

# Leveraging AI for Enhanced English Learning: A Study of University Students' Preferences and Perceptions in China

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## Abstract

This study investigates the preferences and perceptions of university students in China towards Artificial Intelligence-enhanced English as a Foreign Language (EFL) learning tools. As the integration of AI in educational practices expands globally, its application in English language learning has become increasingly significant, especially within the Chinese context, where English proficiency is highly valued. The research aims to uncover how Chinese university students engage with AI-powered English learning tools and their expectations for improvements in these technologies. Through a survey of 269 participants, the study aimed to explore the perception and usage patterns of these tools across different student populations and to identify areas where AI algorithms can be improved to better support language learning. The study employed descriptive statistics to summarize perceptions, usage intentions, usage purposes, etc., and k-means analysis to identify subgroups explaining usage status, scenarios of use, purposes of use, and possible suggestions for improvement to further identify the different customer groups and patterns. The results of the study show that Chinese university students have a high level of awareness and use of AI tools, with translation software and vocabulary learning apps being the most popular. The study also revealed that personalized learning paths, automated tracking and feedback, and improved search functions were also identified as key areas for improvement. These findings can inform the development of more effective educational technologies that can meet the needs of Chinese university students and improve their English proficiency.

## Keywords

Artificial Intelligence, User Adoption, Purpose of Use Analysis, Improvement Needs, English Learning

## 1. Introduction

The dawn of the digital era has marked the inception of a period of significant educational transformation characterized by the integration of Artificial Intelligence (AI), which has engendered substantial alterations in pedagogical strategies and learning processes (Pan et al., 2023). The global educational landscape has been significantly influenced by AI's capacity to tailor learning experiences (Osadcha et al., 2021), making it an essential component in the delivery of language instruction.

In China, English is revered as an important tool for economic prosperity, modernization, and global integration (Gao et al., 2017), and proficiency in English is widely recognized as an effective mechanism for enhancing cross-cultural dialogue. Against the backdrop of China's recognition of English as an indispensable competency for academic and professional development, the integration of Artificial Intelligence (AI) and language acquisition has become a particularly relevant and important area of academic inquiry (Betal, 2023; Chen, 2024). The significance of this topic is underscored by the rapid digitalization of educational tools and the increasing demand for proficiency in English, especially within the Chinese context. English is not only a compulsory subject in the national curriculum but also a gateway to global opportunities (Chen & Gu, 2022). As such, the exploration of AI's role in facilitating English language acquisition is both timely and of profound importance.

A review of the literature reveals a growing body of research that attests to the potential of AI in enhancing language learning outcomes (Chen, 2024; Bicknell et al., 2023; Ahmani, 2019). Studies have highlighted the personalized feedback, adaptive learning paths, and interactive experiences that AI can offer (Osadcha et al., 2021). A significant amount of academic research has delved into the conceptualization, fabrication, and application areas of complex educational tools, all of which are designed to facilitate collaborative, customized, and malleable teaching and learning experiences (Faqih & Jaradat, 2021; Fu et al., 2020; Parsola et al., 2019).

Despite the proliferation of AI in educational settings, there remains a dearth of comprehensive research examining the preferences and perceptions of Chinese university students towards AI-enhanced English learning tools. This gap is particularly evident in the context of the diverse needs and expectations of learners in a highly digitized educational environment. The primary aim of this study is to investigate the attitudes and preferences of Chinese university students towards AI-assisted English learning. By doing so, the study seeks to uncover the extent to which these tools are integrated into students' learning routines and the areas where they perceive the need for improvement. Guided by this overarching goal, this study poses several research questions:

RQ<sub>1</sub>: What are the preferences and perceptions of Chinese college students' use of AI-driven English learning tools?

RQ<sub>2</sub>: How do Chinese college students perceive the purpose of using these AI-

driven English learning tools?

RQ<sub>3</sub>: What improvements they desire to see in future AI-driven educational technologies?

To address these questions, the research employs a quantitative survey (focusing on multiple-choice questions) that includes a nuanced investigation of how long university students have been using AI-driven English learning tools, the scenarios in which they use them, the purposes for which they use them, and how AI-driven English learning tools can be improved in the future. This methodology allows for a comprehensive understanding of students' behaviors and perceptions.

## 2. Literature Review

### 2.1. AI in Education and Language Learning

The advent of Artificial Intelligence (AI) in educational settings has not only transformed language learning but has also raised important questions about the role of technology in pedagogy. Previous scholarly work has identified a multitude of challenges encountered by learners of English as a Foreign Language (EFL), which often include inadequate exposure to the native language environment, scarcity of immediate feedback and dynamic interaction (Li, 2023), and the absence of genuine linguistic milieus (Bahari, 2022), among other issues. However, the integration of AI into the realm of English language education is ameliorating these challenges. The progression of AI technologies, such as Natural Language Processing (NLP), Machine Learning (ML), and Automatic Speech Recognition (ASR) (Rayhan et al., 2023; Hsu et al., 2021), has endowed AI chatbots with the capability to offer punctual conversational responses and engage in interactive exchanges (Huang et al., 2022; Radziwill & Benton, 2017). These chatbots foster authentic educational scenarios (Junaidi, 2020) and offer emotional and customized support (Smutny & Schreiberova, 2020). Therefore, they have been extensively implemented to hone the linguistic competencies of EFL learners.

As AI tools become more prevalent, they offer unique opportunities for personalized instruction and immediate feedback, which are crucial for language acquisition (Wang et al., 2024a; Wang et al., 2024c; Son et al., 2023; Abdel-Hameed et al., 2021; Burstein et al., 2020). For instance, automated essay scoring systems leverage natural language processing (NLP) to evaluate student writing, providing insights into their linguistic abilities and areas for improvement (Ifenthaler, 2023; Ramesh & Sanampudi, 2022). Moreover, AI-driven chatbots have demonstrated their potential to enhance the affective dimensions of language learning by reducing anxiety and increasing motivation among EFL learners (Chen et al., 2023; Ebadi, 2022). By simulating realistic conversational partners, these tools can provide learners with the opportunity to practice language skills in a low-stress environment, thereby fostering a more positive attitude toward language learning (Song & Song, 2023).

