AI-Enhanced Chinese Learning: Transforming Foreign Language Vocabulary Acquisition in the Digital Age

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Abstract: Artificial Intelligence (AI) technology has brought transformative changes to foreign language vocabulary teaching—particularly in Chinese as a Foreign Language (CFL) education. It addresses key limitations of traditional methods, offering innovative solutions to enhance teaching and learning outcomes. This study explores the application status and practical implementations of digital intelligence technology in CFL instruction. By analyzing the deployment scenarios of digital intelligence resources and AI technologies, it probes into the mechanisms through which AI-enabled tools assist learners in deepening understanding of vocabulary usage and cultural connotations, with the goal of providing forward-looking insights to promote ongoing innovation and progress in this domain.

Keywords: Artificial Intelligence; Chinese as a Foreign Language (CFL); Vocabulary Acquisition; Personalized Learning; Digital Education

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1.Introduction

As the wave of technological advancement surges forward, Chinese Education consistently explores new paths empowered by digital intelligence and guided by wisdom, continuously striving for innovation. The 2025 Global "Confucius Institute Day" issued an initiative for a themed year focused on digital intelligence. Advocating for the theme "Building a Smart Network for Chinese Education and Sharing High-Quality Resources," the years 2025 to 2027 were designated as the Confucius Institute Digital Intelligence Themed Years. This initiative aims to leverage the advantages of digital intelligence technology, develop teaching resources and "AI Teaching Assistants," enhance the interactivity and fun of teaching and learning, and achieve an organic integration of traditional pedagogy with innovative concepts.

This study aims to systematically explore the application status and practices of digital intelligence technology in CFL. By analyzing the application scenarios of digital intelligence resources and AI technology, this study entails investigating how AI tools can assist learners in comprehending various meanings embedded in words and aiming to provide forward-looking insights for the continuous innovation and advancement of this field.

2.AI Technology in Foreign Language Vocabulary Teaching

The development of digital and intelligent technologies has undergone multiple iterations, evolving from theoretical germination to large-scale application, and forming a development pattern with both technical depth and application breadth. These technologies are gradually permeating all links of CFL, driving the transformation of CFL from "traditional education" to "digital and intelligent education".

2.1 Intelligent Vocabulary Learning Apps

Intelligent vocabulary learning apps, powered by AI, have emerged as transformative tools in foreign language education, especially in Chinese teaching and learning (Li and Hao, 2026). Take Baicizhan—a popular AI-driven language learning app—as an example. It uses AI algorithms to analyze users' learning habits, vocabulary proficiency, and memory patterns, generating highly personalized learning plans. For instance, users preparing for

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standardized tests like TOEFL or IELTS receive prioritized high-frequency vocabulary lists and progressive difficulty schedules tailored to their progress. Baicizhan also integrates an AI-enhanced smart review function based on spaced repetition—a memory-based algorithm. Words that users struggle to retain are presented more frequently, while mastered words are reviewed at longer intervals. This approach optimizes memorization efficiency and enhances long-term vocabulary retention.

Another notable app, Youdao Dctionary has been integrated with DeepSeek, an powerful AI tool to optimize vocabulary acquisition, offers AI-powered memory aids, such as detailed word explanations (etymology, collocations, synonyms) tailored to users' progress. For example, learners proficient in basic vocabulary but struggling with advanced terms receive targeted advanced materials and exercises. Additionally, it provides different functions such as AI-Q&A, AI-Translation and AI-assistant Xiao P helps to give all-rounds support for language learning groups, enriching the learning experience.

2.2 Automated Assessment Tools

AI-powered automated assessment tools like Pigai Network plays a critical role in CFL vocabulary teaching. Pigai Network automates vocabulary assignment grading using Natural Language Processing (NLP) and Machine Learning (ML): when students submit written or translation tasks, the AI system parses text into words and phrases, comparing them against a comprehensive vocabulary database and semantic/grammatical rules.

For example, the system evaluates whether vocabulary is used correctly in grammar, semantics, and collocations in student essays. It identifies errors (e.g., incorrect usage, wrong collocations, spelling mistakes) and provides detailed feedback with corrections. This automation saves teachers significant grading time while delivering instant feedback, enabling students to address mistakes promptly.

Beyond grading, Pigai Network assesses vocabulary proficiency by analyzing word complexity, high-level vocabulary frequency, and sentence structure. It generates personalized reports highlighting strengths and weaknesses, guiding teachers in designing targeted instruction and helping students adjust learning strategies.

Additionally, Pigai Network offers AI-driven personalized recommendations. Based on assessment results, it suggests relevant materials—vocabulary lists, reading passages, online courses—to address specific gaps.

3.Advantages and Limitations

Digital and intelligent education has rapidly reshaped the traditional educational landscape in the digital era. It provides personalized learning for learners, improves the teaching efficiency and quality, as well as presenting plentiful resources, yet it also exposes a series of practical challenges and drawbacks in application and data security.

3.1 Advantages

AI technology offers distinct advantages that revolutionize foreign language vocabulary teaching, transforming traditional learning paradigms.

3.1.1 Personalized Learning Experience

AI is pivotal in delivering personalized vocabulary learning experiences (Liu, 2024). By collecting and analyzing learner data, AI systems identify individual characteristics—such as learning style (visual, auditory, kinesthetic)—to design tailored pathways.

