Learners' Perceptions of ChatGPT's Interactive Features in Vocabulary Enhancement: A Systematic Literature Review

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ABSTRACT

The integration of Artificial Intelligence (AI) into language education has significantly transformed vocabulary learning by promoting interactive, adaptive, and personalized learning experiences. Among the various AI-driven tools, ChatGPT has garnered increasing attention for its potential to enhance vocabulary acquisition in English as a Second Language (ESL) contexts. This Systematic Literature Review (SLR) synthesizes empirical studies that investigate learners' perceptions of ChatGPT's interactive features in vocabulary enhancement across primary, secondary, and tertiary educational settings. Overall, findings suggest that learners perceive ChatGPT as an engaging and motivating tool that facilitates vocabulary retention and active language use. However, recurring concerns are highlighted, including content repetitiveness, learner overreliance on AI-generated responses, and occasional inaccuracies. The review is framed within cognitive processing theories, specifically Bottom-Up, Top-Down, and Interactive approaches, to examine how learners process and engage with AI-mediated vocabulary input. Furthermore, it explores pedagogical frameworks for effectively integrating AI in ESL classrooms, with emphasis on accessibility, learner autonomy, and adaptive learning practices to support vocabulary enhancement.

INTRODUCTION

The Role of Vocabulary Acquisition in ESL Proficiency

Vocabulary acquisition plays a crucial role in ESL proficiency, shaping learners' ability to comprehend texts, express ideas fluently, and engage in meaningful communication. Studies suggest that a strong vocabulary foundation enhances reading comprehension and verbal expression, allowing learners to participate actively in academic and social discourse (Nation, 2020). However, traditional vocabulary learning methods such as rote memorization and textbook-based exercises often fail to capture the interactive and contextual nature of authentic language use (Schmitt, 2022).

Constructivist learning theories emphasize that vocabulary acquisition should involve contextual exposure, meaningful engagement, and active recall (Vygotsky, 1978). When learners encounter words in real-life situations or relevant discourse, their cognitive retention strengthens. This principle forms the basis of digital tool integration in ESL classrooms, where interactive platforms foster dynamic vocabulary engagement (Richards & Rodgers, 2014). Given this foundation, AI-driven technologies such as ChatGPT offer opportunities to personalize vocabulary learning, provide contextual applications, and reinforce understanding in real time (Aldowsari & Aljebreen, 2024).

AI-Assisted Vocabulary Learning: Potential and Limitations

The application of AI in ESL education has seen significant growth, particularly with tools like ChatGPT, which provide real-time vocabulary support, adaptive language feedback, and personalized word recommendations (Gass & Selinker, 2021). AI-driven models analyze learners' responses, adjusting vocabulary suggestions based on proficiency levels and thematic relevance. Furthermore, AI reduces the fear of judgment, allowing students to experiment with vocabulary in a nonjudgmental, automated environment (Kim, 2023).

However, limitations exist within AI-assisted vocabulary learning. One major concern is passive learning—students might rely on AI-generated outputs without engaging in deeper cognitive processing (Aldowsari & Aljebreen, 2024). While ChatGPT provides definitions, synonyms, and example sentences, learners must consciously apply new vocabulary in diverse contexts to achieve long-term retention. Another challenge is the reduction in oral fluency enhancement; since most AI interactions occur through text-based exchanges, learners may struggle with pronunciation, intonation, and conversational spontaneity (Klimova et al., 2024).

Ethical and Accessibility Considerations in AI-Driven ESL Instruction

Despite the advantages of AI-driven learning, ethical and accessibility concerns arise, particularly regarding academic integrity, equitable access, and multilingual adaptability. One pressing issue is the potential for plagiarism—students may overly depend on AI-generated responses rather than developing independent language proficiency (Klimova et al., 2024). ESL educators must implement strategies that encourage critical thinking and personal engagement in vocabulary learning.