## 2.2. User Preferences and Perceptions of AI in Education and Language Learning

Research into user preferences and perceptions of AI in education reveals a complex landscape of attitudes. In their empirical study, Wang and Xue (2024) conducted an intervention to assess the impact of four AI-driven chatbots—TalkAI, SpeakG, Wenxin Yiyan, and Xunfei Xinghuo—on the academic engagement of Chinese EFL students. Their findings demonstrated a significant positive effect of these chatbots on enhancing academic engagement within Chinese EFL educational settings.

Many scholars have highlighted the positive role of AI tools in education, emphasizing their convenience and potential for customization to meet individual learning needs. Chen et al. (2020) conducted a case study exploring the effectiveness of AI-powered chatbots in language education, revealing students' perceptions and preferences for these tools. Their findings add to the growing body of evidence supporting the integration of AI into language learning environments.

However, while recognizing the advantages of AI, there are also concerns about its potential drawbacks in education. D'Agostino (2023) highlights concerns regarding the reduction of human interaction in AI-mediated learning environments, an over-reliance on technology, and the fear of AI replacing human educators. These concerns emphasize the importance of understanding user preferences and perceptions to ensure the successful integration of AI tools in educational settings.

## 2.3. Role and Aims of AI in Education and Language Learning

The instrumentality of Artificial Intelligence (AI) in educational spheres is characterized by a multiplicity of functions, with the paramount objective being the optimization of learning outcomes (Lee, 2022; Shen & Zhang, 2024). AI's role in language learning, particularly for English as a Foreign Language (EFL), is gaining significant attention due to its ability to offer personalized and adaptive learning experiences.

Studies have shown that chatbots can effectively improve EFL learners' grammar, vocabulary, and speaking skills (Aljohani, 2021; Arini et al., 2022; Li & Peng, 2021). The immediacy and personalization of feedback provided by these tools are seen as valuable assets for learners at all levels. AI-driven systems aim to create an educational environment that is tailored to individual learning paces and needs, making language learning more accessible and engaging. Intelligent learning tools were based on a multitude of emerging technologies, including big data, artificial intelligence, and learning analytics (Wang et al., 2024b). These tools offer functionalities such as intelligent essay assessment, visual feedback, human-machine interaction, and personalized resource recommendations (Chen et al., 2020). Such features contribute to a more dynamic and responsive educational process.

## 2.4. Challenges and Limitations of AI in Education

Despite the numerous benefits, the literature also highlights several challenges and

limitations associated with the use of AI in education. These include issues of data privacy, the potential for algorithmic bias, the need for high-quality data to train AI systems, and the digital divide that may exclude students with limited access to technology (Rudolph, Tan, & Tan, 2023; Selwyn, 2023). A significant concern is the collection and application of student data by AI systems, which can engender apprehensions regarding the confidentiality and security of personal information (Chan & Hu, 2023). Concurrently, the perpetuation of biases present within AI training datasets poses a risk of inequitable treatment for certain learner groups, potentially skewing educational opportunities and outcomes (Ziesche & Kumar Bhagat, 2022).

### 3. Method

#### 3.1. Participants and Procedure

The survey was strategically disseminated via WeChat, reaching out to a diverse cross-section of university students from various disciplines across China. It successfully garnered a total of 269 valid responses, painting a comprehensive demographic picture of the participants. A notable gender distribution within the sample showed a slight predominance of female participants, who constituted 53.2% of the sample (N = 143), suggesting a nuanced gender balance. Male participants were also well-represented, accounting for 46.8% of the respondents (N = 126). The academic makeup of the sample was equally varied, with the majority hailing from engineering, science, and English language majors, alongside a respectable number from the arts, food science, and other fields. The sample spanned across the undergraduate curriculum, from first-year to fourth-year students, and included graduate students in their initial years of postgraduate study. This inclusive sampling strategy has provided a rich and diverse tapestry of the Chinese university student experience, offering a solid ground for the generalizability of our research findings.

#### 3.2. Research Design and Data Collection

The research design of this scholarly endeavor is cross-sectional in nature, utilizing a survey-based approach to garner insights into the awareness, utilization, and perceptions of AI-driven English learning tools among the demographic of Chinese university students. The survey instrument was meticulously constructed to encompass a holistic spectrum of pertinent factors, such as user adoption analysis, purpose of use analysis, usage scenario analysis, and Improvement Needs Analysis in AI-driven algorithms (Table 1).

#### 3.3. Data Analysis

This study employs SPSS 26.0 to be used for descriptive statistical methods to summarize the fundamental characteristics of the sample and the frequency of tool usage, with a particular emphasis on the context within China. Apart from the demographic survey questions, all other questions regarding the current use,

preferences, and attitudes towards AI are in the form of multiple-choice items. For the analysis of these multiple-choice questions, each response option is initially deconstructed into binary variables and then assigned values: respondents who selected a specific option are coded as 1, while those who did not select it are coded as 0. Subsequently, multiple response analysis is conducted to calculate the attitudes and preferences of the respondents.

Moreover, to categorize and delineate the general features of individuals utilizing AI-assisted English learning tools, our study opted for the k-means clustering analysis method. The QUICK CLUSTER command in SPSS 26.0 was utilized, with the specification of three clusters. The convergence criteria were set to an extremely stringent level (CONVERGE (0)), and the maximum number of iterations was capped at 10 to ensure the stability and reliability of the clustering solution. Then, an ANOVA (Analysis of Variance) test is conducted to assess the differences between cluster centers.

