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Original Paper

Application of Artificial Intelligence in Teaching English as a Foreign Language: Progress, Challenges, and Trends

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Abstract

With the rapid development of artificial intelligence (AI) technology, its application in teaching English as a foreign language (EFL) is becoming increasingly widespread, profoundly affecting teaching models and learning experiences. This paper reviews AI application progress, challenges, and future trends in EFL instruction. It points out that AI technology supports effective EFL instruction through personalized teaching, automated assessment and feedback, active and interactive experiences, data-driven learning analytics, intelligent agents/virtual assistants, and humanoid robots. However, challenges such as technological limitations, gaps in AI acceptance and application capabilities, privacy protection and ethical issues, and unequal distribution of EFL instructional resources have also emerged. These challenges require active responses from educational administrative departments, schools, and EFL educators. In the future, the development of AI+EFL education will likely further promote innovation in EFL instruction models, achieve a more learner-centered teaching paradigm, exert a constructive influence, promote interdisciplinary integration and collaboration, and ensure the improvement of educational quality and equity.

Keywords

artificial intelligence, teaching English as a foreign language, personalized learning, educational technology, educational equity

1. Introduction

Learning English as a foreign language (EFL) is essential for individual and social development in globalization. English is one of the most widely used languages in the world, facilitating transnational communication and interaction among people, as well as connections between social entities. At the same time, with the development of artificial intelligence technology and tools (hereinafter referred to as AI), such as OpenAI's GPT4.0 and iWrite (an automated essay scoring tool developed by Foreign Language Teaching and Research Press), EFL instruction has undergone significant changes under the enhancement of AI. Intelligent and innovative teaching environments and tools provide possibilities and broad prospects for personalized and differentiated EFL instruction. To fully utilize AI in EFL instruction and improve the quality and efficiency of education, we need to gain a more profound understanding of the progress of AI applications in EFL instruction, the challenges faced, and development trends.

2. Progress in the Application of AI in EFL Instruction

2.1 Personalized EFL Instruction Assisted by AI

AI can create a more intelligent and personalized teaching environment when integrated with English teaching resources. This integration enhances teaching effectiveness, deepens AI's application in English teaching, promotes teaching reform, and modernizes English education (Guan, 2020). AI can mimic learners' thought processes during study sessions, using computation and reasoning to identify learners' study methods and habits and formulate personalized learning strategies.

For example, Quizlet, an AI-based learning support system, offers flashcard tools (such as English vocabulary cards) and various social learning games. Teachers can create or utilize flashcards available on the system and distribute them to students for self-study. Through the monitoring backend, teachers can track each student's progress. By adopting these tools or games, they can fully harness students' language potential (Nguyen & Le, 2023). Quizlet strives to assist and motivate learners by launching learning assistants to customize one-on-one learning for students and promote personalized learning. Xiaoya, an intelligent assisted teaching system for higher education in China developed by Central China Normal University, is used by universities to enhance the learning experience by integrating various digital tools and resources that cater to the personalized needs of EFL teachers and students (Hubei Provincial Department of Education, 2024).

AI-powered speech technology is crucial in promoting personalized EFL pronunciation and speaking instruction. Due to its efficiency and accuracy, AI-powered speech technology has become the preferred tool for language learners and educators. With significant advancements and innovations in speech input, speech recognition, speech synthesis, and natural language processing, artificial intelligence technology can provide English learners with a more personalized and efficient learning experience (Hua et al., 2017). For instance, the American company Animato has utilized advanced language models and intelligent speech technology to develop and launch an AI video chat application

called CallAnnie. It meets students' personalized speaking practice needs and helps EFL learners improve their listening and speaking skills. Additionally, the multi-language speech recognition and speech synthesis systems and tools developed by China's iFlytek Co., Ltd. have been highly praised by teachers in EFL pronunciation and speaking instruction and have been widely used in personalized EFL instruction.

