with form-focused instruction, and Siemens’ (2005) Connectivism Theory, which emphasizes the importance of digital networks and technologies in a modern learning environment.

The study employed a mixed-methods design. The study used a pretest and a posttest to measure vocabulary gains and found a statistically significant improvement ( $M = 20.50$  to  $M = 24.21$ ,  $p = .035$ ), with a small to moderate effect size (Cohen’s  $d = 0.38$ ), suggesting that the Word-Bot contributed positively to learners’ vocabulary development. Qualitative findings through thematic analysis revealed that students perceived the Word-Bot as engaging, contextually supportive, and useful in building confidence and vocabulary retention. However, limitations include a small sample size (35 chemical engineering students), short duration, and lack of a control group, which restricts the generalizability of the findings. Future research should adopt longitudinal approaches with diverse participants and include controlled conditions to better assess the integration of AI tools in language instruction. The study has pedagogical value by demonstrating how AI-driven platforms can complement traditional vocabulary learning and support personalized, tech-enhanced education.

### INTRODUCTION

Unlike traditional educational aids that only provide access to knowledge, AI chatbots have arisen as new instructional tools. AI chatbots have gained attention in education due to their adaptability and personalization. (Fidan & Gencel, 2022; Wollny et al., 2021) Artificial intelligence chatbots are becoming more commonly applied in education because they can provide customized learning resources, personalized feedback and one-to-one assistance of students (Fidan & Gencel, 2022). They also support teachers by making dynamic student evaluation easier and decreasing the workload (Jeon, 2021). They have applications across multiple fields of study, including

language, psychology, medicine and mathematics (Lee et al., 2022). The increasing body of evidence show that AI chatbots have ability to improve learning outcomes among students, increase motivation, enhance engagement, and ignite curiosity towards learning activities (Chien et al., 2022; Wambsganss et al., 2021). Additionally, students who use chatbots tend to find stress and anxiety in their learning reduced (Klos et al., 2021; Terblanche et al., 2022). Covertly other research contends the AI chatbots might have limited effect on learners’ motivation, self-efficacy, participation, or academic achievement, especially in the context of group learning (Liu, Liao

et al, 2022; Han et al., 2022). This means that the effects of AI chatbots on leaning outcomes are perhaps more complicated than one would expect. .Online application programs support synchronous communication between teachers and students. According to Rahayu (2020), participants in online classes typically used webcams and microphones to interact, like face-to-face classroom settings. Dharma et al. (2017) noted that live online sessions can accommodate around 200 active participants, with up to 3,000 viewers. Although this platform operates on a subscription model, starting at \$1,800 for 20 hosts, a free version is also available, with a 40-minute video session limit. However, as noted by online applications video communication (2020), this time restriction was lifted for primary and secondary school users.

Despite the advantages, there are certain issues that persist. Scholars like Abbasi, Shahid, and Shah (2020) and Dharma et al. (2020) have found the new users may encounter interfaces that are too complex or unfriendly. Additionally, students may encounter distractions, may multitask during sessions, or may find online courses to be longer than anticipated.

### 1.2. Aims & Objectives of the study

This study aims to comprehensively investigate and understand the impact of AI chatbots on MUET's undergraduate students engaged in English Vocabulary Learning, with a focus on assessing the effectiveness, challenges, and overall implications of integrating AI chatbot technology into the language learning curriculum.

- To investigate the AI “Word Bot” effectiveness in tertiary learners’ English vocabulary learning.
- To explore each AI “Word Bot” feature facilitation in learning English vocabulary.

### 1.3. Research Question

1. RQ.1: How does the AI “Word Bot” affect tertiary learners’ English vocabulary learning?
2. RQ.2: How do each AI “Word Bot” features (Visual Word learning technique, Synonyms & Antonyms, Systematic Wordlists, Word Pronunciation, Don’t just Learn, Tests too!) facilitate in learning English vocabulary?

