

Beyond Instrumental Use: A TAM-Based Study of AI-Assisted Language Learning Among Chinese University Students

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Abstract

With the rapid advancement of artificial intelligence (AI), particularly in natural language processing and adaptive learning technologies, AI tools are becoming increasingly prominent in foreign language education. However, their pedagogical effectiveness and impact on learning outcomes remain underexamined. Anchored in the Technology Acceptance Model (TAM), this study surveyed 365 Chinese university students to assess their adoption, usage patterns, and perceptions of AI in language learning. The findings reveal that: (1) students primarily use AI for structured tasks such as writing assistance and grammar training, with less emphasis on speaking and listening applications; (2) perceived usefulness, reflected in improved learning efficiency and language knowledge acquisition, aligns closely with students' cognitive and behavioral engagement; and (3) perceived ease of use and teacher guidance jointly shape learning effectiveness, underscoring the critical role of pedagogy in leveraging AI tools. Based on these insights, the study proposes a three-dimensional framework that emphasizes the development of multimodal functionalities to foster intercultural competence, redefines the teacher's role as a strategic facilitator, and advocates for intelligent, learner-centered ecosystems. These recommendations contribute to advancing the integration of AI in foreign language education and provide practical guidance for its pedagogical optimization.

Keywords: artificial intelligence (AI), Technology Acceptance Model, foreign language education, student perceptions, teacher facilitation

1. Introduction

1.1 Background of AI in Education

In recent years, the rapid development of generative artificial intelligence (AI) has significantly transformed the landscape of educational technology, positioning AI as a cornerstone of global educational reform. AI systems are widely recognized for their ability to personalize learning, enhance efficiency, and expand access to quality education across diverse contexts (Dziuban et al., 2018). In China, the release of the *State Council's notice on issuing the plan for the development of a new generation of artificial intelligence* (2017), the *Notice on the issuance of the "Education Informatization 2.0 Action Plan"* (2018), and the *Guiding Opinions on Promoting the Construction of New Educational infrastructure* (2021) explicitly framed "AI + Education" as a national strategy. The Ministry of Education's 2023 priorities further emphasized deep integration of intelligent technologies across the teaching process, marking a critical phase in the intelligent transformation of foreign language education.

Nevertheless, foreign language education in higher education continues to face three persistent contradictions: (1) the misalignment between standardized curricula and individualized learning needs, (2) the tension between one-way knowledge transmission and students' increasing demand for autonomous learning, and (3) the mismatch between the immediacy required in language reinforcement and the temporal constraints of traditional classroom instruction. These challenges have become structural bottlenecks that restrict improvements in the quality of college foreign language education.

1.2 AI as a Pathway for Reform

AI offers potential solutions to these contradictions. Studies suggest that intelligent writing tools enhance L2 composition (Liu & Zou, 2025), speech-to-text applications improve pronunciation and confidence (Leis, 2025), and

corpus-based natural language processing (NLP) innovates vocabulary and grammar instruction (Jiang & Tang, 2024). Moreover, multimodal interaction technologies such as VR/AR and affective computing provide immersive environments, while generative AI platforms such as ChatGPT facilitate instructional innovation (Amir & Ana, 2024).

Despite these advances, current research remains limited and contested. Evaluations of AI's efficacy are often narrow, emphasizing vocabulary retention while neglecting broader competencies such as intercultural communication (Wei & Nie, 2025). Concerns about data reliability (Crompton et al., 2022; Zhou & Li, 2023) and the risks of overreliance on AI outputs (Yusuf et al., 2024) further complicate assessments of its educational value.

1.3 Research Gap and Theoretical Foundation

Existing studies predominantly adopt a "technology-driven" perspective, emphasizing the technical features of AI tools while overlooking learners' subjective cognition and the socio-cultural context. This results in a limited understanding of the pedagogical effectiveness of AI tools and learners' adoption behaviors in real-world contexts. To address this gap, the current study employs the Technology Acceptance Model (TAM) (Davis, 1989) as its theoretical foundation. TAM highlights the roles of perceived usefulness (PU) and perceived ease of use (PEU) in shaping users' attitudes, intentions, and behaviors toward technology adoption.

By employing TAM, this study moves beyond purely technological or instrumental analyses. A learner-centered framework is constructed to explore how AI tools empower foreign language learning among Chinese university students. Specifically, the study aims to: (1) identify learners' functional preferences for AI tools, particularly in the use of structured versus open-ended tasks; (2) analyze the relationship between learners' subjective evaluations of AI tools and their actual effectiveness; and (3) examine how demographic factors, such as academic discipline, urban-rural divide, and digital literacy, mediate learners' acceptance of and outcomes with AI-assisted learning.

2. Literature Review

2.1 Technology-Driven Trends in AI and Language Education

Research on AI in foreign language education exhibits a strong "technology-driven" orientation, focusing primarily on three domains: (1) Intelligent Tutoring Systems (ITS) (Lu et al., 2021), (2) multimodal interaction technologies (Tao et al., 2022), and (3) generative AI in language services (Yang, 2024). Adaptive systems have improved content recommendation accuracy by up to 30% (Raj et al., 2022), while AI-based language models provide high-quality, authentic input (Hu & Qi, 2023).