2.2 Automated EFL Assessment and Feedback Achieved by AI

Teachers and students extensively use AI for automated assessment and feedback in English teaching and learning (Sharadgah & Sa'di, 2022). For instance, in Chinese schools, teachers and students employ the English writing automated scoring systems of the Pigai website by Beijing Words Network Technology Co., Ltd. and the iWrite website by the Foreign Language Teaching and Research Press to enhance the efficiency and quality of English writing instruction (Lan, 2023). These systems use AI technology to provide students with immediate, accurate, and comprehensive automatic assessment and feedback on their written assignments, significantly enhancing students' positive language learning experience. When using Pigai, students receive instant feedback after submitting their English compositions, including scores, comments, and sentence-by-sentence evaluations. This feedback improves the immediacy of teaching and promotes students' instant reflection and improvement in writing. The iWrite system provides scoring and feedback and detects whether AI generated the composition, adding an extra layer of assurance for teaching. The extensive application of these two systems has increased the efficiency of English writing instruction and provided strong support for improving students' language abilities (Qi, 2023).

Furthermore, AI technology is transforming traditional methods of EFL evaluation and feedback, especially in speaking practice (Qi et al., 2021). For example, tools like NetEase Youdao's Hi Echo, a virtual oral tutor, offer innovative automated assessment and feedback methods for teachers and students. The Hi Echo retains the integrity of each round of conversation. It provides speaking scores from two dimensions, i.e., pronunciation and grammar, along with AI suggestions for expression refinement, greatly enhancing students' oral English abilities. Hi Echo's quick response and extensive text-based practice report output enable students to receive feedback and practice repeatedly in a short time. Launching similar products, such as Liulishuo and Duolingo, has enriched educational resources.

The App Store's iPhone download ranking reflects the widespread application and popularity of these tools in education. Moreover, the AI speaking evaluation system developed by China's iFlytek Co., Ltd. has been used to score and evaluate English-speaking tests in Chinese high school and college entrance exams, with its scoring accuracy recognized by the government and society (Luo et al., 2018).

2.3 Active and Interactive EFL Instructional Experiences Facilitated by AI

In recent years, teachers have begun to emphasize creating more interactive English learning environments with technological support, mainly focusing on the application of Virtual Reality (VR) and Augmented Reality (AR) in EFL education (Chassignol et al., 2018). Research indicates that some students are shy in classrooms, anxious, or lack confidence in communicating and answering questions

in English, fearing making mistakes and receiving negative evaluations (Ahsan et al., 2020). Therefore, teachers need to establish environments that encourage students to express themselves boldly, and VR and AR technologies hold promise in addressing this issue.

For instance, Wu and Hung (2022) investigated the effects of VR on elementary school students' English-speaking performance and found that VR facilitated learners' grammar and lexical use in speaking. Tsai (2023) demonstrates that amid the COVID-19 pandemic, students' EFL learning outcomes significantly improved using STEMUP supported by VR and automatic speech recognition technologies. Similarly, Wedyan et al. (2022) suggested that AR improved EFL students' language skills and academic achievements by combining real-world contexts with virtual imagery to provide a vivid and enjoyable learning environment and experience. Furthermore, mixed reality, which combines VR and AR, could also benefit EFL learners by improving language learning outcomes and enhancing essential elements such as motivation and engagement in EFL learning (Luo et al., 2024).

2.4 Data-Driven EFL Learning Analytics Enabled by AI

In the teaching process, providing students with effective feedback is one of the most critical responsibilities of English teachers. AI technology, supported by big data, can help teachers adjust their teaching and improve students' English learning progress and methods by providing timely assessments (Sghir et al., 2023). For example, big data in English teaching platforms has been used to predict what courses students need, when students are likely to pass assessments, or when they might drop out of online courses. These big data analyses complement AI, offering immediate information about students' success, challenges, and course needs, which helps optimize their English learning experience (Luckin et al., 2016). Teachers can leverage big data to understand students' learning situations, implement personalized teaching strategies, and improve teaching effectiveness. Moreover, AI-based assessments can assist teachers in gaining a better understanding of students' current and future behaviors through learning data analysis and mining (Sghir et al., 2023; Zhang & Zhang, 2021).