## 2. LITERATURE REVIEW

### 2.1. Technology in English Language Learning

The evolution of language learning, particularly, the teaching of English as a second language (ESL), has been significantly influenced by the advent and incorporation of Artificial Intelligence (AI). This technological revolution has not only altered how we teach but also how we learn languages. The impact of AI on ESL extends from customized learning processes to the use of new digital technologies, totally refining the area of language teaching. The fusion of AI and conventional pedagogical practices results in a unique intersection wherein technology enhances human interaction in education. This paper explains how AI has revolutionized ESL through the creation of more effective, interactive and accessible means of individual to acquire languages. The areas of languages instruction, in particular teaching ESL, are witnessing radical alteration because of the inclusion of Artificial intelligence (AI). Such breakthrough partnership has radically transformed the way education is conducted and recognized the way language proficiency is learned. Notably, ESL’s impact by balance with AI includes several factors, such as delivering personalized learning experience and integrating new online resources, such a paradigm shift radically alters the conventional language learning landscape (Chapelle, 2019). The contribution of AI ton ESL is a unique blend of technology and human interaction in the education experience. This paper intends to critically examine the profound impact of AI in ESL. It will explore how such technological innovations have transformed language learning spaces. Kukulska-Hulme and Bull (2019) observed that AI tools are enhancing learning efficiency, engagement and accessibility, AI-based tools are now more effective at individualizing the learning process based on each learner’s personal requirements and level of proficiency, a far cry from the conventional ‘one-size-fits-all’ method generally applied in language training. Also, widespread research has been investigating integrating AI into language learning. Smith and Johnson (2020) point out the technologies like natural language processing and machine learning have revolutionized language learning through the provision of customized content and immediate feedback. The interactive and adaptive

capabilities of AI render it a considerable improvement over traditional language and teaching approaches. A key advantage of AI is its ability to customize the learning experience according to each student's requirements. (Zhang and Patel, 2021) discovered that language learning platforms powered by AI can adjust to the proficiency levels, learning styles, and pace of learners, enhancing the effectiveness and engagement of language learning. The customization has been proven to boost student motivation and enhance results greatly. As AI becomes more common in schools, the responsibilities of language teachers are changing. (Brown and Green, 2019) Explore how artificial intelligence can help educators with planning the curriculum and gain an understanding of students' learning behaviors. Nevertheless, they also stress the importance of teachers acquiring new abilities in order to seamlessly incorporate AI tools in their teaching methods. Even though there are advantages, there are obstacles to incorporating AI into language education. (Lee and Kim 2022) highlight challenges like the digital divide, which can worsen educational disparities by limiting access to technology. In addition, Martin and White (2021) bring up ethical concerns about data privacy and biases in AI algorithms, suggesting a careful approach to incorporating AI in educational environments. In general, research shows that AI could transform ESL education, but it also comes with hurdles that must be thoughtfully addressed. This review lays the foundation for a thorough examination of AI's influence on ESL, recognizing its possibilities but also being aware of its constraints.

## 2.2. History of AI Chatbot

Artificial intelligence (AI) has revolutionized the way we perform daily tasks by enabling the production and evaluation of sophisticated tools and software referred to as intelligent agents, which can execute numerous tasks. Chatbots, being part of these, are AI-based software and instances of human-computer interaction (HCI) systems (Bansal and Khan, 2018). According to Lexicons Dictionaries (2019), a chatbot is "a computer program designed to simulate conversations with human users, mainly over the internet. It uses natural language processing (NLP)

and sentiment analysis to communicate in human language through text or verbal communication with humans or other chatbots (Khanna et al., 2015). In addition to simulating human interactions and entertaining people, chatbots are useful in a variety of areas, such as education, business, e-commerce, healthcare, and entertainment (Shawar and Atwell, 2007). Productivity is the primary motivation for chatbot users, but other motivations include entertainment, social features, and new interactions. In addition, chatbots have become very popular in companies because they reduce service costs and allow more customers to be contacted at the same time. Chatbots are easier to use and can search for static content, for example, a list of frequently asked questions. We provide convenient and efficient support while talking to users. They provide stronger responses by addressing the problem directly (Brandtzaeg and Følstad, 2017).