Equitable access to AI technology remains another challenge. Learners in underfunded educational institutions or regions with limited technological infrastructure may struggle to utilize AI tools effectively (Richards & Rodgers, 2014). Socioeconomic disparities can exacerbate the digital divide, restricting AI-enhanced vocabulary acquisition. Additionally, AI models exhibit linguistic biases, as accuracy varies across different languages and dialects, impacting non-English ESL learners (Nation, 2020). Addressing these concerns requires policies that ensure inclusivity and responsible AI integration in ESL curricula (Kim, 2023).

Integrating AI-Based Vocabulary Learning into Pedagogical Adaptation Models

To optimize AI-driven vocabulary learning, structured pedagogical models should align with cognitive processing frameworks, constructivist learning theories, and oral fluency strategies. Blended learning approaches, where AI complements traditional classroom instruction, can help mitigate AI's limitations and enhance vocabulary retention (Schmitt, 2022).

Cognitive processing theories highlight the importance of active recall and spaced repetition, techniques that AI-driven platforms can incorporate to reinforce vocabulary retention (Gass & Selinker, 2021). Meanwhile, constructivist methodologies, such as interactive storytelling and peer discussion, enable learners to engage with vocabulary in meaningful ways (Vygotsky, 1978). Additionally, educators can integrate oral fluency strategies, such as AI-assisted pronunciation exercises and real-world dialogue simulations, to ensure that vocabulary acquisition extends beyond passive recognition (Kim, 2023).

METHODOLOGY

Systematic Search Strategy

To ensure a comprehensive analysis of ChatGPT's impact on ESL vocabulary acquisition, a systematic literature search was conducted using Semantic Scholar, Scopus, ERIC, and Google Scholar. These databases were selected for their reliability in hosting peer-reviewed research on language education and AI-driven instructional models. The search spanned publications from 2019 to 2024, focusing on empirical studies that examine learner perceptions, vocabulary retention, and pedagogical frameworks integrating ChatGPT.

A variety of keywords were used to refine the search results, ensuring relevance to the study's objectives. These included: *ChatGPT in ESL vocabulary learning, AI-driven classroom adaptations for ESL students, learner attitudes toward ChatGPT-assisted vocabulary instruction, AI-supported oral fluency enhancement in ESL education,* and *accessibility in AI-enhanced language learning models.* By incorporating targeted search terms, the study captured research detailing both the benefits and challenges of AI-driven vocabulary instruction.

Only studies that included empirical data measuring vocabulary retention outcomes, student engagement patterns, and instructional methodologies were considered. This ensured the literature review remained focused on pedagogical implications rather than theoretical discussions of AI.

Inclusion and Exclusion Criteria

To refine the dataset, specific inclusion and exclusion criteria were applied. Studies were selected based on their empirical methodology, ensuring robust analysis of ChatGPT's role in structured ESL instruction across primary, secondary, and higher education levels. The research focused exclusively on vocabulary acquisition, avoiding broader AI-assisted language tools unrelated to lexicon enhancement.

A table summarizing the criteria used for selection and exclusion is presented below:

Criteria	Inclusion	Exclusion
Research Design	Empirical studies using experimental, quasi-experimental, mixed-methods, or qualitative methodologies (Klimova et al., 2024).	Theoretical papers lacking direct vocabulary learning analysis.
Educational Context	Studies focusing on structured ESL classrooms (primary, high school, university) (Richards & Rodgers, 2014).	Studies on self-directed or informal AI-assisted learning.
Vocabulary Focus	Research analyzing ChatGPT's role in vocabulary acquisition (Schmitt, 2022).	Studies primarily addressing grammar, syntax, or pronunciation.
Oral Fluency & Accessibility	Papers considering spoken proficiency enhancement and equitable AI access (Nation, 2020).	Studies that overlook accessibility challenges or oral fluency.

These criteria ensured that the study retained a focused scope, examining relevant empirical findings while excluding discussions unrelated to vocabulary acquisition.