**Table 1.** Survey questions and response categories.

Survey dimensions	Survey questions	Response categories
User Adoption Analysis (UAI)	Q <sub>1</sub> : Which AI-based English learning software/platforms have you used?	UAI-1: Translation software (e.g., Baidu Translate, Youdao Dictionary)
		UAI-2: Baicizhan (百词斩)
		UAI-3: Shanbay (扇贝单词)
		UAI-4: Bubei (不背单词)
		UAI-5: Maimemo (墨墨背单词)
		UAI-6: ChatGPT
		UAI-7: Liulishuo (流利说)
		UAI-8: Itest
		UAI-9: BBC Learning English
		UAI-10: Zhixue (智学网)
		UAI-11: Qtyy (轻听英语)
		UAI-12: Hellotalk
		UAI-13: Callannie
		UAI-14: Other
Purpose of Use Analysis (PUAI)	Q <sub>2</sub> : What are the purposes of using these software/platforms?	PUAI-1: To complete daily assignments/essays/translations/reading/research
		PUAI-2: For passing exams
		PUAI-3: Hobbies
		PUAI-4: Improving English proficiency
		PUAI-5: For further study/employment/overseas study
		PUAI-6: Other

**Continued**

Usage Scenario Analysis (WSUAI)	Q <sub>3</sub> : In what scenarios do you usually use AI assistance learning software/platforms?	WSUAI-1: While waiting in line, between classes, or other fragmented time WSUAI-2: During self-study or other concentrated periods of time
Improvement Needs Analysis (IAI)	Q <sub>4</sub> : In which areas do you think AI algorithms need to be improved?	IAI-1: Personalized learning paths IAI-2: Virtual labs and environmental simulations IAI-3: Automatic tracking, assessment, and feedback IAI-4: Intelligent search and recommendation IAI-5: Virtual tutors and coaching IAI-6: Automated memorization and review IAI-7: Emotional intelligence support IAI-8: Simulated exams and exercises

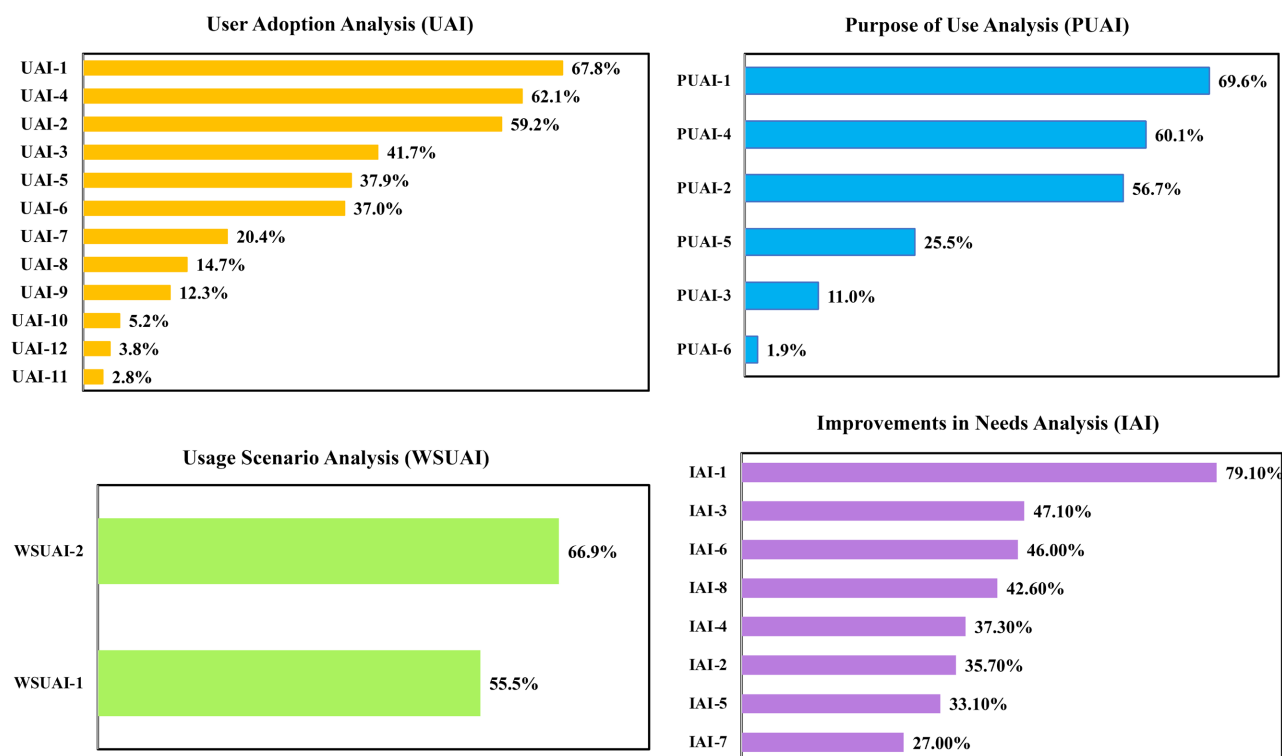
**3.4. Reliability and Validity Test**

The overall reliability of the questionnaire is 0.896, indicating that the reliability of the questionnaire is good and meets the requirements of test theory, making it suitable for large-scale surveys. The Cronbach's  $\alpha$  coefficients for the subscales of self-efficacy, information literacy, and English proficiency are 0.821, 0.865, and 0.818, respectively, indicating that the reliability of each part of the questionnaire is good. In terms of validity, an exploratory factor analysis was conducted, and the construct validity for the subscales of self-efficacy, information literacy, and English proficiency were found to be 0.825, 0.809, and 0.799, respectively, indicating that each part of the questionnaire has good validity in measuring the intended constructs and can effectively reflect the concepts or traits being measured.

**4. Results****4.1. Descriptive Statistical Analysis****4.1.1. User Adoption Analysis (UAI): An Overview of AI-Learning Tool Utilization**

**Figure 1** presents an overview of preferences regarding the use of AI-based learning tools among Chinese university students. The commonly preferred tools in the Chinese context include translation software (e.g., Baidu Translate (百度翻译), Youdao Translate (有道翻译), BaiCiZhan (百词斩), ShanBay (扇贝单词), MoMo Word (墨墨背单词), and ChatGPT, which are commonly used in the Chinese context. The User Adoption Analysis (UAI) section of this study analyzes in detail respondents' usage patterns of various artificial intelligence (AI)-powered English learning tools. Among the many AI English learning software/platforms, translation software (e.g., Baidu Translator (百度翻译), Youdao Translator (有道翻译), etc.) (UAI-1) was the most popular choice at 67.8%, highlighting its indispensable role in facilitating real-time language comprehension and translation

tasks. No Memorized Words (不背单词) (UAI-4) and Momo Words (墨墨背单词) (UAI-2) have adoption rates of 62.1% and 59.2% respectively, indicating a clear preference for tools that enhance vocabulary acquisition through innovative mnemonics.