Yet, these benefits are unevenly distributed. AI significantly improves micro-level skills such as vocabulary retention (+31%) and grammar correction (+28%) (Zheng et al., 2024), but has limited impact on macro-level competencies such as intercultural communication (Xu & Huang, 2024) and critical thinking (Wen, 2024). This "technological efficacy stratification" reflects structural disparities in AI's educational effectiveness.

2.2 Learner Acceptance and the TAM Framework

The Technology Acceptance Model (TAM) remains a key framework for understanding learners' adoption of AI tools in education. Research highlights two developments: (1) a shift from exploring "technological characteristics" to "learner cognition" (Wang & Wang, 2024) and (2) the growing use of multivariate analysis methods (Barnes et al., 2025). Surveys show that perceived usefulness (PU) explains 52% of AI adoption variance, with learners valuing immediate feedback ($\beta=0.67$) and adaptive learning ($\beta=0.59$), while perceived ease of use (PEU), moderated by digital literacy ($r=0.41$, $p<0.01$), accounts for 34% (Lin & Yu, 2025; Ma, 2025).

However, TAM has notable limitations in educational contexts. It struggles to account for the trade-off between usability and task complexity, where overly simplified tools may hinder deep learning, while advanced tools risk deterring users with steep learning curves. TAM's reliance on cross-sectional data limits insight into how acceptance evolves as learners progress in proficiency levels (Zhang & Sun, 2024). Moreover, it inadequately addresses cultural and socio-economic disparities, neglecting challenges like unequal digital literacy (Ma, 2025). Lastly, TAM rarely links acceptance to long-term language outcomes, such as communicative or intercultural skills development (Chen, Jia, et al., 2024).

Future research should expand TAM by considering learner readiness, dynamic acceptance trajectories, and socio-cultural factors to align better with language education's complex objectives.

2.3 Cognitive Explanations for Tool Preference Stratification

Cognitive theories help explain stratification in AI tool use. Swain's (1993) output hypothesis highlights comprehensible output as a critical component of acquisition, involving processes of "attention, reflection, and reprocessing." AI-assisted writing and grammar tools reinforce this cycle through real-time error correction and sentence optimization, producing stronger perceived usefulness. By contrast, listening and speaking tasks depend on coherent, multi-turn

dialogue and abundant comprehensible input, which current AI dialogue systems struggle to provide due to recognition errors and shallow state modeling. This limits students' perceived utility, reinforcing preference stratification.

2.4 Socio-Cultural Dimensions of AI Adoption

Socio-economic disparities further shape adoption. Bourdieu's (1997) cultural capital theory suggests that access to information capital varies with family background and academic specialization. Urban students and language majors often benefit from richer device access, teacher guidance, and peer demonstration, enabling them to transform AI outputs into academic gains through presentations or competitions. This fosters a virtuous cycle of "information capital–learning gain–capital reproduction." Conversely, rural students and non-language majors, with fewer resources and less guidance, often reduce AI use to mechanical translation, missing deeper pedagogical benefits. These dynamics exacerbate inequalities in language learning outcomes.

2.5 Research Gaps

Overall, three gaps persist in existing research: Theoretical gap: overemphasis on technological functions, with only 12.7% of studies engaging intercultural communication frameworks (Xu & Zhang, 2024). Methodological gap: reliance on single-skill assessment in 79.3% of empirical studies, lacking multidimensional measurement systems (Wang & Wang, 2024). Perspective gap: predominance of teacher- and developer-centered analyses, with insufficient exploration of learners' cognitive mechanisms (Liu & Qi, 2024). These gaps highlight the need for learner-centered, multidimensional analyses that incorporate both cognitive and socio-cultural perspectives in evaluating AI's role in foreign language education.

3. Research Questions

Drawing on the above gaps and grounded in the Technology Acceptance Model (TAM), this study addresses the following research questions:

- 1) What are the distribution patterns of the types of AI tools frequently used by Chinese university students in foreign language learning, and what functional preferences do these patterns reveal?
- 2) How does perceived usefulness (PU) influence the actual efficacy of AI-assisted foreign language learning? Are students' subjective evaluations of AI tools consistent with their observed usage outcomes?
- 3) How does perceived ease of use (PEU) interact with the actual learning outcomes of AI tools? Are there significant demographic differences—such as major, urban–rural background, or digital literacy levels—in these effects?

4. Research Methodology

4.1 Questionnaire Design

The questionnaire, administered in Chinese, comprised five modules—Basic Information, Functional Preferences, Self-Efficacy, Influencing Factors, and Opinions/Suggestions—covering 28 items in mixed formats including multiple-choice, Likert scale, and open-ended questions. To ensure its validity, the questionnaire underwent expert review by three academics specializing in educational technology and foreign language learning. Their feedback enhanced item clarity and alignment with research objectives. Key scales for TAM-based constructs, such as perceived usefulness (PU) and perceived ease of use (PEU), were adapted from established studies (Davis, 1989; Venkatesh & Bala, 2008). Reliability testing yielded a Cronbach's alpha of 0.862, while construct validity was verified with a Kaiser–Meyer–Olkin (KMO) value of 0.816 and statistically significant Bartlett's test results ($\chi^2 = 610.178$, $df = 120$, $p < 0.001$). These outcomes confirm the questionnaire's adequacy for statistical analysis.

