

AI-Assisted EFL Speaking Development: A Review of Technologies, Pedagogies, and Learner Outcomes

Huaijin Zhang*

Shanghai University of International Business and Economics, Shanghai, China

**Corresponding author: Huaijin Zhang.*

Abstract

This literature review synthesizes relevant studies published from 2020 to 2026 regarding the application of artificial intelligence (AI) in English as a Foreign Language (EFL) oral learning. Its objective is to evaluate the effectiveness of AI as an auxiliary tool for enhancing oral proficiency among EFL learners. This article first reviews the development of second language acquisition theories, clarifies the fundamental mechanisms and key research directions for enhancing learning outcomes, and analyzes the applications and advantages of AI in oral language teaching, thereby providing a theoretical support for conducting a theoretical review of AI-assisted EFL oral learning. Based on second language acquisition theories and AI-assisted tools in language learning, this article arranges relevant literature from three dimensions, that is teachers, learners, and instructional methods, with an emphasis on analyses of AI tools, teacher roles, and learning outcomes. The findings reveal that AI tools effectively reduce speaking anxiety and enhance learners' willingness to communicate. When embedded into structured pedagogical frameworks, AI also yields consistent improvements in learners' pronunciation, fluency, and linguistic accuracy. Nevertheless, empirical evidence regarding the long-term development of higher-level communicative competence remains insufficient. This review further identifies the limitations and challenges of existing studies from three perspectives, research content, research methods, and research conditions, including limited contextualized feedback, inadequate accent recognition for non-native speech, and potential learner over-reliance on AI systems. It concludes that AI tools can achieve better instructional outcomes when appropriately integrated with human instruction and systematic pedagogical guidance in EFL speaking education.

Keywords

artificial intelligence, assisted-language learning, EFL speaking skills, learner outcomes, pedagogical integration

1. Introduction

As communicative competence stands as the core goal of language acquisition, oral proficiency has long been regarded as an essential skill for EFL learners across all educational stages. In the context of globalization, English language proficiency has gained increasing significance in academic, economic, and technological domains, imposing more stringent requirements on learners' oral communication skills. Traditional teaching modes, however, are restricted by limited communicative scenarios, insufficient practice opportunities, and inadequate personalized feedback. To address these pedagogical dilemmas, educators and researchers have

actively explored innovative instructional approaches, among which AI has emerged as a highly promising solution [1].

In recent decades, the rapid advancement of artificial intelligence (AI) has profoundly transformed education, especially in the field of language teaching and learning [1]. AI innovations have diversified the approaches to providing EFL learners with opportunities of speaking practice and language exposure. For instance, speech recognition and pronunciation tutoring systems, conversational agents, and comprehensive language platforms empower learners to obtain flexible, timely, and low-anxiety interactive experiences at any time, transcending the limitations of traditional classroom schedules and spaces [1,2]. AI-driven learning tools offer immediate and personalized feedback regarding pronunciation and grammar, generate a variety of conversational situations, and adapt dynamically to learners' proficiency levels, thus offsetting the intrinsic limitations in traditional classroom-based instruction [3]. The advent of generative artificial intelligence (Gen-AI) has brought about further innovation in language learning practices. It achieves this by facilitating the design of instructional materials, offering continuous learning feedback, and generating personalized learning pathways. These functions effectively enhance learner autonomy, creative expression, and self-confidence [3,4].

With the development and refinement of AI-assisted technologies, intelligent tools have been increasingly incorporated and integrated into English learning ecosystems. A wide variety of AI tools is growing, ranging from AI-powered speech recognition tool, such as Speechling, to conversational agents, including ChatGPT and Google Assistant. The deep integration of AI and language education creates new opportunities for second language acquisition, allowing learners to engage in more personalized and interactive learning experiences. The widespread application of AI in language education has accumulated an increasing volume of empirical studies on its effectiveness in facilitating the development of EFL speaking skills [1]. Although previous studies have reported positive effects, including improved pronunciation accuracy, enhanced fluency, and reduced speaking anxiety, the existing body of literature remains fragmented with respect to technological types, learner groups, and instructional contexts[1]. Specifically, existing studies are primarily characterized by short-term and small-scale nature, lacking stable and reliable long-term data along with standardized evaluation frameworks. And the participant populations in these experiments tend to be homogeneous. These factors often limit the validity of research results [1]. Therefore, a review is necessary to consolidate empirical findings, identify effective application patterns, and pinpoint research gaps.