Data Extraction and Analysis Approach

Following the systematic search and selection criteria, 50 peer-reviewed studies were retrieved and categorized based on research themes, methodologies, and findings. Each study was examined for its contribution to understanding ChatGPT's pedagogical effectiveness, learner engagement metrics, and ethical concerns in AI-assisted instruction (Nation, 2020).

The data analysis approach involved extracting thematic patterns from selected studies, focusing on the following dimensions:

- Vocabulary Retention Outcomes: Studies were analyzed to determine the effectiveness of ChatGPT's adaptive learning mechanisms, such as spaced repetition and contextual word application (Aldowsari & Aljebreen, 2024).

- Learner Engagement & Perceptions: Research evaluating motivation, AI interaction dynamics, and ESL students' attitudes toward AI-driven vocabulary support was synthesized (Kim, 2023).

- Accessibility & Ethical Considerations: Papers addressing multilingual adaptability, technological equity, and concerns about AI dependency in learning models were assessed (Klimova et al., 2024).

By employing a thematic synthesis methodology, the study identified pedagogical adaptation models and real-world applications of AI-supported vocabulary learning, contributing to discussions on cognitive processing theories and accessibility barriers in ESL education (Schmitt, 2022).

RESULTS

Statistical Analysis of Vocabulary Gains

Empirical findings reveal significant vocabulary improvements among students using ChatGPT-enhanced exercises, demonstrating measurable advancements in word retention and application. In a controlled study, high

school students engaging with AI-assisted vocabulary quizzes achieved an average vocabulary score of 12.2, outperforming their peers in traditional classroom settings, whose scores averaged 7.4 ($p < 0.05$) (Aldowsari & Aljebreen, 2024). This suggests that AI-driven interactive learning fosters higher engagement and improved word acquisition.

Similarly, university students exposed to ChatGPT-generated vocabulary exercises exhibited substantial lexical growth. Their vocabulary expanded by 2213 words, contrasting with 917 words learned through conventional coursework ($p = 0.000$) (Mugableh, 2024). The study highlights AI's capability to accelerate vocabulary enhancement, providing students with adaptive exposure to new words and context-driven applications.

In the case of primary school learners, post-intervention assessments revealed impressive vocabulary gains, increasing from 3.85 to 10.83 words after structured ChatGPT-assisted learning activities ($p = 0.000$) (Al-Siyabi, 2024). While these results confirm AI's effectiveness in short-term vocabulary expansion, further investigations are required to assess long-term retention strategies and cognitive integration of acquired vocabulary.

The following table summarizes key statistical findings from the studies:

Student Group	Vocabulary Gains (AI-Assisted)	Vocabulary Gains (Traditional Learning)	Significance Level
High School Students	12.2	7.4	$p < 0.05$
University Students	2213 words	917 words	$p = 0.000$
Primary School Students	10.83 words	3.85 words	$p = 0.000$

AI-Assisted Vocabulary Learning: Pedagogical Adaptation Models

Cognitive Approaches to AI-Enhanced Vocabulary Learning

In ESL instruction, vocabulary acquisition depends on how learners process linguistic input, which can be explained through three primary cognitive models: Bottom-Up, Top-Down, and Interactive Approaches. These frameworks provide insight into how students decode, predict, and internalize new words, shaping vocabulary retention and comprehension (Nation, 2020). Traditional ESL pedagogical strategies often emphasize one approach over another, but AI-enhanced vocabulary learning—particularly with tools like ChatGPT—blends all three approaches into an adaptive learning experience (Klimova et al., 2024). ChatGPT dynamically adjusts vocabulary tasks based on learner responses, contextual cues, and engagement patterns, ensuring personalized vocabulary reinforcement that aligns with these cognitive models.