2.5 Intelligent Agents/Virtual Assistants and Humanoid Robots Meeting Diverse EFL Teaching Needs

In EFL instruction, the application of intelligent agents or virtual assistants and humanoid robots is becoming increasingly widespread. These AI technologies can provide personalized learning plans and resources based on students' learning behaviors, proficiency levels, and personal preferences (Goyal et al., 2023; Tuna & Tuna, 2019). Such customized learning paths can more effectively meet the unique needs of each EFL student. At the same time, they can offer real-time feedback and tutoring. When practicing language skills, students can receive immediate feedback, allowing them to learn and improve more quickly. Additionally, virtual assistants and humanoid robots can serve as learning partners, interacting with students through simulated real-life conversation scenarios, providing opportunities for language practice and enhancing students' language communication skills (Kim et al., 2019; Tuna & Tuna, 2019).

3. Challenges and Solutions

In AI-enhanced EFL instruction, schools and teachers may face several challenges, including limitations of AI technology, gaps in AI acceptance and application abilities among teachers and students, privacy protection and ethical considerations, and the maintenance of educational equity. Appropriate solutions to these issues need to be identified.

3.1 Technological Limitations

A major challenge to the application of AI in EFL instruction lies in AI's innovative competence in language use. Until recently, AI tools have exhibited limitations in understanding complex language logic and creative thinking. For instance, they may misinterpret contextual texts and commit errors in creative writing. Moreover, they may produce mechanized, formulaic, or inconsistent output language and knowledge in EFL instruction of listening, speaking, reading, and writing. These problems reflect the technical constraints of AI in critical thinking and innovation. Studies have indicated that AI writing tools tend to generate mechanical, formulaic texts and are not equipped to handle advanced writing tasks, necessitating the generation of new insights (Stokel-Walker, 2022; Zhai, 2023). Such tasks demand critical thinking skills and innovative abilities not inherently present in AI systems.

Another technical limitation is observed in the AI systems' assessment and early warning capabilities. Although current AI tools can understand natural language, provide responses to inquiries, and score EFL learners' English language performance according to predefined criteria, they cannot autonomously develop evaluation criteria pertinent to the intricacies of EFL learning tasks. Consequently, AI assessment might not furnish language proficiency reference scales corresponding to various score levels (Liu & Wu, 2020). Meanwhile, AI assessment may also overlook the progression of students' English knowledge over an extended period (Zou & Wang, 2021). Furthermore, AI tools should be improved to incorporate an early warning mechanism for EFL learners.

Several key improvements in AI should be pursued to overcome these technological constraints. First, AI systems should be enhanced with advanced natural language processing algorithms capable of deciphering intricate, complex language structures and contexts and fostering creative thinking. Integrating machine learning models trained on diverse linguistic data can help AI interpret contextual texts more accurately and produce more natural and creative outputs. Second, incorporating adaptive learning technologies that personalize the AI's responses based on individual learner profiles can mitigate the issue of mechanized and formulaic language production, promoting a more personalized and dynamic learning experience. Third, developing robust evaluation criteria that reflect the nuances of EFL learning tasks is essential. These criteria can be accomplished by incorporating input from experienced EFL educators into the AI's assessment algorithms, ensuring that proficiency scales are comprehensive and represent different skill levels. Finally, implementing an early warning system within AI tools can help monitor and track students' progress over time, providing timely feedback and intervention strategies to support continuous improvement in language acquisition. These suggestions could enhance the efficacy and responsiveness of AI systems in EFL education, fostering a more

engaging and practical learning experience.