Given that the current literature scattered across diverse technical application domains, learner groups and teaching contexts, making it difficult to reach unified conclusions regarding the overall effectiveness of AI-assisted EFL speaking instruction. This paper reviews the theoretical requirements for second language acquisition from the perspective of oral skill teaching and examines the advantages of AI-assisted teaching. It establishes a literature review framework tailored to practical needs and analyzes research publications on AI technology in EFL instruction from 2020 to 2026 based on this framework. The study evaluates each category of literature concerning its developmental trends, instructional applications, methodological features, and learning outcomes. The purpose of this review is to provide evidence-based references for curriculum design, teacher training, and the future development of AI-assisted language education.

2. Theoretical Background

To effectively integrate relevant research findings and establish a fundamental framework, it is essential to clarify the analytical methods based on second language acquisition (SLA) theories and the application of artificial intelligence (AI) in language learning, thereby providing guidance for the literature review.

2.1 Second Language Acquisition Theories

Speaking proficiency is widely recognized as one of the most demanding skills for EFL learners [2,3,5-7], and also constitutes a major difficulty in skill-based instruction. Consequently, it is essential to conduct a review of second language acquisition theories related to learning mechanisms to offer directional guidance for academic research.

Krashen's [8] Input Hypothesis posited that offering an adequate amount of engaging, relevant, and comprehensible input ($i + 1$) while minimizing learners' emotional filtering is conducive to natural language

acquisition. Krashen's theory redirects the emphasis of second language acquisition (SLA) from 'instruction' to 'learning', fundamentally transforming the basic comprehension of language learning mechanisms. Nevertheless, the proposed $i + 1$ framework encounters challenges in practical implementation and undervalues the significance of output. Therefore, Swain [9] stressed that input alone is inadequate, and comprehensible output represents another crucial condition for successful language acquisition. Output (speaking/writing) fulfills three vital functions, namely attention arousal, hypothesis verification, and metalinguistic contemplation, which contribute to in-depth language acquisition. The output hypothesis provides theoretical support for student-centered teaching methods, emphasizing classroom interaction and language production. Building upon these theories, Long [10] extended his Interaction Hypothesis by suggesting that meaning negotiation concurrently involves input, learners' internal cognitive resources (especially selective attention), and output, with these three elements working synergistically to drive acquisition. He also underscored the facilitating role of negative feedback (e.g., recasts or clarification requests), indicating that such feedback allows learners to recognize the disparities between their interlanguage and the target language, thus refining their knowledge framework.

The development of second language acquisition theories have shifted from emphasizing the advantages of classical mining-based teaching methods to focusing on the intrinsic mechanisms of skill-based learning to enhance instructional effectiveness. Through interdisciplinary approaches, innovative mechanisms have been proposed, and their underlying teaching principles have been elucidated based on actual teaching outcomes. These theoretical mechanisms are interconnected and interactive, forming a comprehensive theoretical framework that provides a foundation for applied research in oral language teaching. However, implementing these mechanisms in traditional teaching environments remains challenging and the introduction of artificial intelligence has led to significant advancements in this field.