Example items include statements such as PU module: "AI tools improve efficiency in grammar learning," rated on a 5-point Likert scale. Open-ended questions in the Opinions/Suggestions module solicited participant feedback on AI tool advantages and limitations.

4.2 Data Collection and Analysis

The survey was conducted online via Questionnaire Star between April 19 and April 30, 2025, yielding 365 responses, of which 363 were valid (effective response rate: 99.45%). SPSS 25.0 was used for quantitative analysis, including descriptive statistics and reliability testing of TAM-based scales. Cronbach's alpha of 0.862 indicated high internal consistency, and factor analysis confirmed sampling adequacy and data usability for advanced analyses.

4.3 Research Participants

This study employed stratified sampling across disciplinary, geographic, and institutional attributes, ensuring diversity among 365 students from 13 universities (final valid sample: 363). Participants included students from urban ($n = 190$, 52.25%) and rural ($n = 175$, 47.95%) origins, spanning both foreign language majors ($n = 103$, 28.22%) and non-foreign language majors ($n = 262$, 71.78%). Academic years ranged from Freshmen ($n = 73$, 20.00%) to Seniors ($n = 74$,

20.27%).

The sample's diversity supports generalizability but highlights potential biases. Urban students' digital literacy levels may skew perceptions of ease of use, whereas non-foreign language majors may influence tool usage frequency. While the sample reflects broad accessibility to AI technologies, future studies should address these limitations through stratified sampling or differentiated analysis to mitigate demographic or disciplinary imbalances.

5. Research Results

5.1 Basic Usage of AI Tools

College students generally demonstrate a strong willingness to adopt AI technologies, with most respondents maintaining an open and positive attitude toward their use. Only a small minority expressed reservations or skepticism. In practical scenarios, AI tools are primarily utilized for academic purposes, such as essay writing, foreign language learning, and autonomous study, aligning closely with students' educational needs. Beyond academics, many students also use AI tools in more personalized contexts, such as exploring hobbies or other areas of interest, showcasing their broader value in fostering diverse personal development.

When it comes to tool preferences, domestic AI platforms are particularly popular among students due to their tailored features and localization advantages. At the same time, widely known international tools, such as ChatGPT, are appreciated for their advanced technological maturity, offering complementary benefits. Taken together, AI tools have become an integral part of many students' educational routines, serving as both efficient productivity aids and innovative learning resources for exploring new methods of study.

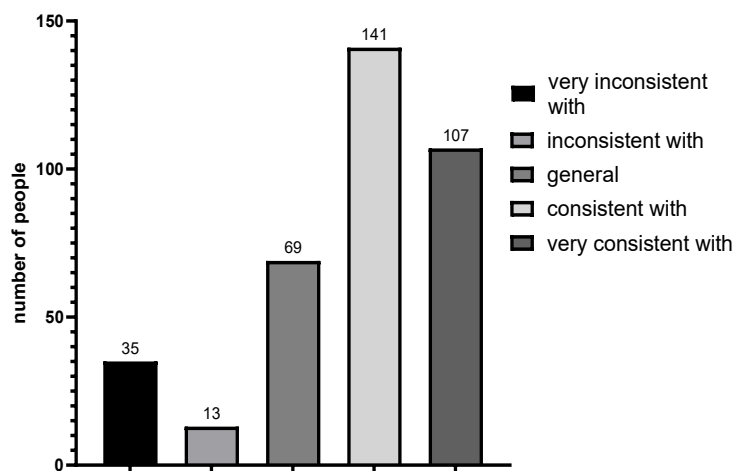


Figure 1. Attitudes Toward AI Technology

The bar chart illustrates students' attitudes toward AI technology. A majority displayed a positive outlook, with 107 respondents selecting "very consistent with" and 141 choosing "consistent with" regarding their interest in using AI tools. An additional 69 students were neutral, indicating a balanced perspective. Only a small group expressed skepticism, with 13 respondents selecting "inconsistent with" and 35 choosing "very inconsistent with." These results highlight varying levels of enthusiasm, ranging from active interest to cautious dissent, offering key insights into how students engage with AI.

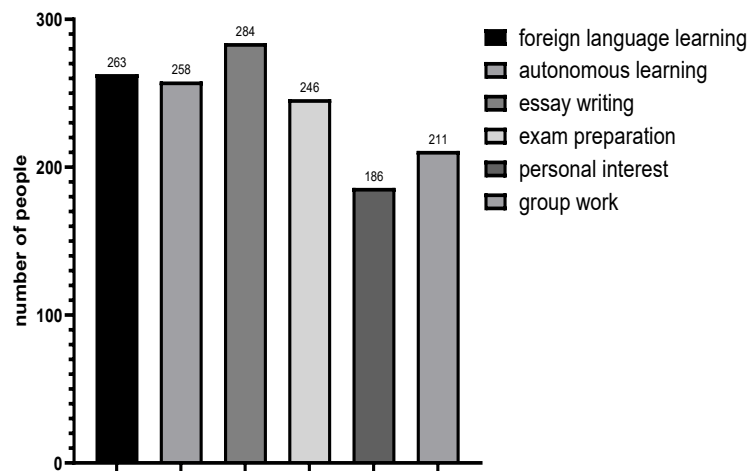


Figure 2. Scenarios of AI Tool Use

The chart reflects how students utilize AI tools across different educational and personal contexts. Essay writing accounts for the highest usage, with 284 participants relying on these tools for academic support. Similarly, 263 participants reported using AI for foreign language learning, signifying its role in enhancing language education. Autonomous learning also proved significant, with 258 participants citing its use for personalized study plans. Beyond academics, 186 participants indicated using AI to explore personal interests, highlighting its flexibility in supporting self-driven growth. These trends suggest that AI usage is strongly purpose-driven, satisfying both academic and personal needs.