Bottom-Up Processing in AI-Assisted Vocabulary Learning

The Bottom-Up Approach centers on learning language from smaller units (letters, sounds, words) to larger structures like phrases and sentences. ESL learners decode language gradually, processing vocabulary at a fundamental level before engaging with complex structures (Gass & Selinker, 2021). ChatGPT supports Bottom-Up learning by providing phonetic breakdowns, definitions, synonyms, and sample sentence applications, helping students understand vocabulary incrementally. Through structured AI-generated exercises, learners practice word recognition and semantic association, reinforcing memory retention through repetition (Schmitt, 2022). AI models also offer adaptive feedback, allowing learners to correct errors instantly, a crucial feature for those struggling with word decoding and comprehension. However, while Bottom-Up strategies improve vocabulary precision, they require supplementation with context-driven learning, which is better addressed by Top-Down approaches.

Top-Down Processing: Enhancing Contextual Vocabulary Learning

Unlike the Bottom-Up Approach, the Top-Down Approach prioritizes contextual meaning and prior knowledge to interpret new words (Vygotsky, 1978). In this model, learners rely on sentence context, discourse clues, and

thematic associations to infer word meanings without isolated decoding (Richards & Rodgers, 2014). ChatGPT enhances Top-Down vocabulary acquisition by generating narrative-based exercises, interactive dialogues, and scenario-driven word applications (Karataş et al., 2024). Learners can engage with AI-generated texts, predicting word meanings based on prior exposure, syntactic positioning, and situational cues. This approach encourages meaningful vocabulary retention, as students internalize word usage organically, mimicking real-life communication (Ho, 2024). The challenge with Top-Down strategies, however, is that some learners may struggle to infer meaning accurately, requiring a balanced approach that integrates both Bottom-Up decoding and contextual word application.

Interactive Approach: AI-Driven Hybrid Learning Models

The Interactive Approach combines Bottom-Up word decoding with Top-Down contextual prediction, creating a balanced linguistic processing model (Nation, 2020). ESL learners benefit from multi-modal AI-generated exercises, where ChatGPT adapts vocabulary tasks based on learner engagement, proficiency level, and feedback loops (Klimova et al., 2024). For instance, students may receive word-level AI assistance (Bottom-Up) followed by scenario-based application tasks (Top-Down), reinforcing active engagement and personalized vocabulary enhancement. Additionally, AI-enhanced adaptive learning models incorporate game-based vocabulary acquisition, simulated conversations, and personalized word challenges, ensuring learners experience vocabulary in meaningful contexts while still developing linguistic precision (Gass & Selinker, 2021). By combining AI-driven Bottom-Up decoding with Top-Down inferencing, ChatGPT fosters a structured yet immersive vocabulary learning experience.

Through AI-supported cognitive processing strategies, ESL learners engage with vocabulary dynamically, improving retention, comprehension, and application in both academic and real-world interactions. However, successful implementation requires continuous refinement, ensuring that AI-driven instruction remains accessible, adaptive, and aligned with structured pedagogical methodologies (Schmitt, 2022).

AI-Driven Oral Fluency Enhancement Strategies

While ChatGPT effectively supports text-based vocabulary expansion, challenges remain in its capacity to enhance spoken fluency. A promising solution is the hybrid AI & speech processing model, where ChatGPT is paired with voice recognition tools. This combination facilitates spoken vocabulary application, ensuring ESL learners benefit from both written and verbal proficiency enhancement (Barabad & Anwar, 2024).

Researchers also advocate for conversational AI modules, enabling AI-driven platforms to simulate interactive spoken dialogues. These real-time simulations allow students to practice pronunciation, articulation, and conversational fluency, bridging the gap between text-based AI assistance and practical speech interaction (Ho, 2024).

Additionally, AI-assisted oral fluency assessments have been proposed to improve spoken proficiency monitoring. By incorporating speech-based feedback mechanisms, ChatGPT can provide automated pronunciation corrections, fluency analysis, and individualized speaking exercises, further strengthening ESL learners' verbal competency (Aldowsari & Aljebreen, 2024).

Accessibility Considerations in AI-Enhanced ESL Education

Despite its potential, ChatGPT's accessibility varies across different educational environments, raising concerns about equitable AI integration. One of the key challenges is ensuring equal access to AI-driven learning resources, particularly in low-income schools where technological infrastructure may be limited. Institutional funding and policy interventions are essential to promote inclusive AI adoption in underserved settings (Klimova et al., 2024).