**Figure 1.** Overview of AI-learning tool utilization among Chinese university students. Notes: Dichotomy group tabulated at value 1.

ChatGPT (UAI-6), with an adoption rate of 37.0%, reflects the burgeoning use of conversational AI to improve language fluency and comprehension. LiuLishuo (流利说) (UAI-7), with an adoption rate of 20.4%, is recognized for its focus on oral proficiency, which is a key component of language mastery. Itest (UAI-8) and BBC Learning English (UAI-9) have adoption rates of 14.7% and 12.3%, respectively, indicating that a large number of users use these platforms for assessment and exposure to well-known educational content. Knowledge Learning (UAI-10), Listening English (UAI-11), and Hellotalk (UAI-12) have lower adoption rates of 5.2%, 2.8%, and 3.8%, respectively, suggesting the existence of specialized tools catering to niche learning preferences such as listening learning and community-based language exchange.

This comprehensive analysis highlights the heterogeneity of AI-assisted English learning tools and the varying levels of user engagement with these technologies. The findings data reveal a diversity of tool preferences that reflect the multifaceted needs of language learners. The findings are instructive for the development of educational technology, suggesting the need for a tailored approach to designing tools to accommodate a variety of learning styles and goals.

#### 4.1.2. Purpose of Use Analysis (PUAI)

Our investigation into the reasons behind the adoption of AI learning tools reveals a nuanced tapestry of user intentions. A predominant 69.6% of users employ AI tools to accomplish daily tasks, indicating a reliance on these technologies for routine academic and research activities. Additionally, a significant portion, 60.1%, utilizes AI with the goal of enhancing their English proficiency, demonstrating a strategic use of AI for skill development.

Furthermore, 56.7% of users engage with AI tools in preparation for exams, suggesting that these platforms are perceived as valuable study aids for achieving success in educational assessments. The use of AI for longer-term aspirations such as further studies, employment, or overseas education is also notable, with 25.5% of users identifying these as their primary motivations.

While the majority of users' purposes align with academic and professional advancement, a smaller yet insightful 11.0% use AI tools as a hobby, indicating a recreational interest in language learning facilitated by technology. Lastly, a minimal 1.9% of users cite other purposes for using AI, which may encompass a variety of personal or unique reasons that contribute to the diversity of user engagement with AI learning tools.

These findings underscore the multifaceted roles that AI plays in supporting users' language learning journeys, from practical task completion to hobbyist engagement, and highlight the broad applicability of AI in meeting individual educational goals and interests.

#### 4.1.3. Usage Scenario Analysis (WSUAI)

Our survey findings indicate that users exhibit a preference for utilizing AI-assisted learning software/platforms across various timeframes. Specifically, 55.5% of users opt to engage with these tools during fragmented time periods, such as while waiting in line or during breaks between classes, suggesting a strategic approach to seizing opportune moments for learning. Conversely, 66.9% of users express a preference for utilizing these platforms during dedicated self-study sessions, highlighting a tendency to allocate concentrated blocks of time for focused learning activities. This divergence potentially reflects the diverse strategies employed by users in managing their time and their preferences for learning environments that cater to their individual study habits and contexts.

#### 4.1.4. Improvement Needs Analysis (IAI)

The empirical survey has discerned a pronounced demand for personalized learning paths (IAI-1), amassing a preference rate of 79.1%, thereby evidencing a marked inclination toward tailored educational experiences. Subsequently, the features of automated tracking, assessment, and feedback (IAI-3) and automated memorization and review (IAI-6) have garnered substantial interest, with respective preference rates of 47.1% and 46.0%, indicating a significant degree of user engagement with these technological dimensions.

These quantitative indicators highlight the collective expectation among users

that AI-driven educational platforms should enable personalized and interactive learning engagements. The Intelligent Search and Recommendations (IAI-4) garnered a 37.3% preference rate, while the feature of Simulated Exams and Exercises (IAI-8) secured a 42.6% preference rate, further reinforcing the desire for adaptive and practical learning tools.

Moreover, the categories of Virtual Labs and Environmental Simulations (IAI-2) and Virtual Tutors and Mentoring (IAI-5) have received extensive endorsement from the user community, with preference rates of 35.7% and 33.1%, respectively. These figures suggest a pronounced appetite for immersive and guided learning experiences that can be facilitated through advanced AI technologies.

Furthermore, the incorporation of Emotional Intelligence Support (IAI-7) has also garnered notable support, with a user approval rate of 27.0%, indicating a recognition of the importance of emotionally responsive systems in enhancing the learning process.

## 4.2. K-Means Analysis

### 4.2.1. The User Adoption Analysis (UAI)

The User Adoption Analysis (UAI) showed that the K-means clustering analysis delineated three distinct user clusters based on their preferences for AI-assisted English learning tools (Figure 2).

Cluster 1: Selective AI Adopters (N = 119)

Known as “Selective AI Adopters,” Cluster 1 exhibits a selective adoption of AI tools, favoring translation software (UAI-1) and vocabulary-focused applications such as 100 Words (UAI-2) and No Second Choice (UAI-4). This cluster, comprising 119 cases, shows a diminished preference for interactive language learning platforms or educational content providers, suggesting a predilection for tools that directly enhance vocabulary and translation skills, without diversifying into a wider spectrum of language learning applications.