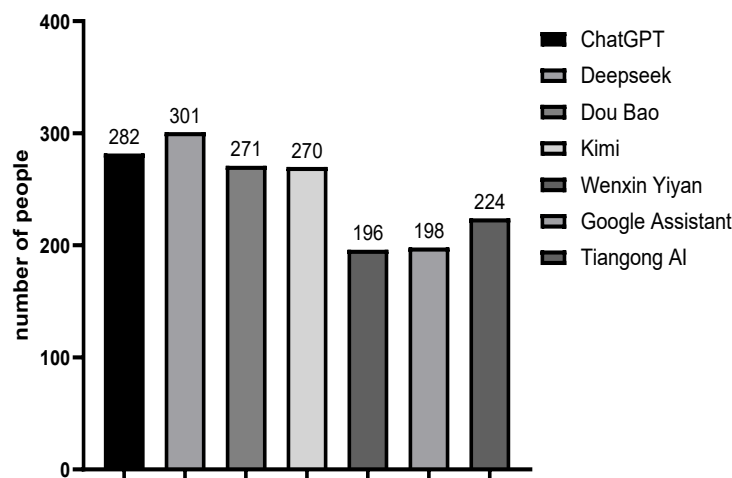


Figure 3. AI Tool Preferences

The chart showcases the specific AI tools students prefer. Domestic tools like DeepSeek (301 respondents) and Dou Bao (271 respondents) are widely used, likely due to their localized features and strong promotional efforts in China. International tools like ChatGPT (282 respondents) are similarly popular, recognized for their sophisticated natural language processing capabilities. Additionally, Kimi attracted 270 users, appreciated for its diverse features. These findings illustrate a balanced demand for both domestic and international AI tools, with students valuing tools based on their specific features and functions.

The data reveals a higher demand for essay writing tools over listening/speaking aids, which may be linked to students' learning environments. Verbal practice in classrooms or the limited utility of listening/speaking tools for solo study could explain this trend. Furthermore, the sophistication of writing tools often outpaces that of AI-based listening or speaking tools, influencing students' preferences. The perceived ease of use for writing tools may stem from their accessible interfaces, while listening/speaking tools often present usability challenges or require teacher guidance to

integrate effectively. Future research should investigate how learning motivations, virtual interaction challenges, and tool design impact these preferences. Incorporating TAM constructs—such as perceived usefulness and ease of use—could further clarify students' divergent functional needs.

5.2 Functional Preferences

The survey reveals a clear instrumental focus in college students' use of AI tools for foreign language learning. Most students prioritize "hard skills" such as writing assistance and vocabulary/grammar training (mean = 3.40 and 3.34, respectively), as these directly address exam-oriented needs. These functions see significantly higher usage compared to those aimed at "soft skills" like listening practice (mean = 3.10), speaking practice (mean = 3.12), and cross-cultural communication (mean = 3.09). Many students use these latter functions only occasionally or as supplementary tools.

Table 1. Functional Preferences

Name	Mean	Standard deviation	Median
How often do you use AI tools to assist foreign language learning?	3.380	1.170	3.000
How often do you use AI for writing assistance (e.g. grammar correction, essay generation)?	3.400	1.155	3.000
How often do you use AI for listening training (e.g. AI voice dialog, listening material recommendation) ?	3.100	1.432	3.000
How often do you use AI for speaking practice (e.g. pronunciation scoring, simulated conversations) is:	3.120	1.356	3.000
How often do you use AI for vocabulary and grammar learning (e.g., word memorization, grammar parsing) ?	3.340	1.241	3.000
How often do you use AI for cross-cultural communication learning (e.g., cultural background knowledge pushing)?	3.090	1.200	3.000

This trend reflects broader educational priorities. The emphasis on test preparation and written proficiency in language education drives students to focus on measurable outcomes like writing accuracy and vocabulary mastery, which are closely tied to their academic success. Additionally, limited exposure to real-world oral communication or cultural exchange in their learning environments reduces the immediate relevance of listening, speaking, and intercultural skills.

Enhancing the application of AI tools to support soft skills could address this imbalance. By incorporating features like conversational AI, interactive cultural modules, and context-driven learning scenarios, AI tools could make listening, speaking, and cross-cultural functions more engaging and practically valuable. Encouraging the integration of these skills into foreign language education could create a more well-rounded learning experience, bridging the gap between academic requirements and real-world communication needs.

