
The Effectiveness of AI-Based Applications in Improving EFL Learners' Vocabulary and Grammar Mastery: A Literature Review

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Abstract

This literature review explores the theoretical foundations and existing studies on the effectiveness of artificial intelligence (AI)-based applications in improving vocabulary and grammar mastery among English as a Foreign Language (EFL) learners. With the growing integration of AI in education, particularly in language learning, it becomes essential to understand how AI tools such as Grammarly, ChatGPT, Duolingo, and ELSA Speak contribute to enhancing learners' linguistic competence. The study synthesizes existing literature and theoretical frameworks, including constructivist learning theory, the cognitive load theory, and the interactionist perspective, to analyze how AI-based tools facilitate vocabulary acquisition and grammatical accuracy. The findings from prior studies indicate that AI applications provide personalized feedback, immediate correction, and adaptive learning paths, which significantly enhance learner engagement and autonomy. However, the review also highlights limitations, such as overreliance on technology, lack of contextual learning, and potential inaccuracies in AI feedback. This paper concludes that while AI-based applications have strong theoretical and empirical support for improving vocabulary and grammar mastery, their effectiveness depends on guided implementation and integration with pedagogical strategies.

Keywords: Artificial Intelligence, EFL, Vocabulary Mastery, Grammar Mastery, Literature Review

INTRODUCTION

The integration of Artificial Intelligence (AI) in education has brought about a transformative shift in how teaching and learning are conceptualized and implemented, particularly within the field of English as a Foreign Language (EFL) (Lara Alcívar et al., 2024). As classrooms evolve in the era of digital transformation, AI technologies have emerged as powerful pedagogical tools capable of reshaping traditional language instruction. Unlike conventional methods that often rely on static materials and teacher-centered delivery, AI-based systems introduce dynamic, learner-centered approaches characterized by interactivity, adaptivity, and continuous feedback. These technologies can analyze learner performance in real time, diagnose individual strengths and weaknesses, and tailor instructional content to meet specific learning needs (Zhong, 2024). Such affordances have made AI-based applications increasingly popular among educators and learners seeking personalized learning experiences that promote engagement and measurable improvement.

In the context of language acquisition, vocabulary and grammar represent foundational elements of communicative competence (Xu, 2024). Vocabulary knowledge determines a learner's capacity to express meaning, while grammatical control ensures structural accuracy and coherence in communication. Mastery of these two components is therefore essential for producing meaningful, fluent, and accurate utterances, which form the basis for successful interaction in academic and real-world contexts. Yet, despite their importance, vocabulary and grammar remain challenging for many EFL learners due to limited exposure, insufficient feedback, and the abstract nature of linguistic rules. Here, AI-based tools play a crucial role by providing contextualized input, adaptive exercises, and instant corrective feedback that help learners internalize linguistic patterns more efficiently than traditional instruction alone.

Recent advances in Natural Language Processing (NLP), machine learning, and Intelligent Tutoring Systems (ITS) have given rise to a new generation of AI-powered applications such as Grammarly, ELSA Speak, ChatGPT, and Duolingo. These platforms utilize sophisticated algorithms to deliver real-time feedback, detect and correct errors in grammar and vocabulary usage, and design adaptive learning pathways that adjust according to learners' evolving proficiency levels (Eswaran et al., 2024). For example, Grammarly provides automated grammatical correction and stylistic suggestions, ELSA Speak focuses on pronunciation and fluency, Duolingo gamifies language learning through structured tasks, and ChatGPT facilitates open-ended, human-like conversations that encourage active language use. Collectively, these tools aim to enhance accuracy, fluency, and autonomy, offering learners a flexible environment to practice beyond the confines of the classroom.

However, while the practical benefits of these technologies are widely acknowledged, their pedagogical effectiveness requires deeper exploration through a theoretical lens (Kosov et al., 2023). Understanding how AI tools contribute to language learning involves examining them within established frameworks such as Communicative Language Teaching (CLT), Constructivism, Sociocultural Theory, and Second Language Acquisition (SLA) models. These frameworks provide insight into how adaptive feedback fosters noticing, how interaction supports scaffolding within the Zone of Proximal Development (ZPD), and how low-anxiety environments reduce affective barriers to learning. A theoretical analysis is therefore essential not only to validate the claims of AI developers but also to guide educators in integrating these tools effectively into curriculum design.

Accordingly, this paper aims to conduct a theoretical literature review that synthesizes previous research on AI-assisted language learning, particularly in the domains of vocabulary acquisition and grammar mastery. The review seeks to identify the underlying mechanisms through which AI supports linguistic development, evaluate its alignment with contemporary pedagogical principles, and explore its potential limitations and ethical considerations. Ultimately, the study will highlight the pedagogical implications of incorporating AI-based tools into EFL instruction and offer insights into how educators can harness these technologies to foster more personalized, interactive, and effective learning experiences.