3.2 Teachers and Students' AI Acceptance and Application Competence

The integration of AI into EFL instruction presents a significant challenge in terms of the willingness of teachers and students to adopt AI technologies. Resistance to change is a common phenomenon, particularly in educational settings where traditional methods have long been established and are perceived as effective. This resistance may be attributed to several factors, including a lack of familiarity with AI technologies, concerns over their reliability and effectiveness, and a deep-seated belief in the superiority of conventional pedagogical approaches (Alieto et al., 2024). Additionally, there is often a fear of the unknown, which can manifest as apprehension towards new technologies that require a shift in established teaching practices (Dimitriadou & Lanitis, 2023).

Furthermore, many EFL teachers and students may need more skills and familiarity with AI technologies, which can significantly hinder their adoption and utilization (Du & Gao, 2022). Technological literacy encompasses the ability to operate digital tools and an understanding of how these tools can be integrated into the teaching and learning process to enhance outcomes (Casal-Otero et al., 2023). Without adequate training and ongoing support, teachers may feel overwhelmed by the complexity of AI technologies, leading to reluctance or outright resistance to their use (Du & Gao, 2022). Similarly, students who are not well-versed in using AI tools may find them intimidating, which can impede their learning experience and reduce engagement.

To address the challenges in AI acceptance and the proficiency required for its application, researchers have posited that the successful integration of AI in educational settings hinges on more than the technology's reliability. It also critically depends on the attitudes and perceptions of its end-users, encompassing both EES teachers and students (Wang et al., 2021). A multifaceted approach is essential to surmount these obstacles, encompassing extensive training and robust support systems. Additionally, it is imperative to illustrate AI's advantages to the EFL instructional experience, such as tailored learning paths and heightened student engagement (de Oliveira Lima et al., 2024).

3.3 Privacy and Ethical Issues

In the era of AI application in EFL instruction, significant challenges arise around privacy and ethical issues. As educational institutions adopt online and blended learning, AI applications process vast amounts of learner data, raising concerns about data privacy protection and management and potential biases and discriminations in data collection and use (Hockly, 2023). The lack of transparency in data collection is particularly alarming, especially concerning adolescent learners, where informed consent is often overlooked (Han, 2022). The ethical implications of surveillance in learning analytics are profound. Although AI can identify at-risk learners, it may unfairly penalize learners with unique learning patterns or personal circumstances, potentially misrepresenting their capabilities and progress (O'Neil, 2016). This bias further underscores the need for educators to consider the ethical dimensions of AI in EFL instruction.

Addressing the privacy and ethical challenges mentioned above is crucial. Teachers and students

utilizing AI tools should engage AI technology vendors to address pertinent issues highlighted by Regan and Jesse (2019). These include information privacy, anonymity of user data, surveillance protocols, user autonomy, non-discriminatory measures, and ownership of information. Strategies must ensure user control over private data and transparency in data usage. Measures should also focus on anonymizing data where applicable, minimizing surveillance, enhancing user autonomy, implementing non-discriminatory practices, and clarifying data ownership rights. This collaborative effort between AI users and providers is essential for fostering a secure environment conducive to the ethical deployment of AI in EFL instruction (Regan & Jesse, 2019).

3.4 Educational Equity

The swift advancement of information technology has exposed a digital divide, where disparities in information literacy among teachers and students pose significant challenges to educational equity in EFL instruction. This divide is characterized by unequal access to tools, varying proficiency in their application, and the consequent impact on academic outcomes (Lutz, 2019). Obstacles, such as limited access to comprehensive databases, insufficient funding, and a lack of targeted AI products, hinder the integration of AI into EFL instruction. Moreover, skill disparities among teachers and students can lead to inconsistent AI application in teaching, affecting both the quality of instruction and student learning outcomes. Addressing the uneven distribution of EFL instructional resources, exacerbated by AI, is thus a pressing concern.