5.3 Self-Efficacy

The survey highlights clear stratification in college students' perceptions of self-efficacy when using AI tools for foreign language learning. Many students credit AI tools with significantly improving learning efficiency through features like quick word lookups and instant feedback. These tools are especially effective in foundational skills, such as vocabulary acquisition (mean = 3.46) and grammar correction (mean = 3.47). However, their perceived impact on higher-order language skills, such as oral fluency (mean = 3.37) and cross-cultural understanding (mean = 3.12), is notably weaker. Several respondents pointed out that the mechanical nature of AI feedback and the lack of authentic, context-rich environments make the tools less effective for complex communicative tasks.

Table 2. Self-efficacy

Name	Mean	Standard deviation	Median
My foreign language vocabulary has improved significantly after using the AI tool.	3.460	1.096	3.000
My grasp of grammar (e.g., sentence structure, use of tenses) has improved after using the AI tool.	3.470	1.096	3.000
My oral expression (e.g., pronunciation accuracy, fluency) is more fluent after using the AI tool.	3.370	1.107	3.000
I have a better understanding of cross-cultural communication (e.g., cultural differences, social etiquette) after using the AI tool.	3.120	1.106	3.000
My efficiency in foreign language learning (e.g., time management, speed of task completion) has increased after using the AI tool.	3.730	0.983	3.500

The data reflect a strong consensus that AI tools primarily improve learning efficiency (mean = 3.73), which was rated higher than vocabulary (3.46) or grammar (3.47). This underscores their role in streamlining task management and optimizing academic outcomes. However, the relatively low ratings for cross-cultural understanding and oral fluency reveal significant gaps, with variability in students' experiences (SD = 1.11 for both areas).

This disparity arises from two key factors. First, AI tools are designed to excel in structured learning tasks, such as grammar drills and vocabulary practice, where instant feedback and tailored guidance are highly effective. These features bolster students' confidence and self-efficacy in mastering core language components. However, the tools' limitations in simulating authentic communication scenarios create challenges for higher-order language learning. Second, the absence of immersive and interactive environments restricts students' ability to develop cross-cultural competence and fluent oral expression, skills that require dynamic, real-world contexts.

To address these gaps, future AI tools could integrate technologies like virtual reality (VR) to create immersive cultural simulations and context-driven conversational experiences. Additionally, personalized listening and speaking modules that adapt to individual learners' needs could enhance their potential in developing oral fluency and cross-cultural awareness. By advancing these functions, AI technologies can better support the holistic development of language learners, moving beyond foundational skills to more complex communicative competencies.

5.4 Influencing Factors

The effectiveness of AI tools in college students' foreign language learning largely depends on two key factors: technological ease of use and teacher guidance. From the 363-student survey, technical ease of use (mean = 3.99, SD = 0.95) and teacher guidance (mean = 3.77, SD = 0.87) emerged as the two most significant factors driving task completion efficiency. Feedback speed (mean = 3.69) was also rated highly, though occasional lags discouraged some users. Interestingly, the mean score for increased study time was only 2.60 (median = 2.5), suggesting that students often rely on AI tools to achieve more in less time, rather than extending their learning duration.

Table 3. Influencing Factors

Name	Mean	Standard deviation	Median
I think the interface of the AI tool (e.g., clear navigation, clear categorization of functions) is easy to use.	3.990	0.948	4.000
When using the AI tool, I believe I am able to complete learning tasks (e.g., writing, listening exercises) effectively.	3.790	0.913	4.000
After using the AI tool, I invested more time in foreign language learning (e.g., increase in daily study hours).	2.600	1.119	2.500
Teacher's guidance (e.g., recommendation of tools, demonstration of usage) helps me to better utilize AI tools in learning foreign languages.	3.770	0.874	4.000
Do you think the speed of feedback (e.g., grammar correction in real time) of the AI tool meets the needs?	3.690	0.918	3.500

In conclusion, AI tools' ease of use and teacher guidance complement each other in shaping effective language learning. On the technological side, AI tools are highly valued for their intuitive interfaces, seamless resource integration, and instant feedback, all of which improve task efficiency, particularly in areas like vocabulary acquisition and grammar correction. These features help simplify learning processes and enable students to complete tasks more effectively. However, some technical limitations, such as response delays during oral exercises, hinder user experience, especially in tasks requiring real-time interaction. This highlights the need for further technical optimization to fully address students' learning needs. On the pedagogical side, teacher guidance is essential for maximizing the utility of AI tools. Teachers play a critical role in demonstrating tool functionalities, aligning them with specific learning objectives, and designing targeted tasks. Through structured guidance, students not only master AI tools more quickly but also understand how to use them strategically, increasing their autonomy and motivation in the learning process. Teacher involvement also bridges the gap between tool functionality and contextualized application, ensuring that students engage more deeply with the content. While user-friendly design facilitates efficient task execution, teacher support enhances students' confidence and strategic application of these tools. To further improve outcomes, efforts should focus on resolving technical delays and equipping teachers with better training to integrate AI into their pedagogy.

5.5 Opinions and Suggestions

This section summarizes the findings from open-ended questions designed to explore factors affecting the use of AI tools in foreign language learning, particularly from the perspective of their perceived ease of use. Additionally, student perspectives on the current state of AI tool functionality and suggestions for technological improvements were collected. The analysis of responses utilized statistical methods to distill key themes, which were subsequently visualized in line graphs.