Cluster 2: Emerging Technology Adapters (N = 128)

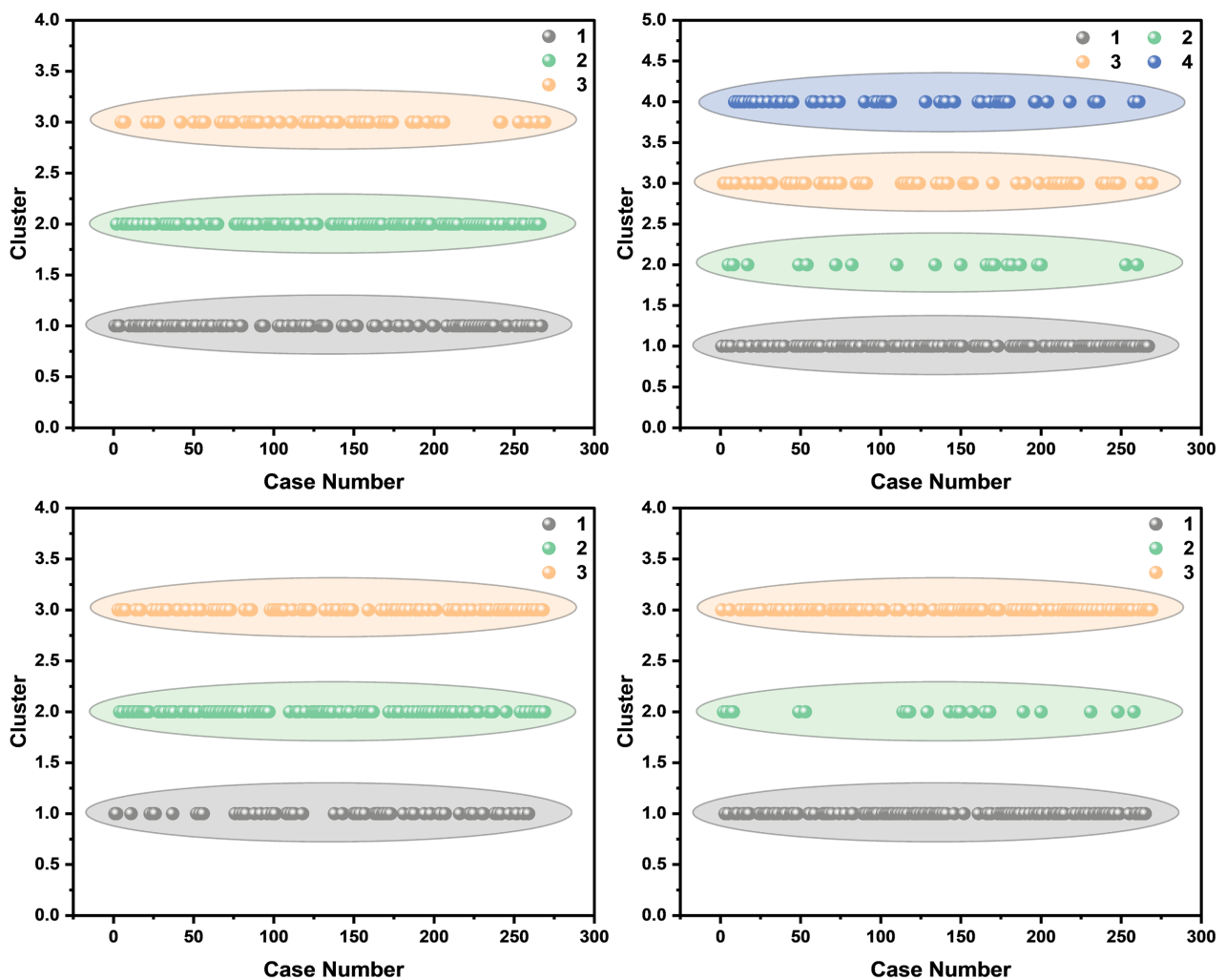
This cluster is called “Emerging Technology Adapters” and is characterized by the adoption of unique AI-assisted English learning tools. Contrary to the other clusters, this cluster is not keen on translation software (UAI-1). Instead, they show a clear interest in innovative AI technologies such as ChatGPT (UAI-6), reflecting their tendency to adopt advanced AI tools in their language learning process. There are 128 cases in this cluster, indicating that a significant proportion of users are open to new AI applications.

Cluster 3: Active AI Participants (N = 22)

Cluster 3, referred to as “Active AI Participants”, shows a strong interest in various AI tools. This group shows a strong preference for translation software (UAI-1), vocabulary-building applications such as Baicizhan (UAI-2), and the anti-text learning tool, Bubei (UAI-4). Their interest also extends to interactive platforms, such as Liulishuo (UAI-7), Itest (UAI-8), and educational content from BBC Learning English (UAI-9). The high preference for these tools, as well as for innovative

technologies such as ChatGPT (UAI-6), suggests that the cohort is proactively integrating AI into different aspects of their language learning experience. With a total of 22 cases, this cluster highlights a small but highly engaged user base.

The results of the analysis of variance (ANOVA) showed significant differences ( $p < 0.05$ ) in the preferences for various AI tools among the clusters, highlighting the unique preferences of each cluster. These F-tests are descriptive, as the purpose of clustering is to maximize the differences between user preferences. It is worth noting that the observed significance levels were not adjusted for multiple comparisons and, therefore, should not be interpreted as a test of the hypothesis that cluster means are equal.



**Figure 2.** Overview of clusters of preferences for AI-assisted tools among Chinese university students.

#### 4.2.2. Purpose of Use Analysis (PUAI)

The Quick Cluster analysis delineated four distinct user segments, each with unique preferences for AI-assisted English learning tools. The clusters are named and characterized as follows (**Figure 2**):

Cluster 1: Comprehensive Academic Users (N = 132)

Cluster 1, designated as the “Comprehensive Academic Users,” exhibits a pronounced preference for utilizing AI tools across a spectrum of academic activities. These users demonstrate a high inclination for employing AI to accomplish daily academic tasks and essays (PUAI-1), prepare for exams (PUAI-2), and enhance their English proficiency (PUAI-4). Interestingly, while they show a notable interest in using AI for educational pursuits, they express a lower preference for engaging with AI tools for hobbies (PUAI-3). Furthermore, the group displays a lack of high preference for using AI for further study, employment, or overseas opportunities (PUAI-5) and no significant inclination towards other unspecified uses of AI (PUAI-6). There are 132 cases in this cluster, suggesting that Cluster 1 is particularly interested in the practical applications of AI in improving English language skills and immediate academic performance rather than for recreational or long-term career development purposes.