2.2 Artificial Intelligence in Language Learning

Language learning involves deep interactions among various teaching elements and requires flexible, adaptable instructional approaches. Leveraging profound linguistic understanding, artificial intelligence (AI) is profoundly influencing second language (L2) learning by providing tailored, interactive, and accessible context for instruction [11-14]. According to Akhter [9], Educational Artificial Intelligence (AIED) can be viewed as an integration of three core disciplines, that is computer science, statistics, and pedagogy. This convergence has given rise to closely related subfields such as Educational Data Mining (EDM), Learning Analytics (LA), and Computer-Assisted Education (CBE). These fields aim to optimize teaching, enable personalized learning, and reshape educational ecosystems through the integration of AI technologies with educational contexts. Among these, AI-Assisted Language Learning (AILL) stands out as one of the most dynamic subfields within AIED. In language education, Human-Machine Interaction (HMI) forms the foundational framework of AI-assisted learning environments, where intelligent agents engage in real-time conversational interactions with users, and the underlying technology provides both content and conditions for supporting the interaction hypothesis proposed by second language acquisition theory, thereby meeting the requirements of Krashen's [8] framework. By harnessing Natural Language Processing (NLP), machine learning, and speech recognition technologies, these systems are capable of responding to voice commands and engaging in fundamental dialogues [15]. This facilitates bidirectional interaction between input and output, thereby realizing Swain's [9] design. Artificial intelligence technology features personalization, adaptability, real-time feedback, natural language processing, and data analysis capabilities, enabling the optimization of intelligent educational environments, promotion of personalized language learning, and enhancement of learning outcomes [16-19]. By dynamically adjusting instruction based on learner experiences, it achieves efficient interaction through the synergistic integration of three key elements, thereby meeting the requirements of the Long's [10] hypothesis.

It can be said that AI empowers education and language acquisition through multiple approaches. When reviewing relevant literature, it is essential to integrate AI-assisted methods with corresponding theoretical frameworks. First, AI creates intelligent educational environments by delivering tailored learning experiences based on learners' styles, paces, and preferences, dynamically adjusting content difficulty, providing instant feedback, facilitating effective communication via natural language processing, and analyzing learner behavior through data to assist educators in refining instructional strategies. Second, in personalized language learning, AI adaptively adjusts content and difficulty levels according to learners' needs and progress, offers targeted

feedback, utilizes natural language processing to analyze pronunciation and grammar, customizes learning materials, and conducts real-time assessments to track progress. Finally, AI enhances language learning outcomes by identifying patterns and trends through data analysis, improving accessibility (including for individuals with disabilities and those with limited resources) while delivering cost-effective learning opportunities, thereby boosting the effectiveness, affordability, and overall success of language acquisition [1,15].

3. Literature Review

Given that relevant literature is scattered across fields such as technological applications, learning methods, and instructional approaches. To systematically integrate research findings, it is essential to return to the practical aspects of skill-based teaching in second language acquisition and summarize relevant literature across three dimensions: instructional methods, teachers, and learners. Nevertheless, each field undergoes further subdivision into sub-areas. Therefore, this review primarily focuses on three key perspectives: AI-assisted English speaking learning tools, the role of teachers, and learning outcomes, all informed by the aforementioned SLA theories.

3.1 AI-Assisted Tools

While extensive researches have been conducted on AI tools in oral English language learning, most studies focus on empirical studies of specific AI tools, with relatively few systematic reviews available. A representative example is Sutrah's [2] study, which comprehensively covers all aspects of AI tool applications in oral teaching. Based on Sutrah's [2] study, this section will illustrate the practical use of AI tools in oral instruction.

According to Sutrah, [2] AI-assisted tools designed to enhance oral English proficiency in EFL learning can be generally classified into three types according to their main functions and targeted speaking skills, namely speech recognition and pronunciation tutors, conversational agents and chatbots, and comprehensive language platforms. Firstly, AI-powered speech recognition and pronunciation coaching tools, including ELSA Speak and Speechling, provide real-time feedback on specific aspects of pronunciation. Secondly, AI-driven conversational agents and chatbots, such as ChatGPT, focus on improving users' fluency, vocabulary, and grammar skills by simulating interactive human-like dialogue. Thirdly, comprehensive language learning platforms, such as Duolingo, integrate AI to provide personalized study tasks and training for speaking, aiming to improve multiple speaking skills[2]. These tools are characterized by real-time responsiveness, personalization, and integration, with timely feedback mechanisms that enable learners to rectify errors promptly, thus contributing to the enhancement of learners' fluency and pronunciation. Additionally, intelligent algorithms facilitate adaptive personalized learning by recommending tailored practice plans based on users' foundational learning profiles, thereby precisely addressing individual learning barriers[2].