5.5.1 Advantages of AI Tools in Foreign Language Learning

Student feedback revealed several significant advantages of AI-enabled tools in foreign language learning. These include: ①Enhanced learning efficiency: AI tools streamline learning processes, enabling faster and more effective task completion. ②Comprehensive language analysis: Detailed insights into grammar, vocabulary, and syntax help students identify and correct errors effectively. ③Improved memory retention: Features such as spaced repetition enhance long-term knowledge retention. ④Diverse learning modes: The tools support varied learning methods, including visual, auditory, and interactive formats tailored to individual needs. ⑤Timely updates: AI systems offer up-to-date content and continuously improve based on user feedback. ⑥Interactive learning methods: AI-based technologies promote engagement through interactive exercises and simulations. ⑦Support for writing skills: AI tools provide constructive feedback and suggestions to improve writing style and accuracy. ⑧Personalized learning: The adaptive learning capabilities cater to individual goals and proficiency levels, which received positive feedback from many students.

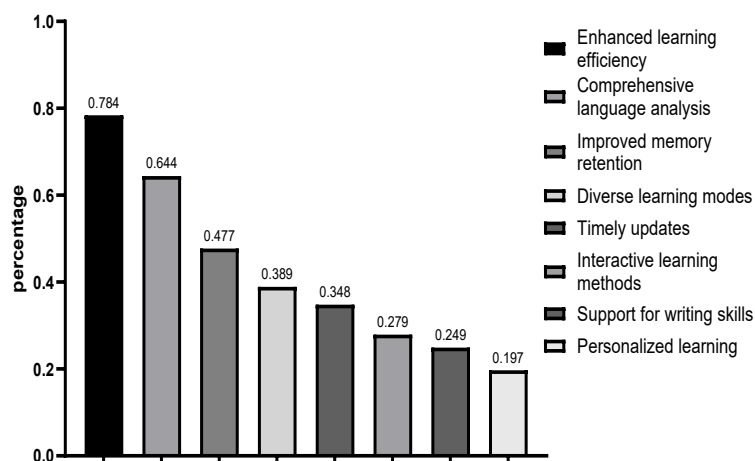


Figure 4. Bar chart of advantages of AI-enabled foreign language learning

As highlighted in Figure 4, "Enhanced learning efficiency" scored the highest recognition among students, followed by "Detailed language analysis" and "Improved memory retention," reflecting the value of AI tools in supporting structured, efficient, and content-rich learning environments.

5.5.2 Shortcomings of AI Tools in Foreign Language Learning

Despite the above advantages, students also identified notable limitations in the current functionality of AI tools for language learning. ①Lack of flexibility in feedback: Feedback provided by AI tools is often generic and lacks adaptability to individual learning needs. ②Limitations due to preset programming: The rigid design and behavior of AI tools prevent nuanced responses and creativity, limiting their potential in dynamic learning contexts. ③Poor language clarity: Some tools fail to provide precise, natural, or contextually appropriate language examples, leading to student confusion. ④Restricted interaction methods: Interactions with AI tools remain mostly one-dimensional, lacking the depth required for fostering real-world communicative competence. ⑤Lack of emotional engagement: The absence of human-like emotional connection limits the appeal and motivational impact of AI-assisted learning experiences.

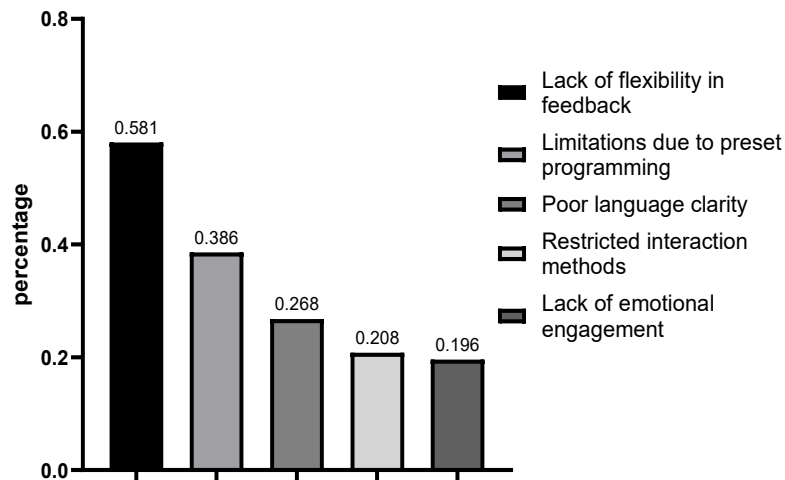


Figure 5. Bar chart of the shortcomings of AI-enabled foreign language learning

As shown in Figure 5, "Lack of flexibility in feedback" was the most frequently mentioned issue, emphasizing the need for more adaptable and personalized responses. These limitations collectively underscore the importance of improving the adaptability, interactivity, and emotional connection within AI-driven learning tools.