#### Cluster 2: Balanced Integration Enthusiasts (N = 20)

Cluster 2, identified as the “Balanced Integration Enthusiasts,” presents a nuanced pattern of preferences for AI-assisted English learning tools, reflecting a balanced approach to integrating AI across both academic and personal interests. Members of this cluster show a strong and consistent high preference for using AI tools for a variety of purposes, including daily academic tasks and essays (PUAI-1), exam preparation (PUAI-2), improving English proficiency (PUAI-4), and for further study, employment, or overseas opportunities (PUAI-5). This cluster accounts for 20 cases, indicating a group that values the comprehensive utility of AI in enhancing their language skills and supporting their academic and professional ambitions.

However, Cluster 2 also stands out by expressing a high preference for engaging with AI tools as part of their hobbies (PUAI-3), suggesting that these users find joy and recreation in the interaction with AI, thereby blurring the lines between work and leisure. This recreational interest is a distinctive feature of Cluster 2 when compared to Cluster 1, which showed a lower preference for AI in hobbies. The Balanced Integration Enthusiasts are characterized by their enthusiasm for integrating AI into all facets of their lives, from academic excellence to personal interests, while maintaining a clear focus on activities that are aligned with their educational and professional goals.

#### Cluster 3: Proficiency-Focused Practical (N = 65)

Cluster 3, labeled as the “Proficiency-Focused Practical,” is characterized by a specific set of preferences that highlight a targeted use of AI tools. This group demonstrates a strong inclination towards using AI to improve English proficiency (PUAI-4), with a high preference indicated in this area. However, they show no significant interest in the other activities measured by the survey, such as daily academic tasks (PUAI-1), exam preparation (PUAI-2), hobbies (PUAI-3), further study or career advancement (PUAI-5), and other unspecified uses of AI (PUAI-6). This cluster accounts for 65 cases, suggesting a user segment that is particularly focused on practical language enhancement and does not extend their interest to recrea-

tional or broader academic applications of AI.

Cluster 4: Minimalist Engagers (N = 52)

Cluster 4 is distinguished by a lack of high preference across most activities, with the exception of completing daily assignments/essays/translations/reading/research (PUAI-1). Unlike any other cluster, Cluster 4 has a high preference for daily academic tasks and essays (PUAI-1), but a complete lack of interest in exam preparation (PUAI-2), hobbies (PUAI-3), further study or careers (PUAI-5), and other uses of AI (PUAI-6). This cluster, which includes 52 cases, suggests a segment of users who are highly selective in their use of AI, focusing on specific areas that directly contribute to their language proficiency and immediate academic requirements without diverting attention to other potential uses. This cluster may represent users who engage with AI tools in a limited capacity, primarily for essential academic tasks and without a strong inclination toward exams, hobbies, or advanced language proficiency.

The Analysis of Variance (ANOVA) outcomes, with significant differences ( $p < 0.05$ ) across clusters for the purposes of using AI tools, further validated the distinctive preferences of each cluster. These F-tests, while descriptive and not adjusted for multiple comparisons, effectively highlight the heterogeneity in user motivations for engaging with AI-assisted learning technologies.

### 4.2.3. Usage Scenario Analysis (WSUAI)

The k-means clustering analysis converged quickly after the initial iteration, and different clusters of users were found based on their usage scenarios of the AI-assisted English learning tool. The final clustering centers are divided as follows, based on users' preferences for WSUAI-1 and WSUAI-2 usage scenarios (**Figure 2**):

Cluster 1: Broad Scenario Users (N = 59)

There are 59 cases that significantly demonstrate a high preference for WSUAI-1 and WSUAI-2, a cluster that represents a wide range of user groups. Their preference makes clear that integrating AI tools into the English learning experience is not only a universally applicable strategy, but also a highly inclusive approach. This finding highlights the potential of AI technology to enhance the efficiency and experience of English learning, further confirming its wide application value and adaptability in diverse learning environments.

Cluster 2: Users of Complementary Scenarios (N = 117)

In this study, the largest cluster of 117 cases is characterized by a low preference for WSUAI-1 and a high preference for WSUAI-2. This feature not only reveals the cluster's preference for different use scenario sets, but also further implies that there may be significant differences in users' choice and acceptance of AI tools in different application scenarios. In particular, a high preference for WSUAI-2 may mean that in some specific use cases, the tool is better able to meet the needs of users and provide more optimized or appropriate features and services. This finding has important value for understanding user behavior, optimizing AI tool design, and enhancing user experience.

Cluster 3: Selective Scenario Users (N = 93)

The analysis of the cluster, which covers 93 cases, clearly shows a high preference for WSUAI-1 and a low preference for WSUAI-2. This finding has important academic value, as it reveals how much attention users pay to specific use cases when choosing AI tools. Specifically, users of this cluster tend to choose AI tools that perform better in specific application scenarios, namely WSUAI-1. This shows that in practical applications, users will evaluate and select AI tools based on specific needs and scenarios rather than solely on the generic performance or functionality of the tool.

An Analysis of Variance (ANOVA) was performed to test for significant differences between the clusters' preferences for the usage scenarios. The results revealed significant differences for both WSUAI-1 ( $F(2, 266) = 1448.866, p < 0.000$ ) and WSUAI-2, with specific F values and significance levels to be inserted. These findings indicate that the clusters are statistically distinct in their usage preferences.

#### 4.2.4. Improvement Needs Analysis (IAI)

The Improvement Needs Analysis (IAI) has identified a range of desired enhancements for AI-assisted English learning tools, with a focus on personalized learning experiences, automatic tracking and feedback, and improved search and recommendation functionalities (Figure 2).

##### Cluster 1: Basic Enhancement Supporters (N = 117)

Cluster 1 is the “Basic Enhancement Supporters” and is characterized by a selective focus on improvements in specific foundational aspects of AI-assisted learning. With 117 cases in this cluster, they place significant value on personalized learning paths (IAI-1) and automated memory and review (IAI-6), which are essential for individualized learning and knowledge retention. However, they exhibit no high preference for enhancements in virtual labs and environment simulation (IAI-2), automatic tracking, assessment, and feedback (IAI-3), intelligent search and recommendations (IAI-4), virtual tutors and mentoring (IAI-5), emotional intelligence support (IAI-7), mock exams and practice (IAI-8), or other unspecified enhancements (IAI-9), suggesting a strategic emphasis on core features that directly influence the learning experience.