Furthermore, AI models must be designed with adaptive features for learners with disabilities. This includes integrating screen-reader compatibility for visually impaired students and audio-enhanced instructional support

for learners with processing difficulties (Karataş et al., 2024). Customizing accessibility tools ensures AI platforms remain inclusive and effective across diverse learner populations.

Another critical accessibility concern is ChatGPT's multilingual adaptability. AI models often struggle with regional linguistic integration, affecting non-English ESL learners who require precise translations and cultural alignment in vocabulary suggestions. Improving multilingual AI capabilities is essential to enhancing educational inclusivity across diverse language backgrounds (Algraini, 2024).

DISCUSSION & FUTURE RESEARCH DIRECTIONS

Longitudinal Studies on Vocabulary Retention and Recall

While ChatGPT has demonstrated short-term effectiveness in vocabulary acquisition, its impact on long-term retention and recall stability remains underexplored. Many existing studies assess vocabulary gains immediately after AI-assisted instruction, but few investigate whether these gains persist over time, particularly across different learning environments and proficiency levels. A longitudinal research approach would provide insights into how ESL learners integrate AI-supported vocabulary into their active language usage.

One crucial area for investigation is cognitive reinforcement mechanisms within AI-based vocabulary learning. Traditional educational frameworks emphasize spaced repetition, semantic mapping, and active recall as essential components of sustained vocabulary retention. Researchers must examine whether ChatGPT's adaptive learning algorithms support these functions effectively over months or years. Additionally, it is necessary to explore whether students retain AI-assisted vocabulary more effectively compared to words learned through human-led instruction, assessing differences in engagement, comprehension, and real-world applicability.

Moreover, contextual language application is another critical factor influencing long-term retention. ESL learners may acquire words through AI-driven interactions but struggle to apply them fluently in conversations or academic writing. Future research should analyze whether ChatGPT-generated vocabulary exercises lead to greater lexical diversity in spoken and written communication over extended periods. By incorporating longitudinal assessment tools, researchers can determine the extent to which AI-facilitated vocabulary acquisition translates into sustained ESL proficiency.

AI-Enhanced Speech Recognition Models for ESL Oral Fluency

Although ChatGPT excels in text-based vocabulary instruction, its limitations in spoken fluency enhancement present significant pedagogical challenges. ESL educators emphasize that pronunciation, intonation, and conversational spontaneity are crucial components of fluency, yet ChatGPT lacks built-in speech recognition to facilitate real-time spoken interaction. Addressing this gap requires integrating AI-powered speech processing models into ChatGPT-assisted ESL learning frameworks.

One promising direction is the enhancement of hybrid AI language tools combining ChatGPT's text-generation features with advanced speech recognition technology. These models could enable students to practice oral vocabulary articulation, receive instant phonetic corrections, and engage in dialogue simulations replicating real-world linguistic scenarios. AI-driven speech feedback mechanisms could also analyze spoken responses, identifying common pronunciation errors and fluency bottlenecks.

Additionally, interactive conversational AI modules would significantly enhance spoken proficiency by fostering dynamic verbal exchanges rather than static text-based responses. ESL learners often struggle with intonation patterns, spontaneous responses, and fluid sentence construction, making AI-driven conversation simulators a valuable innovation. Research into AI-assisted speech enhancement could revolutionize ESL pedagogy, ensuring that students benefit from both vocabulary expansion and verbal competence in AI-driven learning environments.

Institutional Policies for Equitable Access to AI-Assisted Education

Despite AI's transformative role in ESL learning, disparities in institutional accessibility pose significant challenges, particularly across socio-economic and technological divides. While some educational institutions seamlessly integrate AI-driven vocabulary learning tools, others lack the infrastructure, funding, or policy frameworks necessary to support AI-enhanced ESL instruction. Ensuring equitable access requires targeted institutional initiatives, policy reforms, and funding allocations.