3.2 Teachers' Roles in AI-Assisted Instruction

Teachers function as the primary facilitators in the teaching process. While numerous studies have examined the role of educators in AI-assisted instruction (e.g., [20]), systematic reviews summarizing this role remain relatively scarce, with a study conducted by Li et al. [5] being a notable example. This part focuses on reviewing the key findings of the study presented in Li et al. [5].

According to Li, Zhou, and Chiu, [5] within the context of AI chatbot-supported language learning, teachers can undertake multiple roles, including prior knowledge presenters, designers, facilitators, assessors, and educational resource providers, to help students learn languages more effectively. In learning environments supported by AI chatbots, these five distinct teacher roles can address students' needs for autonomy, competence, and a sense of belonging, thereby enhancing their motivation to learn through chatbots. And appropriately designed chatbot-assisted collaborative tasks can effectively reduce students' anxiety and concerns in peer interaction [5,6]. In addition, teachers can establish positive teacher-student relationships in classroom instruction by utilizing AI chatbots, which is conducive to strengthening learners' autonomy and cultivating a sense of belonging in language learning. The study emphasized the importance of understanding teachers' roles in AI-assisted language learning to improve their Technology-Packed Content Knowledge

(TPACK), while recommending that teachers adopt the support strategies outlined in Self-Determination Theory (SDT) to develop the ability to design diverse assignments tailored to students' needs [5].

3.3 Effects of AI Tools on EFL Speaking Improvement

Learners serve as the principal beneficiaries of educational services. The utilization of AI tools to improve English as a Foreign Language (EFL) oral proficiency covers a wide range of aspects. This review centers on learners' pronunciation, speaking skills, and affective dimensions in language learning.

3.3.1 Pronunciation and Speaking Skills

Pronunciation emerged as the most consistently improved linguistic dimension across studies, as stated by Sutrah and Dennis et al., [2,3,7]. ASR-based tools, in particular, demonstrated strong effects on pronunciation accuracy, attributed to their ability to provide phoneme-level feedback and visual articulatory guidance. A study by Dennis [7] examined the impact of AI-powered speech recognition technology (AI-SRT) on EFL learners' pronunciation and speaking skills, revealing significant improvements in the experimental group. The study examining the use of Speechling program, facilitated by AI-powered speech recognition technology (AI-SRT), at a Thai university found that this application's flexible online pronunciation, speaking and vocabulary exercises, artificial speech recognition, and constructive error-correction capabilities, significantly enhanced the pronunciation proficiency of sophomore EFL majors[7].

In addition, the pronunciation trainer based on generative artificial intelligence (G-AI) offers real-time feedback and multilingual support, utilizing pre-trained automatic speech recognition (ASR) and text-to-speech (TTS) models for speech analysis and synthesis. The mechanisms facilitating pronunciation enhancement encompass repeated exposure to native-like models, immediate error detection, and the possibility of self-correction. In contrast to traditional pronunciation instruction, which frequently relies on teachers' instruction, AI tools can identify specific phonemes that deviate from the target norms and provide targeted practice [3,4]. The study conducted by Tai and Chen [3] demonstrated the efficacy of generative AI chatbots and interaction modes in enhancing second language oral proficiency. The Coole Bot was adopted as an experimental tool, featuring highly interactive and multifunctional conversational functions that ensure coherent dialogue process and effectively address complex issues. The results indicated that Coole Bot, a G-AI chatbot, significantly improved the oral skills of EFL learners.