##### Cluster 2: Holistic Improvement Advocates (N = 61)

Cluster 2, known as the “Holistic Improvement Advocates,” exhibits a strong and consistent demand for enhancements across all areas of AI-assisted learning. This cluster, comprising 61 cases advocating for a comprehensive enhancement in AI functionalities, this cluster has shown a marked preference for the development of personalized learning paths (IAI-1). They also advocate for advancements in automatic tracking, assessment, and feedback (IAI-3), intelligent search and recommendation (IAI-4), virtual tutors and coaching (IAI-5), automated memorization and review (IAI-6), emotional intelligence support (IAI-7), and simulated exams and exercises (IAI-8). However, they express a lower preference for virtual labs and environmental simulations (IAI-2) and other unspecified improvements (IAI-9), indicating a focus on practical, immediately applicable enhancements to AI learning tools.

### Cluster 3: Specialized Development Seekers (N = 91)

Cluster 3, identified as “Specialized Development Seekers,” with 91 cases, exhibits a focused and targeted preference for specific improvements in AI-assisted learning tools. This cluster has expressed a strong and clear demand for enhancements in personalized learning paths (IAI-1), indicative of a desire for more tailored educational experiences. Unlike other clusters, Cluster 3 does not express a high preference for a broad range of improvement areas. Their specific interest in automatic tracking, assessment, and feedback (IAI-3) suggests a demand for systems capable of providing real-time progress monitoring and adaptive feedback to facilitate more effective learning. The absence of high preference for other areas such as virtual labs and environmental simulations (IAI-2), intelligent search and recommendation (IAI-4), virtual tutors and coaching (IAI-5), automated memorization and review (IAI-6), emotional intelligence support (IAI-7), simulated exams and exercises (IAI-8), and other unspecified improvements (IAI-9) indicates a selectivity that may reflect a pragmatic approach to prioritizing improvements that directly affect learning outcomes and efficiency.

An Analysis of Variance (ANOVA) was conducted to test for significant differences in preferences for usage scenarios among the clusters. The results indicated that the F-statistic is significant ( $p$ -value < 0.05), revealing significant differences in the means of these variables between the clusters. This suggests that the preferences of the clusters for AI-assisted English learning tool enhancements are statistically distinct from one another.

## 5. Discussion

### 5.1. Chinese University Students Have a Very High Adoption Rate of Artificial Intelligence (AI) Tools, Especially Translation Software and Vocabulary Acquisition Applications

The findings of the current study reveal a notably high adoption rate of artificial intelligence (AI) tools among Chinese university students, particularly for translation software and vocabulary acquisition applications. The widespread use of these tools is consistent with the existing literature, which underscores the significance of technology in contemporary educational practices (Osadcha et al., 2021). However, the unique context of China, where English is not the native language, introduces a distinct dynamic in the application of AI for language learning. Our findings support previous research that demonstrates the positive influence of AI on language learning outcomes (Chen, 2024; Bicknell et al., 2023).

Moreover, they uncover specific preferences and usage patterns among Chinese students that have not been extensively addressed in the literature. For example, the preference for translation software over other AI tools may suggest a reliance on real-time translation to surmount language barriers. The popularity of AI-assisted learning tools associated with translation software may be closely related to the nature of traditional English language teaching in China. Specifically, since the 1980s, Chinese English teachers have been encouraged to adopt the Grammar-

Translation Method (GTM), which is prevalent in high schools and colleges, whereas the conventional aspects of the English teaching process have traditionally included text review, explanation of new texts, English-to-Chinese translation of texts, and grammar drills (Lu et al., 2018). The overreliance on translation software by Chinese students during the foreign language learning process could potentially have negative implications for their English learning. It may lead to a mechanized approach to language learning, a phenomenon often referred to as “dumb English,” which is detrimental to the development of active thinking and adaptation to the culture of English-speaking countries. We advocate that educators and researchers in the field of English language teaching in China should pay further attention to students’ learning needs and provide appropriate guidance on the rational use of translation software.

The high usage rates of AI tools, alongside demands for significant improvements, suggest a “satisfaction gap” among users. This gap reflects user’ high expectations for AI tools and their awareness of the tools’ current limitations. Users recognize the potential of AI to enhance their English learning experience but are also keenly aware of areas where these tools fall short of their expectations. For instance, while translation software is widely used and appreciated for its real-time language comprehension support, users also express a strong desire for more personalized learning paths and interactive experiences that current tools may not fully provide.

This satisfaction gap has important implications for future tool development. It indicates that developers need to focus on enhancing key features such as personalization, automatic tracking and feedback, and improved search functionalities. By addressing these areas, developers can better align AI tools with users’ expectations, potentially increasing user satisfaction and engagement.

## **5.2. The Main Motivation for Chinese University Students to Use AI in Foreign Language Learning**

Our study identifies three primary motivations for Chinese university students’ use of AI in foreign language learning. Firstly, they employ AI tools to perform daily tasks, indicating a dependency on technology for routine academic and research activities. Secondly, they strategically utilize AI to enhance their English proficiency, demonstrating a purposeful approach to skill acquisition. Lastly, they use AI to prepare for exams, perceiving these platforms as valuable study aids for achieving success in educational assessments.

The significance of English learning skills in China is underscored by the fact that English has been integrated into the compulsory national curriculum (Chen & Gu, 2022). Chinese students primarily use English learning aids for completing homework assignments, meeting daily study and research needs, such as reading foreign literature, and preparing for exams at various levels. The necessity to pass the CET-4 and CET-6 (The College English Test (CET) is a standardized English proficiency test managed by the Chinese Ministry of Education and is divided into

two levels: CET-4 and CET-6. The CET-4 is designed for undergraduate students in their first two years of study, while the CET-6 is intended for those in their third and fourth years, aiming to assess their English language skills at a higher level) tests is particularly emphasized, as these are crucial for obtaining important foreign language proficiency certificates. These certificates are essential for students seeking employment after graduation or pursuing further education in graduate school.