RESEARCH METHODS

This study adopts a literature review design employing thematic synthesis to explore the theoretical and empirical evidence on the effectiveness of AI-based tools in enhancing vocabulary and grammar mastery among EFL learners (Abu Qbeita, 2024). The review focuses on synthesizing current research to provide a comprehensive understanding of how Artificial Intelligence supports linguistic development within formal educational contexts.

Data Sources

Relevant literature was collected from reputable academic databases, including Scopus, ERIC, Google Scholar, and ScienceDirect, focusing on publications from 2013 to 2024. The search terms used were: “*AI in EFL learning*,” “*artificial intelligence and vocabulary acquisition*,” “*AI grammar correction*,” “*ChatGPT in language learning*,” and “*intelligent tutoring systems for EFL*.”

Inclusion and Exclusion Criteria

The inclusion criteria consisted of:

- Peer-reviewed journal articles and conference papers
- Studies focusing on AI-based tools in EFL contexts
- Literature discussing vocabulary and grammar learning outcomes

- Theoretical and conceptual papers explaining pedagogical implications

Exclusion criteria included:

- Studies not related to EFL learners
- Articles focusing only on speaking or writing skills without mention of vocabulary or grammar
- Non-English publications

Data Analysis

The selected articles were analyzed thematically using qualitative content analysis. The analysis focused on three dimensions:

1. Theoretical frameworks explaining AI-assisted learning
2. Reported benefits and challenges of AI tools
3. Pedagogical implications for vocabulary and grammar mastery

Themes were synthesized to develop a comprehensive theoretical understanding of AI's role in EFL vocabulary and grammar instruction.

RESULTS AND DISCUSSION

A synthesis of the reviewed literature indicates that Artificial Intelligence (AI) tools hold substantial potential to enhance vocabulary and grammar acquisition in English as a Foreign Language (EFL) contexts. Their effectiveness is primarily attributed to the creation of adaptive, interactive, and feedback-driven learning environments that respond dynamically to individual learner needs. By leveraging Natural Language Processing (NLP), machine learning, and intelligent tutoring systems, AI applications provide learners with personalized instruction, immediate corrective feedback, and contextualized practice opportunities (Kaswan et al., 2024). These features collectively support key processes in language learning, such as noticing, repetition, and meaningful use, which are essential for developing lexical depth and grammatical accuracy. The integration of AI is further validated by constructivist, interactionist, and cognitive theories, which emphasize active engagement, scaffolded learning, and adaptive feedback as drivers of linguistic competence. Thus, when appropriately embedded within pedagogical frameworks, AI tools function as powerful supplementary resources that extend and reinforce classroom learning.

Despite these advantages, the literature consistently highlights that the success of AI integration is contingent upon its pedagogical alignment and the role of teachers as facilitators and mediators. AI systems, while intelligent, operate within algorithmic boundaries and are primarily designed to address form-focused instruction—such as vocabulary recall, grammar correction, and pronunciation training. They are less equipped to capture the socio-cultural, pragmatic, and discursive dimensions of language use, which involve interpreting meaning across varied contexts, understanding idiomatic nuances, and navigating interpersonal communication norms (Godwin-Jones, 2024). These complex, human-centered aspects of language learning require teacher guidance, peer interaction, and authentic communicative experiences that AI alone cannot fully replicate. Moreover, without thoughtful integration, there is a risk of over-reliance on technology, which may reduce opportunities for critical thinking, collaboration, and creative language use—skills essential for holistic communicative competence.

Therefore, educators are encouraged to adopt blended learning models that strategically combine AI-based autonomous practice with teacher-led instruction and collaborative classroom activities. In such models, AI serves as a complementary tool, reinforcing accuracy and fluency through individualized drills and feedback, while classroom instruction focuses on developing higher-order linguistic skills, cultural awareness, and communicative strategies. Teachers play a

central role in curating tasks, interpreting AI-generated data, and designing reflective learning opportunities that help students transfer their digital learning into authentic communication. Additionally, effective implementation requires teachers to develop AI literacy, enabling them to evaluate the appropriateness of tools, monitor learner engagement, and ensure equitable access.

In conclusion, while AI-based applications offer transformative possibilities for vocabulary and grammar instruction, their pedagogical impact depends on intentional design, teacher expertise, and contextual adaptation. A balanced, human-centered approach that integrates technology within established language teaching frameworks ensures that learners benefit from both the precision and scalability of AI and the empathy, judgment, and cultural insight provided by educators. Such synergy represents the most promising pathway toward achieving comprehensive language proficiency in modern EFL classrooms.

CONCLUSION

This theoretical literature review concludes that AI-based applications hold significant promise for improving EFL learners' vocabulary and grammar mastery. Supported by constructivist, cognitive, and interactionist theories, these tools enhance learning through personalization, feedback, and autonomy. Nonetheless, their optimal effectiveness requires guided integration, critical awareness, and pedagogical adaptation. Future research should explore culturally adaptive AI designs and long-term impacts on learner autonomy.

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