For visual learners, AI recommends image-rich materials (diagrams, animations). For example, teaching "村落 (cunluo，villages) involve displaying maps of Chinese villages and corresponding images to reinforce visualization and memory. Auditory learners receive audio resources—pronunciation recordings, vocabulary podcasts, or stories featuring target words.

AI also adapts to learning speed and proficiency. Advanced learners access complex vocabulary (idioms, technical terms) and challenging exercises, while beginners start with basic vocabulary and progress gradually. AI apps adjust difficulty based on performance—mastery of basic vocabulary triggers automatic progression to

advanced content.

3.1.2 Providing Abundant Learning Resources

AI technology integrates and curates vast vocabulary learning resources (Wang, 2025). In the digital era, a wealth of materials—text dictionaries, vocabulary lists, audio-visual contents, and interactive games—are available, and AI identifies the most relevant, high-quality resources for learners.

For example, AI-powered platforms search thousands of Chinese articles, news stories, and academic papers to select texts containing current vocabulary. When teaching festival-related vocabulary, AI recommends Spring Festival or Mid-Autumn Festival videos, combining vocabulary exposure with cultural context.

AI also generates customized resources using natural language generation. It creates personalized exercises—fill-in-the-blanks, sentence construction, matching games—tailored to proficiency levels. Intermediate learners, for instance, receive exercises focusing on word collocations and contextual usage rather than basic definitions.

Additionally, AI facilitates access to resources through translation and subtitling. For CFL learners, AI translation tools convert Chinese materials into native languages, and video subtitles enhance comprehension, expanding access to diverse learning content.

3.2 Limitations

Despite its merits, AI in foreign language vocabulary teaching has inherent limitations.

3.2.1 Deficiencies on emotions and self-learning abilities

Excessive reliance on digital and intelligent technologies may bring negative impacts on students' physical and mental development and core abilities. The convenience of obtaining direct answers from AI tutors may make students lose the willingness and ability of independent thinking and hands-on problem-solving, gradually forming a strong psychological dependence (Jiang and Xu, 2025). Over-reliance also discourages critical thinking: learners may accept AI explanations uncritically, failing to explore alternative interpretations.

Language learning involves cultural understanding and emotional connection—elements AI cannot replicate. Teachers provide encouragement, empathize with frustration, and share personal experiences to motivate learners. The lack of face-to-face communication and emotional interaction between teachers and students, as well as among students, in the intelligent education environment may lead to the deficiency of students' social communication skills, emotional perception and empathy ability, which is not conducive to their all-round development.

3.2.2 Data Privacy and Security Concerns

AI platforms involves the large-scale collection, storage and analysis of extensive personal information and learning data (histories, scores, contact information), raising privacy risks (Liu, 2024). If the data management system is not perfect and the security protection measures are not in place, there will be serious risks of data leakage, misuse and even illegal trading, which endangers students' personal information security. Misuse of data (e.g., targeted advertising) also undermines trust. Clear regulations and robust security measures are essential to mitigate these risks (Jiang and Xu, 2025) .

4.Implications

The widespread application of AI tools in vocabulary learning has brought profound implications for teachers, learners, educational institutions, and policymakers, reshaping the traditional landscape of vocabulary instruction and acquisition.

4.1 Implications for Teachers and Learners

For teachers, AI integration requires enhanced technical proficiency. Educators must master AI tools (vocabulary apps, platforms, assessment tools) and integrate them seamlessly into lessons (Huang, 2025). For

example, teachers can use AI platforms to assign level-specific vocabulary tasks and analyze assessment data to identify gaps requiring in-class reinforcement.

For learners, rational AI usage matters. AI provides resources and plans, learners must engage actively—critical thinking, connecting new vocabulary to existing knowledge, and practicing in real communication. For example, learners should create original sentences using AI-provided examples to master usage. Learners also need digital literacy skills: navigating platforms, interpreting AI feedback, and protecting data. These skills enable effective use of AI tools and enhance learning efficiency.

4.2 Implications for Educational Institutions and Policy-makers

Educational institutions play a critical role in AI integration. They must invest in infrastructure—high-speed internet, updated devices, and AI software licenses—to support AI-based teaching. For example, universities should ensure computer labs are equipped to run AI vocabulary apps smoothly.

Institutions should also provide teacher training on AI principles, tool usage, and data analysis. Workshops can teach educators to interpret AI-generated reports and design data-driven lessons. Encouraging participation in AI-assisted language teaching research fosters best practice sharing.

Policy-makers must formulate policies to promote responsible AI development in education and provide financial support for AI language product (Liu, 2024). They need to establish standards for AI vocabulary learning tools to ensure the accuracy of learning content, protect learners' data privacy (data encryption, security audits, transparent privacy policies), and guide the healthy development of AI in education, so as to maximize the positive impact of AI on vocabulary education and promote the overall improvement of language education quality.

5.Conclusion

In conclusion, AI technology has brought transformative changes to foreign language vocabulary teaching—particularly in CFL instruction. It addresses key limitations of traditional methods, offering innovative solutions to enhance teaching and learning outcomes.

AI is not a panacea, but when combined with traditional teaching methods and used responsibly, it serves as a powerful catalyst for improving CFL vocabulary teaching quality and effectiveness. Further research and innovation are needed to fully unlock AI's potential, developing integrated teaching models that leverage the strengths of both human instruction and AI assistance.

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