## 2.3. AI Chatbot in English Vocabulary Learning

The feedback provided by AI-based chatbots enables students to identify areas of improvement, track progress, and make precise goals for developing their language. Self-assessment and feedback enhance learners' anatomy and develop meta cognitive skills which are key to success in language in language acquisition in long-term, Ahmad, S., Akhtar, S. A., Jahan, M., & Shaheen, F. (2025). Overall, using AI chatbots and virtual assistant in language learning is of tremendous potential in boosting authentic language practice, offering targeted feedback, and crafting conversational fluency. All these technological aids provide accessible, interactive learning environment where learners can gain personalized guidance, instant feedback, and continuous support-leading to better language proficiency and communication competences.

For new learners, speaking English to others can be daunting. Chatbots, on the other hand, offer a secure and supportive environment for practicing oral language. Chatbots are more interactive, and fun compared to older techniques like listening and repeat exercises. This greater appeal and user friendliness might account for the increasing interest in chatbot-driven language learning products. An excellent example is, utilized by more than 150

million individuals around the globe, mirroring new worldwide. Traditional classrooms are often costly, limited in accessibility, and may not offer sufficient chances for practicing spoken language skills. Furthermore, serious in-person introductory courses tend to be even more expensive and less accessible. The scarcity of opportunities to practice speaking English leads to a situation where individuals might

fulfil written requirements but face challenges communicating effectively, as demanded in academic or professional settings. There is a crucial necessity to offer widespread, efficient education that specifically addresses the need for language learners to practice and improve their speaking abilities. Khalil, M., Amreen, S., & Ather, F. (2025).

**2.4 Theoretical Framework**

The study is guided by two theoretical perspectives, (i) Nation’s (2001) theory of vocabulary learning and (ii) Siemens’ (2005) theory of Connectivism.

Nation’s Aspect	Application in the Study	Evidence from Word Bot
Deliberating learning	The Word Bot directly teaches vocabulary using a wordlist, glosses or definitions.	Participants use Word Bot to intentionally study words via a wordlist or quizzes.
Incidental Learning	Participants pick up words naturally through interaction with Word Bot in a meaningful context.	While chatting with Word Bot, participants encounter new vocabulary in context, which was acquired unintentionally.
Noticing, Retrieval and Repetition	The Word Bot repeats vocabulary over time, asks participants to recall the meaning and shows words in various contexts.	The Word Bot’s features offer spaced repetition, recall tasks and context-based usage, promoting retention.
Receptive Vs Productive Knowledge	Participants first understand (receptive) and later use (productive) new words during interaction.	Participants recognize new words and later try to produce them in responses guided by the Word Bot.

Connectivism Principle	Application in the study	Evidence from Word Bot
Learning occurs across a network	Students learn through a non-linear AI-based environment	The Word Bot connects learners to digital content, meaning learning is no longer limited to a classroom or textbook
Technology is a learning partner	The Word Bot acts as real-time support, adapting to learners’ needs	The Word Bot recommends words, adjusts difficulty and responds to learner inputs, acting as an intelligent node.
Self-directed and personalized learning	Participants engaged with the Word Bot at their own pace, focusing on their vocabulary gaps	Participants chose what to study, revisited difficult words and got instant, adaptive feedback from the Word Bot

The capacity to know is more important than current knowledge.

Participants developed the skills to learn vocabulary independently, beyond the study.

After using Word Bot, participants were better equipped to search, recognize and acquire new words using an online tool

### 3. RESEARCH METHODOLOGY

#### 3.1 Research Design

This study employs a mixed method, integrating both quantitative and qualitative approaches to examine the effectiveness of AI Word Bot in vocabulary acquisition. This design allowed for a systematic process of intervention, observation, and reflection and helped adopt a pragmatic hands-on approach to improving vocabulary instruction. First, quantitative components involved the administration of pre-test and post-test, with data analyzed using a paired-sample t-test in SPSS to measure vocabulary improvement over the six weeks. The qualitative component utilized thematic analysis of students' responses to open-ended questions, capturing their experiences and perceptions of learning vocabulary through AI-based instruction. By combining statistical analysis with in-depth qualitative insights, this study provides a comprehensive understanding of how AI-driven learning tools impact vocabulary development, while also contributing to classroom-based pedagogical innovation. Qualitative research is an appropriate method when it explains the results that were found in the quantitative research. So, a researcher should be encouraged to implement mixed methods.