In response to these challenges, the national government should prioritize the research and development of AI and its integration into the educational system to foster digital learning. Schools should collaborate and share AI-driven teaching methodologies and resources to ensure equitable access to quality education. Both teachers and students need to improve their digital literacy and adapt to new technologies, e.g., GPT4.0 and SparkDesk, focusing on assisting those with lower levels of digital literacy (Guo et al., 2023). A collective societal effort is required to achieve a fair distribution of educational resources in the AI era. Looking forward, by 2030, AI is anticipated to revolutionize EFL instruction through intelligent tutoring systems, thereby enhancing the learning experience (Zou & Wang, 2021).

4. Development Trends and Prospects

4.1 Advancement of AI Technology and EFL Learner-Centered Enhancement and Risks

The intelligent era signifies a shift from teacher-centered to more learner-centered classroom paradigms. In this paradigm, individual learners' needs, preferences, and interests play a central role in shaping their learning experiences (Huang et al., 2023). The rapid development of AI technology will further propel this transformation.

Advancements in AI technology, particularly in the field of Natural Language Processing (NLP) and the application of Large Language Models (LLMs), mark the move towards personalized, precise, and human-like educational technology (Zhao et al., 2023). Based on deep learning, LLMs can understand

and generate natural text more profoundly, demonstrating logical thinking and reasoning abilities. These technological advancements not only enhance the accuracy of human-computer interaction but also offer new possibilities for personalized learning. Additionally, the integration of multimodal learning with NLP hints at new directions in AI technology development, such as multimodal large models, intelligent agents, VR, AR, and humanoid robots. Applying these new technologies in EFL instruction could strengthen the learner-centered approach.

This learner-centered strengthening encompasses EFL teaching, learning, and assessment. Teachers can use AI to translate rich educational resources into multiple languages and integrate them into virtual teaching environments, achieving immersive teaching that transcends the limitations of traditional physical settings, thereby enhancing students' learning experience and efficiency. In learning, AI can help students formulate more personalized learning paths to accommodate the unique intellectual differences of each student, thereby optimizing learning outcomes. In assessment, teachers can use automated assessment and feedback systems to quickly and accurately evaluate students' assignments, tests, and exams, providing personalized feedback and suggestions based on the assessment results and helping students identify and correct errors. This AI facilitation can free teachers more time and energy to consider better teaching strategies and conduct educational research.

However, despite AI's ability to strengthen the learner-centered approach in EFL instruction, there are risks of exceeding this approach. Over-reliance on AI technology could lead to a decline in students' self-directed learning abilities and trigger privacy and data security problems. Therefore, while leveraging AI to enhance EFL instruction, we must also address these potential risks to ensure that technological advancements genuinely serve the learner-centered approach rather than deviating from its original intention.

4.2 Innovation in EFL Instruction Models

The integration of AI will revolutionize the personalized learning experience in EFL instruction. AI systems can analyze students' behavior patterns, ability levels, and personal preferences, thereby customizing personalized learning plans and resources (Wei, 2023). This customized learning path not only effectively meets each student's unique needs but also provides real-time feedback and tutoring through intelligent agents or virtual assistants. Humanoid robots, acting as learning partners, simulate real dialogue scenarios and interact with students, offering opportunities for EFL practice and enhancing students' communication skills.

The further development of AI, combined with VR and AR, will bring multimodal and immersive learning experiences to EFL instruction. The vivid language learning scenarios AI creates make students feel as if they are in a native language environment. This immersive learning method not only increases students' opportunities for language practice but also enhances their interest and motivation in EFL learning (Edmett et al., 2023).

The development of AI technology provides continuous EFL learning resources and support, aiding learners in achieving their lifelong learning goals. Learners can access learning materials and tutoring

anytime and anywhere. This support is not limited to classroom teaching but extends to learning needs in daily life. The development of AI technology offers learners a comprehensive language learning solution, ensuring continuity and personalization of learning activities and promoting long-term language proficiency development (Wei, 2023).