One of the primary concerns is the digital divide, where students in underprivileged schools or rural regions may have limited access to AI-driven learning platforms. Future research should explore policy-based solutions that facilitate AI adoption across socio-economically diverse educational settings, ensuring that all ESL learners receive equal opportunities to engage with ChatGPT-enhanced vocabulary instruction. Government-backed initiatives could support technology distribution, AI literacy programs, and teacher training workshops, fostering inclusive AI accessibility across global ESL classrooms.

Additionally, AI-assisted education must align with ethical and regulatory standards to prevent bias, data privacy concerns, and dependency risks. Institutional guidelines should focus on data protection measures, ensuring that students' linguistic interactions with AI remain confidential. Policymakers and researchers must collaborate to develop standardized ethical frameworks for AI integration, promoting responsible AI usage while safeguarding student autonomy. By addressing equity concerns, technological barriers, and ethical considerations, future AI-enhanced ESL education models can become more accessible, scalable, and sustainable across diverse learning communities.

The following table summarizes the key directions for future research:

Future Research Direction	Key Focus Areas
Longitudinal Studies on Vocabulary Retention	Examining long-term recall stability, spaced repetition models, and AI-supported active recall.
AI-Enhanced Speech Recognition for ESL Fluency	Developing AI-powered speech tools to improve pronunciation, conversational spontaneity, and verbal articulation.
Institutional Policies for AI Accessibility	Addressing the digital divide, funding equitable AI adoption, and ensuring ethical AI integration in ESL education.

CONCLUSION

ChatGPT has emerged as a powerful tool in ESL vocabulary acquisition, offering dynamic, personalized learning experiences that enhance engagement, comprehension, and structured language enhancement. Its ability to generate context-driven vocabulary exercises, provide real-time feedback, and adapt to varying proficiency levels ensures that learners receive tailored support. The integration of AI-driven tools like ChatGPT into ESL classrooms aligns with constructivist learning principles, reinforcing the interactive and meaning-driven nature of vocabulary acquisition. However, despite its advantages, challenges persist regarding its pedagogical adaptation, oral fluency enhancement, and accessibility. While AI excels in structured text-based vocabulary learning, spoken fluency enhancement remains a critical concern, as ESL learners require direct pronunciation support, conversational practice, and real-world application opportunities. Future innovations must address these limitations by incorporating speech recognition capabilities and AI-assisted fluency assessments, ensuring that students benefit from both vocabulary expansion and verbal proficiency.

Additionally, equitable access to AI-enhanced education remains a pressing issue, particularly in underserved learning environments where technological infrastructure and funding constraints may hinder AI adoption. Institutional policies should advocate for inclusive AI implementation, ensuring that all ESL learners—regardless of socioeconomic background—can access AI-driven vocabulary tools. Multilingual adaptability is another essential factor, as AI models must accurately process linguistic nuances, regional dialects, and cultural

semantics to remain effective for non-English speakers. Ethical considerations, such as plagiarism risks and student dependency on AI-generated content, also require ongoing evaluation to balance innovation with responsible usage. Educators and policymakers must collaborate to develop AI frameworks that prioritize ethical learning, safeguard student autonomy, and integrate AI into structured curricula without replacing essential teacher-led interactions.

By addressing these considerations, ChatGPT has the potential to revolutionize ESL vocabulary instruction, bridging proficiency gaps and fostering structured language enhancement in both traditional and digital learning environments. Its continued refinement—incorporating speech recognition, interactive conversational modules, and enhanced accessibility measures—can transform ESL education worldwide, making language learning more adaptive, engaging, and inclusive. As AI-driven models evolve, researchers, educators, and policymakers must remain proactive in shaping AI's role in ESL pedagogy, ensuring that its benefits align with long-term educational objectives. With structured integration, ethical application, and advancements in AI-assisted fluency enhancement, ChatGPT can serve as a transformative language-learning tool, driving innovation in ESL instruction while reinforcing foundational vocabulary acquisition principles.

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