5.5.3 Expectations for AI Tool Improvements and New Features

Based on feedback, college students articulated several key expectations for the improvement and development of AI tools. ①Enhanced information filtering and deeper reasoning capabilities: Students request better quality of AI-generated content, focusing on accuracy, depth, and contextual relevance. ②Learning path planning: Structured, personalized study plans can guide learners through individualized, goal-oriented trajectories. ③Integration with educational platforms: Seamless connections between AI tools and institutional learning management systems would improve usability and access. ④Multilingual comparative learning: Tools that facilitate comparative learning across multiple languages can deepen students'cross-linguistic understanding. ⑤Improved memory retention functionalities: Better tools for long-term knowledge retention and review are needed to support sustainable learning. ⑥Intelligent memory assistance – Students expressed a demand for AI-driven memory features to better manage, categorize, and consolidate knowledge.

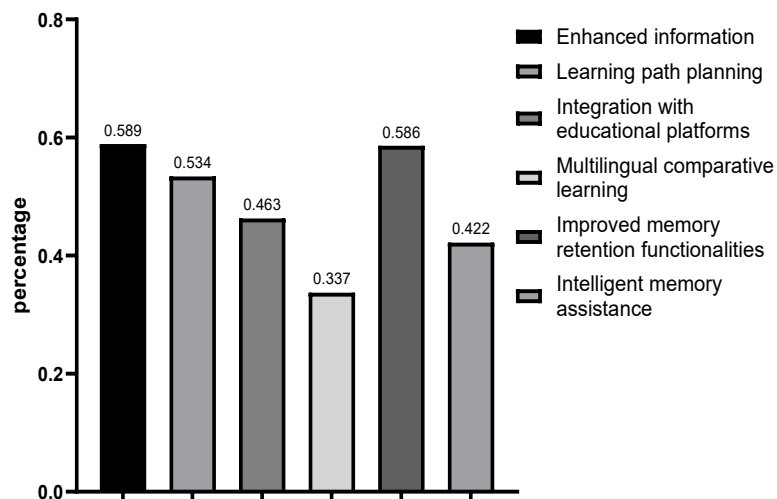


Figure 6. Bar chart of AI tool improvement and new function expectation

As illustrated in Figure 6, "Improved memory retention functionalities" received the highest level of support, followed by "Intelligent memory assistance" and "Learning path planning." These expectations highlight a common desire for AI tools to go beyond isolated features and deliver comprehensive, learner-centered solutions that address individuals' cognitive and academic needs.

In conclusion, while AI tools already provide significant efficiency and adaptability in foreign language education, addressing the identified shortcomings and incorporating student suggestions into future functionalities will be critical for ensuring their effective and sustained usage.

6. Discussion

6.1 Structural Preferences in AI Tool Functionality

This study finds that college students exhibit clear structural preferences in their selection and use of AI tools for foreign language learning, with a focus on "hard skills" such as writing assistance and vocabulary/grammar training, while the usage of "soft skills" like cross-cultural communication and oral expression is significantly lower.

As shown in Figure 3, over 80% of students expressed willingness to learn about and use AI technologies ("consistent with" or "very consistent with"). Figure 7 illustrates the diverse range of AI tools used in daily life, including popular models like ChatGPT, DeepSeek, Dou Bao, and Kimi, which are widely favored among students, indicating a high level of acceptance of AI tools. However, according to the functional preference data in Table 3, writing assistance (mean = 3.40) and vocabulary/grammar learning (mean = 3.34) are the most frequently used functions, suggesting that over half of the students "frequently use" these functions. In contrast, cross-cultural communication (mean = 3.09) is significantly less utilized, indicating that at least half of the students use this function only "occasionally" or less. This structural bias aligns with the current exam-oriented teaching focus, which emphasizes written proficiency over comprehensive language application skills. Additionally, the technical limitations of AI tools, which primarily excel in text processing and lack robust contextual awareness and cultural interaction capabilities, contribute to this trend.

These findings are consistent with Feng Qinghua and Zhang Kaiyi (2024), who noted that AI technologies significantly enhance "hard skills" but are limited in "soft skills" applications due to insufficient technical support. Similarly, Yang Lianrui (2024) observed that AI effectively promotes vocabulary and grammar acquisition but falls short in cultural understanding and pragmatic competence. This functional preference difference is not accidental, but is the result of the combined effect of technological foundation, educational orientation and social culture. From a technical point of view, current AI is quite mature in cognitive tasks such as text generation and grammar correction, but still has limitations in aspects that require contextual understanding and social interaction. As a result, the way students use it is largely limited by the scope of the technology's own capabilities, presenting a pragmatic logic of "using whatever the technology offers". On the other hand, this usage pattern also deeply reflects the inherent tendency of the education system. In a test-oriented teaching environment, students are more inclined to master standardized, written language expressions than truly diversified communicative competence, and AI tools cater to this need by providing efficient writing aids and grammatical exercises, further reinforcing students' reliance on "instrumental linguistic competence" and ignoring language as a cultural carrier and a medium of communication. It further strengthens students' reliance on "instrumental language skills" by providing efficient writing aids and grammar exercises, while ignoring the nature of language as a cultural carrier and communication medium.

