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Artificial Intelligence in English Second-Language Acquisition: Roles, Challenges, and Optimization Pathways

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Abstract. Artificial intelligence (AI) is extending the range of input, feedback, practice and personalised support for English as a second language learning. AI has been applied widely in language education for automated writing evaluation, chatbot-based interaction, adaptive learning, and instructional assistance, and is now helping to enhance the efficiency of learning and student autonomy. However, the rapid development of AI has also brought about several issues, such as a lack of long-term studies, inconsistent integration into teaching, over-reliance on machine-generated answers, and unresolved ethical problems of privacy, bias and academic integrity. This paper examines the application of artificial intelligence in English as a foreign language learning and explores how to improve it. Based on narrative literature review and conceptual analysis of representative studies in AI-enhanced language education, this paper will collect relevant research results and point out existing deficiencies. According to the above analysis, AI will act as a support for teaching and learning, not a replacement for it. The future direction will be focused on personalised guidance, multimodal learning, stronger empirical validation, and responsible governance.

Keywords: artificial intelligence, second language acquisition, English learning, generative AI, language education

1. Introduction

Artificial Intelligence is now one of the most influential technologies in language education. Now that AI systems are available, they can offer students all sorts of personalised study, exercises and other support services according to their current language ability, and are far more advanced than the old computer-assisted language learning programs. English as a Second Language learners need to receive sufficient input, participate in meaningful output, get timely feedback and stay interested in learning. At the same time, with the rapid development of AI, new problems have arisen: many tools have been adopted in a hurry without proper assessment, and their actual teaching effectiveness is unknown.

This paper addresses the following three questions. First, what are the development background and theoretical basis of AI in English second-language acquisition? Second, what are the current applications of AI and what problems restrict their educational value? Third, how can AI be optimised to support language learning rather than hindering it? Accordingly, this paper consists of

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three sections: research background, current applications, existing challenges, and optimization strategies.

This is a theoretical paper based on a narrative literature review and conceptual analysis, not on empirical classroom data. It can offer a system for exploring how artificial intelligence is used in education, identify current problems in that process, and put forward new directions for research and teaching. It can help to connect the enthusiasm for new technology with educational practice and provide strong support for the continuous development of AI-assisted English learning.

2. Background: theoretical basis and development of AI in English second-language acquisition

2.1. From computer-assisted language learning to AI-enhanced learning

At various times, technology has been introduced into language education to address different problems; now, many advanced AI systems are available. At first, the only functions of these digital tools were vocabulary drills, grammar exercises and fixed feedback. They had limited functions and could not meet the different needs of different learners. With the development of machine learning and natural language processing in recent years, large language models have gradually appeared and are now more versatile and interactive. Therefore, learning English is more personalised, intelligent and responsive today.

2.2. Theoretical compatibility with second language acquisition

AI technology perfectly fits the core requirements of second language acquisition, including sufficient linguistic input, repeated output practice, real-time interaction and timely feedback. According to Vygotsky's sociocultural theory, artificial intelligence can provide digital support in the learning zone of the student to offer numerous reading and listening materials, simulate communication, correct errors, and adjust task difficulty. AI can offer these learners an alternative place to study if they do not have regular contact with English speakers [1]. It will also be less dependent on class hours and provide more opportunities for practice. Therefore, AI is not only a technological advancement but also a tool to meet the demands for learning in second language acquisition.

2.3. The changing role of learners and teachers

The Spread of AI has also altered the roles of students and teachers. The learners are no longer passive recipients of knowledge; they can use AI to study language, correct writing and practise speaking on their own. Teachers are now moving from being the sole sources of knowledge to designers, guides and facilitators of learning. There will be new roles and functions. AI, if used without pedagogical design, cannot foster learners' initiative or improve teaching effectiveness. For this reason, the background of AI in second language teaching should be viewed as changes in educational relations and not merely as technological progress.

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3. Current status and challenges: applications and limitations of AI in English learning

3.1. AI in writing support and automated writing evaluation

Among the current applications of AI in English as a Second Language learning, writing support is one of the most mature. Automated Writing Evaluation (AWE) systems and generative AI tools can identify grammatical errors in student writing and suggest different words to help them revise their essays. These tools are very suitable for learners who require immediate feedback, which is not always available from teachers. Li et al. have shown that the holistic scores of AWE can be used as a form of formative assessment in ESL classes, but they should not replace human assessment but work alongside it. At the same time, the AI writing assistance is also relatively superficial [2]. It can help improve grammar and expression, but it does not always help learners learn logic, argumentation or rhetorical awareness. Therefore, AI writing tools should be regarded as aids to assist people's work, not replacements for human labour.

3.2. AI in speaking, interaction, and conversational practice

AI also provides an effective platform for oral English practice. AI chatbots and conversational systems can be used to practice speaking repeatedly by asking and answering questions in a relaxed setting. This is good because many second-language learners are reluctant to speak in class due to the fear of making mistakes. Du and Daniel systematically reviewed 24 empirical studies and found that AI-powered chatbots can help students reduce speaking anxiety and improve their pronunciation, confidence and interest in EFL [3]. Wang and others further showed that visually embodied GenAI chatbots can motivate students more to communicate and reduce their fear of speaking foreign languages compared with traditional teaching methods. Wan and Moorhouse used Call Annie as an AI speaking partner to study its application in independent practice and warned that it could not replicate the rich culture and society of human interaction [4]. However, the current AI conversation systems still have deficiencies in pragmatics, discourse coherence and culturally appropriate interaction [5]. They can produce fluent but unnatural-sounding responses; that is, the learners have received language input that is technically correct but communicatively deficient. Therefore, although AI is convenient for practice, it cannot replace genuine human connection entirely.