3.3.2 Affective Dimensions of Language Learning

Emotional factors play a pivotal role in second language (L2) acquisition [21-24]. For instance, foreign language anxiety (FLE) hinders oral proficiency improvement, while emotional engagement fosters active participation and enhances learning outcomes [21]. Artificial intelligence can strengthen the emotional dimensions by creating customized, low-stress environments that promote enjoyment and motivation [22,23]. A study conducted by Yan [24] examined the effects of AI-mediated instruction on Chinese EFL learners' oral proficiency, foreign language enjoyment (FLE), anxiety levels, and emotional engagement, revealing significant improvements in oral competence, marked increases in FLE, reduced anxiety, heightened enjoyment and the sense of achievement, as well as greater emotional investment. The study identified four interconnected themes, that is oral proficiency, FLE, anxiety, and emotional engagement, illustrating how AI-powered conversational tools employ personalized, interactive, and adaptive approaches to boost learners' engagement and enthusiasm.

And Wu et al., [25] also explored the role of emotional factors in AI-assisted second language acquisition. The study examined the impact of incorporating artificial intelligence (AI) chatbots into thinking-pair-sharing (TPS) activities on foreign language speaking anxiety (FLSA), foreign language enjoyment (FLE), and oral performance, and the results demonstrated that integrating AI chatbots into TPS activities significantly reduced students' FLSA, enhanced their FLE, and improved their English oral performance.

Moreover, a study involving 400 participants indicated that AI-supported language learning and communication significantly improved participants' oral speech and pronunciation. The study further found that AI use (including AWE, chatbot, and ASR) boosted learner' confidence in English communication. Additionally, researchers observed that repeated use of speech recognition tools (ASR) was proved to be highly effective in mitigating anxiety associated with English oral communication activities [26].

3.4 Challenges and Limitations

The aforementioned studies examined the use of AI-assisted tools to enhance oral English proficiency among second language learners across three dimensions. However, these investigations still face unique challenges and limitations, primarily manifested in their research content, methodologies, and participant groups.

Firstly, the current scope of research remains at a superficial level, which leaves space for a more profound understanding of the subject matter and poses substantial challenges. The most common challenges stem from technical shortcomings in AI systems and constraints in teaching methodologies. When interacting with AI chatbots, students often encounter technical issues. For instance, AI tools may fail to accurately recognize regional accents or dialect variations among non-native learners, or provide timely, effective feedback, thereby hindering students' autonomy [27]. Although the relevant input theory is logically sound from a mechanistic perspective, there remains a gap in integrating it with practical technology. Another challenge lies in the fact that AI tools are typically used in environments lacking authentic social interaction, which may impede the development of cultural understanding, pragmatic skills, and conversational competence [27]. Certain chatbots developed by native speakers employ speech patterns and vocabularies that pose challenges for elementary or secondary school EFL learners who participated in experiments to comprehend, which exerts negative impact on their academic development and substantially diminishes their sense of achievement [3,27,28]. The content is in alignment with Krashen's [8] Input Hypothesis and Long's [10] Interaction Hypothesis. However, its implementation presents challenges. Notably, although the operational mechanisms of intercultural communication theory are clearly manifested herein, its profound theoretical foundations still await comprehensive exploration.

While numerous studies indicated that AI chatbots create stress-free, non-judgmental learning environments that alleviate academic anxiety and fear, other researches pointed that students were frequently exposed to information gaps or expression limitations when interacting with these bots. Since chatbots are built on AI technology, students struggle to establish social emotional connections and may even experience feelings of isolation [3,27,29]. This phenomenon exerts a negative influence on students' social interaction abilities. Furthermore, some studies indicate that the misuse of AI chatbots by students may negatively influence their cognitive development and social relationships [3].

Additionally, inherent limitations of the research methods themselves may compromise the generalizability of research findings. These studies often employ a specific AI tools as intervention measure and establish control groups [3,7,24,25]. For instance, small sample sizes and short intervention durations may hinder definitive conclusions about long-term capability improvements. Therefore, future research should incorporate longer observation periods and comprehensive evaluations [7,24,25]. Another limitation lies in the subjectivity of assessment methods used. Although pre-tests, post-tests, and questionnaire surveys poss research value, more objective measurement methods are still required to verify the research findings. Furthermore, the prevalence of quasi-experimental or pre-experimental designs in some existing studies limits the reliability of causal inferences [7,24,25]. Consequently, randomized controlled trials with larger, more diverse samples are needed to better establish causal relationships and strengthen the evidence for the effectiveness of AI-assisted English learning.