#### 3.2 Data Collection Tools,

Pre-test and Post-test  
Open-ended Question.

#### 3.3 Sampling and Participants

Purposive sampling

Participants: 35n= undergraduate students included both male and female students aged between 18-22 years from 23 Batch B.E. Chemical Engineering.

### 4. FINDINGS

#### 4.1 Quantitative Results

The research aimed to see the effectiveness of AI "Word Bot" for the acquisition and retention of vocabulary, resolving the difficulties of learning vocabulary through AI "Word Bot". This chapter

critically discusses the impact of AI "Word Bot," which is the main part of this study. The data of this study have a great deal of collaboration with e-learning, and they have been developed by the pretest and posttest.

The paired samples t-test revealed a statistically significant difference in vocabulary scores from the pre-test (M = 20.50, SD = 8.02) to the post-test (M = 24.21, SD = 8.72), with a mean difference of 3.71. The calculated t-value of 2.205 and p-value of 0.035 ( $p < 0.05$ ) indicate that the improvement in vocabulary scores was not due to random chance. The effect size, measured by Cohen's d, was approximately 0.38, suggesting a small to medium effect. While the correlation between pre-test and post-test scores was moderate ( $r = 0.317$ ) and not statistically significant, the overall results indicate a meaningful impact of the AI chatbot on vocabulary acquisition.

#### 4.2 Quantitative Results

The analysis is further explained in the domain of research questions of this study. The thematic analysis in this study involved examining students' responses to understand their experiences with the AI Word-Bot. The analysis followed a systematic process, and the themes provided a deep understanding.

*P1: With the help of this wordlist, I can identify the category of the word which is Noun, Adjective or any other parts of speech.*

*P2: Images make words real, for me and boost memory to recall and understand them.*

*P3: After seeing many examples in different sentences, it has given me more confidence when I use new words.*

*P4: This feature helped to use a more natural and fluent speaking style.*

*P5: I become more actively involved in the progress through self-testing.*

### 5. DISCUSSION

#### 5.1 Quantitative Discussion.

The findings of the quantitative results indicate that AI Word Bot had a significant impact on

undergraduate students' vocabulary learning, as evidenced by the analysis. The paired sample T-test results revealed a notable improvement in students' pre-test and post-test results. Chatbot helped with long-term retention of productive vocabulary and promoted incidental vocabulary learning, indicating that AI driven tools can effectively aid vocabulary learning.

### 5.2 Qualitative Discussion

The qualitative findings of this study, analyzed through thematic analysis, provide deeper insight into students' experience with AI Word-Bot for vocabulary learning. By examining patterns in students' responses to an open-ended question, key themes such as Engagement, Vocabulary Improvement and Autonomous learning emerged, shedding light on AI Word Bot's effectiveness in enhancing vocabulary acquisition. One of the most prominent themes identified was Engagement, as many students expressed that the interactive nature of Word Bot made learning more enjoyable and motivating. Another significant theme was Vocabulary improvement, as students reported an increased ability to recall and apply new words in different contexts. Many participants highlighted that exposure to systematic word lists, contextualized examples helped them deepen their understanding of vocabulary usage.

### 5.3 Conclusion

The study explored the impact of AI-driven vocabulary learning, specifically through the AI Word Bot, on tertiary-level students' English vocabulary acquisition. The findings indicated that AI-assisted learning significantly improves students' vocabulary retention and overall learning experience. The embedding of AI technology in vocabulary learning created an interactive and participative learning culture, facilitating both implicit and explicit vocabulary learning. Through methodical exposure to new words in contextual situations, the AI technology provided better comprehension of word use and retention.

### 5.3 Limitation of the study.

This research has a relatively small sample size, which is 35 participants from one institution and might

restrict the generalizability of the results to other fields of study and levels of education. Further, data collection using Google Forms could have limited the quality of interaction and opportunity for on-the-spot feedback. The study also focused on short-term improvement without measuring long-term vocabulary retention.

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