3.3. AI in personalized learning and teaching support

AI is now also being used to personalise learning. According to the learners' data, the AI system can recommend vocabulary and grammar exercises, reading materials and listening tasks suitable for them. It will address learners' deficiencies more efficiently. AI also assists teachers in lesson preparation, material organization and assessment management. These functions will reduce teachers' workload and increase teaching flexibility. However, personalisation is also limited by the quality of the data and the design of the system. If the model has been poorly trained or is too general, the recommendations may not be suitable for the learner's level. Personalisation is thus promising but not yet widely implemented.

3.4. Main research gaps and practical challenges

Although research on AI in language education has increased in recent years, some deficiencies still exist. Firstly, many studies are relatively short in duration and have a small number of subjects, thus

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failing to assess the long-term impact. Ngo et al. conducted a three-level meta-analysis of AWE effectiveness and found that while it generally improved writing quality, such improvement varies significantly across learning contexts and learner populations. Secondly, most research focuses on user satisfaction or task completion and pays little attention to the development of language [6]. T. Third, there is a lack of comparison between AI-based feedback and teacher-based or peer-based feedback. Ranalli found that L2 students' participation in automated feedback is uneven; they lack trust and only use superficial revision methods for learning. In addition, the following ethical issues have not been addressed: data privacy, algorithmic bias, academic integrity and unequal access to advanced technologies [7]. J. Peer Mohamed listed the various types of bias, such as algorithmic, demographic, cultural and linguistic, that could harm underrepresented groups of learners in AI-enhanced language education. The above problems show that AI in English education is not perfect and requires more studies [8]. In other words, the current situation is not simply one of development, but rather a combination of educational prospects and actual risks.

4. Optimization pathways: how AI can better serve English second-language learning

4.1. Theory-informed integration into language teaching

The first optimisation path is to incorporate artificial intelligence into language education based on educational theory and not just for convenience. AI should be embedded into clear learning goals, classroom activities, and feedback mechanisms. For example, in writing instruction, learners can have their work initially reviewed by AI; however, under the teacher's direction and after self-correction, they need to revise it further. Thus, AI can be used in the course of learning rather than just at the end. Theory-informed integration can help guarantee that AI serves to enhance language learning rather than promoting passive learning.

4.2. Personalized and tiered support

The second optimisation path is to increase personalisation. The learners are of different levels, have different habits and goals. A beginner needs basic vocabulary scaffolding and simple sentence correction; an advanced learner, on the other hand, is in the discourse-level and genre-analysis stage. Therefore, the AI system should offer different kinds of support and not use a single type of feedback. Personalised design can make AI educationally more meaningful and closer to the real development of learners. It can also help avoid the problem of over-generalised responses that do not meet the needs of learners.

4.3. Expansion toward multimodal learning

The third way is to move beyond text-based functions and add support for multiple modes of language. Learning English also includes listening and speaking, as well as pronunciation and interaction, not just reading and writing . Li and others have found that technology-supported multimodal feedback can improve students' writing abilities in a second language by using multiple senses, such as sight, sound and text . Therefore, the future AI system will integrate text analysis, speech recognition, pronunciation correction and interactive dialogue [9]. Multimodal learning can provide all-encompassing and vivid language environments. It can also make AI more practical for communicative competence and linguistic accuracy . It is also suitable for students who need to practise several languages at the same time.

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4.4. Strengthening empirical validation and comparative research

The fourth way is to strengthen empirical support with data. Currently, most of the research on AI in language learning is either based on limited observations or has only short-term effects. Future studies will use longitudinal, mixed-methods and comparative designs to determine whether artificial intelligence is actually helping students learn better over time. Researchers need to compare various kinds of AI feedback, different learner groups and different educational environments. It will increase the reliability of the evidence base and help differentiate real learning gains from temporary novelty effects. To develop AI-based language learning in schools more smoothly, more studies are needed.

4.5. Building governance and AI literacy

The fifth is to improve governance and AI literacy. Teachers and learners need to know how to use AI ethically, critically and effectively. Teachers and learners should be aware of the risks to personal information, verify the accuracy of AI output, and use AI to enhance learning rather than to replace it. Schools and institutions should set specific rules for the use. Good governance is required to address problems such as ethics and pedagogy in AI for education. If users can evaluate AI output critically and use it responsibly, it will produce greater educational benefits [10].

5. Conclusion

This paper has examined the role of artificial intelligence in English as a foreign language education theoretically. Based on the above analysis, AI is now used in many ways in language teaching to expand learning opportunities and provide individualised support. It has the following advantages: it is more convenient, promotes student self-directed learning, and expands learning opportunities beyond the classroom. At the same time, the paper also shows that AI cannot be regarded as an all-encompassing solution for language learning. The educational value of AI will be determined by how easily it can be incorporated into teaching, how responsibly it will be used, and whether learners and teachers can critically interpret the results.

In short, AI should be used to support human teaching and not to replace it. Currently, there are promising applications in writing support, conversational practice, and individualised learning, but they are still limited by shallow feedback, short-term evidence, over-reliance, and ethical risks. Therefore, the future direction of AI in English as a Second Language (ESL) teaching should focus on theory-informed design, personalisation, multi-modality expansion, strengthened empirical verification, and governance.

A deficiency in this paper is that it is a theoretical study and lacks primary classroom data or experiments. Future research can use a longer-term method, combine various types of data, and compare the results in different environments. Also, future studies could examine how AI affects learners at different proficiency levels in comparison with teacher feedback, and determine whether AI literacy influences learning outcomes. In the future, the main question may not be whether AI should be introduced into language teaching, but rather how it can be used in a way that is both pedagogically reasonable, ethically responsible, and academically feasible.

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