Moreover, the research conditions available to the investigators were limited, which affected the credibility of the study conclusions. For instance, relevant studies are often confined to specific contexts, concentrating on individual schools, particular English proficiency levels, or single AI applications, which may curtail their generalizability [3,7,24,25]. Therefore, future research should integrate longitudinal studies to comprehensively examine the long-term effects of artificial intelligence on proficiency, autonomy, motivation, and other factors, by refining the study population levels and accounting for language proficiency levels [26].

4. Discussion

This paper synthesizes several studies on artificial intelligence-assisted English oral learning, focusing on four key aspects: the current characteristics of AI in enhancing oral English proficiency, the role of teachers during students' AI usage, the specific aspects and affective impacts of AI application on oral proficiency enhancement, and the limitations and challenges associated with existing researches. The comprehensive

analysis of research findings holds significant implications for teaching practices and provides guidance for future academic exploration.

From a pedagogical perspective, educators should master the application of artificial intelligence, leveraging it differently across various scenarios beyond its role as a temporary tool. By strategically integrating AI technologies, such as speech recognition tutoring systems and conversational AI assistants, into blended learning designs, they can enhance instructional support for teachers and thereby provide students with more effective guidance. Multiple studies have demonstrated that artificial intelligence significantly enhances the oral proficiency of English as a second language learners, particularly in areas such as accuracy and fluency. Most users report reduced speaking anxiety and increased willingness to express themselves in English after using the real-time conversational features offered by AI tools. Therefore, when selecting such tools, priority should be given to their real-time personalized feedback capabilities and ability to create low-anxiety learning environments, thereby effectively improving pronunciation accuracy, language fluency, and learning autonomy. To ensure sustainable implementation, educational institutions must prioritize teacher training in AI literacy and address regional disparities in technology adoption to guarantee equitable access. From the perspective of students, positive emotional guidance exerts a crucial role in English oral learning. A positive emotional state facilitates the mitigation of the emotional filtering effect, enabling students to more readily assimilate and comprehend new knowledge. In the context of English oral learning, educators can adopt a variety of strategies to stimulate students' motivation and intrinsic impetus, such as establishing a hierarchical learning goal system and devising contextualized interactive tasks. Moreover, students should be encouraged to utilize artificial intelligence as an auxiliary instrument for daily oral practice, thereby alleviating psychological stress and enhancing confidence in oral communication.

Future research can be conducted from the following perspectives: First, longitudinal in-depth studies and mixed-method approaches should be employed to thoroughly examine the long-term effects of AI-assisted oral training on learners' skills and its impact on socio-emotional dimensions. Second, intelligent oral training systems tailored to diverse accent characteristics and real-world contexts require further development. Based on practical applications, this study proposes evidence-based strategies for optimizing AI integration in English oral teaching. These findings, through elucidating effective integration models of human and AI tutoring, provide crucial references for academic discussions in technology-assisted language learning.

5. Conclusion

This article synthesizes literature and empirical evidence from 2020 to 2026 to critically evaluate the role of Artificial Intelligence as an assisted language learning tool in enhancing the speaking skills of EFL learners. However, the review also identifies substantial challenges, including technical limitations in accent recognition, a lack of human-like interaction for pragmatic skill development, and persistent issues related to the implementation of the experiment. It is important to generalize these findings cautiously, as the majority of the reviewed studies are constrained by small sample sizes, short intervention durations, and context-specific designs, which may limit the broad applicability of the results. The implication is that AI tools can be more effective when integrated with human instruction and pedagogical guidance. Overall, AI serves as a powerful supplementary tool rather than a replacement for human instruction in EFL speaking education.

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