The integration of AI tools into language learning also has implications for traditional English teaching methods. There is an impact on the traditional knowledge lecturing teaching method, as well as on the teacher-student relationship, which is evolving into a new model of teacher-machine-student interaction in the age of artificial intelligence. While traditional classroom teaching and textbook use remain fundamental, AI tools are serving as supplementary resources that offer personalized learning experiences and immediate feedback. Textbook use is not necessarily being replaced but rather complemented by AI tools that provide interactive and adaptive content, reinforcing what is learned from textbooks. This shift suggests a move toward a hybrid model where AI tools enhance traditional learning resources rather than replace them.

### **5.3. The Preferences and Perceptions of Chinese University Students Using Artificial Intelligence Tools in Different Scenarios**

The finding of this study pertains to the preferences and perceptions of Chinese university students regarding the use of AI tools in different scenarios and the areas for improvement in AI-assisted language learning tools. Our study indicates that students tend to utilize AI tools during fragmented time periods, such as while waiting in line or during breaks between classes. This behavior suggests that they are strategically using moments of downtime for learning, capitalizing on opportunities to study in short bursts. This approach could be attributed to the convenience and accessibility of AI tools, allowing students to engage with learning materials whenever and wherever they find time.

Additionally, there is a marked preference among students for using AI platforms during dedicated self-study sessions. This preference underscores a tendency to reserve blocks of uninterrupted time for focused learning activities, which may lead to deeper engagement with the material and potentially better learning outcomes. Both usage scenarios attract a significant number of users, with more than half of the students surveyed indicating a preference for one or the other. However, there is a slight difference in the preferences, with the former (fragmented time usage) being prioritized over the latter (dedicated self-study time). This prioritization may reflect the students' various strategies for time management and their inclination toward learning environments that align with their individual needs. The distinction in preferences could also be indicative of the students' learning habits and contexts. For instance, some students might find it more effective to engage

in short, frequent study sessions due to their schedules, while others might prefer longer, uninterrupted sessions for more in-depth learning. These findings are valuable for developers of AI-assisted language learning tools, as they point to the need for features that support both types of usage scenarios. This could include functionalities that allow for quick and easy access to learning materials during short breaks, as well as tools that facilitate focused study during dedicated learning periods. Additionally, the feedback from students on areas for improvement can guide the enhancement of existing tools, ensuring they better meet the diverse needs of learners.

Furthermore, our survey of Chinese university students shows that the convergence of AI and education requires more than just providing standardized tools; it also requires a personalized learning experience. Students are looking for AI systems that can design tailored learning paths and deliver educational content that matches their unique learning style and pace. Additionally, they seek systems that provide automated tracking and feedback mechanisms that allow them to closely monitor their academic progress and receive instant guidance. In addition, students clearly want AI tools with features such as automated memory aids, mock exams, and intelligent search and recommendation functions. These elements are intended to synergistically foster an interactive and adaptive educational environment.

Our findings are similar to the observation in previous studies that AI's ability to customize the learning experience has significantly shaped the global educational landscape, making it an important element in language teaching and learning (Osadcha et al., 2021). Empirical studies have highlighted the benefits of personalized feedback, adaptive learning trajectories, and dynamic learning experiences provided by AI, especially in language acquisition (Wang et al., 2024c; Son et al., 2023; Abdel-Hameed et al., 2021; Burstein et al., 2020). For example, automated composition assessment systems based on natural language processing (NLP) can evaluate students' compositions, providing insights into their language skills and areas for improvement (Ifenthaler, 2023; Ramesh & Sanampudi, 2022). The role of AI in language learning, especially English as a Foreign Language (EFL) learning, is increasingly recognized, with studies showing that chatbots can significantly improve the grammar, vocabulary, and speaking skills of EFL learners (Aljohani, 2021; Li & Peng, 2021).

## 6. Conclusion

This study comprehensively examines the preferences and perceptions of Chinese college students toward AI-assisted English learning tools. The study found that the current preferences of Chinese college students for English-assisted learning tools tend to favor translation applications and vocabulary learning, and they are more concerned about the utility of these smart tools in accomplishing daily study, homework, and research, as well as having higher expectations for personalized learning experiences, automatic tracking, and intelligent feedback systems

in the future. The findings highlight the need for AI tools that are adaptable, interactive, and capable of integrating various learning scenarios. This study contributes to the field of educational technology by identifying the specific preferences of an important population—Chinese university students—for AI-assisted language learning. By revealing students' preferences for personalized and advanced AI features, this study provides guidance to developers and educators in creating tools that are not only technologically advanced but also pedagogically relevant. Insights from this study should contribute to the development of AI-powered English learning tools to meet the unique needs of Chinese university students. Personalization and adaptability, innovative features, and the ability to incorporate different learning scenarios are crucial. In addition, users' calls for continuous improvement of AI algorithms should drive the development of future educational technologies.

The results of the study also suggest that AI tools are seen as important aids for test preparation. However, as a cross-sectional study, we cannot rule out the possibility that high-achieving students simply used AI more (correlation) rather than AI, leading to higher grades. Future research could address this limitation by using longitudinal studies or experimental designs that track students' AI use and academic performance over time. Such studies could include pre-tests and post-tests to assess changes in English proficiency and control for variables such as prior academic achievement. In addition, combining statistical methods such as multiple regression analysis allows researchers to explore the relationship between AI tool use and academic performance while controlling for potential confounders.

Although our study provides valuable insights into Chinese college students' preferences and perceptions of AI-enhanced English learning tools, there are some limitations. First, although our sample included students from different disciplines in China, the findings were not categorized by field of study. Future research could conduct a comparative analysis to explore whether there are significant differences in the preferences of students from different disciplines (e.g., engineering and English majors). Second, this study did not delve into the specific effects of widely used translation applications and vocabulary tools on users' English proficiency. While the literature review highlighted concerns that translation software might lead to "dumbed-down English," there is a lack of control groups or longitudinal studies to measure the long-term effects of these tools on English fluency and pragmatic language skills. Future studies could fill this gap by including control groups or longitudinal designs to assess the effects of AI tools in improving English proficiency. Once again, this study only collected students' perceptions of AI tools. Future research could enrich the study by including teachers' and educators' perspectives to gain a more comprehensive understanding of the role of AI in English language teaching and learning. Future research could also explore the impact of AI tools on traditional teaching methods and textbook use, as well as potential changes in teacher-student relationships in the context of AI-enhanced learning.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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