In addition, AI provides scientific decision-making support for teachers and educational institutions through learning data analysis (Cardona et al., 2023; UNESCO Education Sector, 2019). AI helps teachers formulate more effective EFL teaching methods and resources by analyzing students' learning progress, difficulties, and interests. At the same time, based on analysis and evaluation, AI can provide immediate language correction and improvement suggestions, assisting students in enhancing their language skills.

4.3 The Constructive Impact of AI+EFL Instruction

The extensive application of AI in EFL instruction heralds a profound transformation in the educational field. This transformation requires proactive responses from governments and schools worldwide to formulate and refine corresponding educational policies (UNESCO Education Sector, 2019). These policies should align with the trends in technological development to ensure the quality and fairness of AI+EFL instruction.

AI+EFL instruction is expected to improve privacy protection and educational information security laws for teachers and students (Hutson, 2023). The widespread application of AI in EFL instruction relies on substantial amounts of personal data from teachers and students and educational activity data. Consequently, legislative bodies need to continue refining relevant legal guidelines to protect the privacy and information security of teachers and students.

This integrated education is anticipated to facilitate equitable access to educational resources. AI-driven online learning platforms and applications can overcome geographical and economic barriers, providing more teachers and students access to high-quality English education resources. Teachers and students in remote or economically underdeveloped areas can use the Internet to access advanced AI+EFL learning tools, thereby narrowing the educational gap and promoting educational equity (Liu, 2020).

This integration will likely facilitate the comprehensive establishment of algorithm review systems and mechanisms (Edmett et al., 2023). On a societal level, close cooperation among academia, industry organizations, and government is necessary to develop data usage norms and ethical standards and to establish third-party evaluation systems to monitor algorithm issues. On an individual level, it is essential to enhance teachers' abilities to identify algorithmic biases and to educate students on related knowledge, collectively building a healthy educational application ecosystem that achieves a deep integration of technology and humanity.

In addition, this integration is likely to drive governments to set standards to ensure the quality and effectiveness of AI+EFL instructional products (de Almeida et al., 2021; Straub et al., 2023). The current market has many AI-assisted EFL instructional products of varying quality. Establishing unified

quality standards and certification systems can help schools, teachers, and students choose reliable products, ensuring that teachers and students benefit from them.

4.4 Interdisciplinary Integration and Collaboration

The application of AI in EFL instruction helps promote the integration and collaboration of AI technology with multiple disciplines (Cheng, 2018). This can achieve cross-integration of knowledge and skills between different disciplines, generating more innovative ideas and solutions and improving the quality and efficiency of EFL instruction. For example, AI can analyze students' English pronunciation and writing, offering real-time feedback. This analysis involves not only linguistics but also computer science and data science. By analyzing students' language expressions, AI can propose targeted improvement suggestions. AI can track and analyze students' learning behaviors, helping teachers understand students' learning habits and preferences. Teachers can better understand students' needs and design more effective teaching strategies by combining linguistics, education, and psychology knowledge. Therefore, the application and development of AI in EFL instruction involve interdisciplinary integration and collaboration, inspiring the development of AI technology, imparting more humanistic value, and further promoting innovation and improvement in EFL instruction.

5. Conclusion

In summary, with the rapid development of AI, its application in EFL instruction has become an important driving force for educational innovation. The diverse applications of AI in EFL instruction have not only greatly improved teaching efficiency and personalized learning experiences but also provided teachers with powerful teaching support tools. However, the application of AI also brings challenges and risks, such as the unequal distribution of EFL instructional resources. Therefore, governments, schools, and educators need to work together. By improving digital literacy, sharing AI-driven teaching resources and methods, and other means, they can promote the healthy and sustainable development of AI+EFL instruction. These measures ensure that technological progress can benefit every learner, achieving dual enhancements in the quality and equity of education.

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