To summarize, the use of AI tools by university students shows a clear structural preference, with writing and grammar training constituting the core application scenarios, while the demand for "soft skills" such as listening and speaking is still lacking. This functional preference is a structural choice made by a combination of technological availability, habitus in the educational field, and individual linguistic capital. It reveals that at the current intersection of technology and education, tools have not completely broken the established educational model, but have to some extent strengthened its inherent tendency, leading to the replacement of value rationality by instrumental rationality in language learning, and ultimately resulting in this significant stratification of functional preferences.

6.2 Consistency Analysis of Perceived Usefulness and Learning Efficacy

The study demonstrates a strong correlation between students' perceived usefulness of AI tools and their sense of self-efficacy, particularly in areas such as learning efficiency, vocabulary acquisition, and grammar mastery. Students' subjective evaluations are generally aligned with their actual usage patterns, underscoring the reliability of AI tools in enhancing structured language skills.

As shown in Table 2 (self-efficacy data), AI tools' contribution to learning efficiency achieved the highest mean score (3.73), followed by grammar proficiency (mean = 3.47) and vocabulary development (mean = 3.46). In contrast, oral expression (mean = 3.37) and intercultural communication (mean = 3.12) received comparatively lower ratings. This stratified pattern of efficacy highlights a subjective assessment framework consistent with students' functional preferences, wherein the practical benefits of AI tools for language knowledge accumulation are strongly acknowledged, while their capacity to enhance communication-based skills is perceived with greater reservation.

These findings align with prior research. For example, Wang Shusheng and Wang Junju (2024) identified perceived usefulness as a key determinant of students' behavioral intentions to adopt AI tools. Their study revealed that when

learners perceive direct benefits to their educational outcomes, their acceptance and frequency of use increase significantly. Similarly, Hu Jiasheng and Qi Yajuan (2023) highlighted the strengths of AI tools in providing "strong grammatical logic but weak contextual interaction." By offering instant feedback and robust error correction functions, AI applications enable students to rectify mistakes rapidly, thereby improving the accuracy and fluency of their written language production—outcomes that resonate with students' efficiency-driven learning objectives within limited time constraints. However, the relatively lower perception of AI's effectiveness in enhancing oral expression and intercultural competence can be attributed to its current limitations in replicating authentic communication contexts and generating context-sensitive feedback. As such, perceived usefulness is primarily concentrated in foundational language skills, where AI demonstrates its greatest strengths.

In conclusion, the study finds that students' subjective evaluations of AI tools align across cognitive and behavioral dimensions, with a predominant emphasis on learning efficiency and knowledge acquisition in the domains of vocabulary and grammar. These findings highlight the current utility of AI tools in structured language learning while simultaneously revealing the areas where further technological development is needed to address higher-order language skills.

6.3 Critical Role of Perceived Ease of Use and Teacher Guidance

This study highlights the dual-core mechanism formed by perceived ease of use and teacher guidance in shaping the effectiveness of AI tools for foreign language learning. The findings reveal significant demographic variations in how these factors influence students' learning outcomes. Specifically, foreign language majors report higher usage frequency and more positive efficacy perceptions compared to non-foreign language majors, suggesting that academic background moderates both technology acceptance and its educational effectiveness.

As shown in Table 3 (influencing factors data), the ease of use of AI tool interfaces received the highest score (mean = 3.99), emphasizing that intuitive, user-friendly design is a critical prerequisite for the successful integration of AI tools into students' learning processes. Teacher guidance (mean = 3.77) also emerged as a key determinant, demonstrating its significant role in improving students' self-efficacy, task completion rates, and overall learning efficiency. Teachers' recommendations and instructional demonstrations are instrumental in helping students master AI tools, enabling flexible, strategic, and confident use.

These findings are consistent with Zheng Chunping et al. (2024), who identified the "teacher guidance + technology assistance" hybrid model as effective for facilitating students' initial adoption of educational technologies. In this framework, teachers act as "cognitive mediators," guiding students in establishing positive cognitive frameworks that enhance their learning experiences. Similarly, Hu Kaibao's (2024) theory of the "technology-cognition-emotion triad" reinforces the interconnected relationship between perceived ease of use, teacher guidance, and students' attitudes toward technology adoption. While most students find AI tools easy to use, challenges such as selecting appropriate tool functionalities, aligning features with specific tasks, and interpreting feedback remain prevalent—particularly among first-time users. In these instances, teacher mediation is essential, as it helps students develop effective usage strategies and provides differentiated guidance tailored to specific learning tasks. This targeted support not only improves the precision and efficiency of AI tool usage but also reinforces students' recognition of the tools' pedagogical value, reducing technology-related anxiety. Thus, teacher guidance and the user-friendly design of AI tools complement one another, enabling the transition from mere usability to meaningful, optimized utilization.

In conclusion, the effectiveness of AI tools in language learning is determined not only by their technical accessibility but also by the pivotal role of teachers as educational facilitators. To achieve the full potential of these tools, future efforts should focus on strengthening teacher support mechanisms at the system design level while enhancing the adaptability of AI tools to accommodate diverse academic backgrounds and learning styles. By addressing these dimensions, AI tools can better support personalized and impactful language education.

7. Conclusion

This study highlights the dual role AI tools play in foreign language education, offering significant opportunities to enhance learning while presenting notable challenges. The findings reveal that most college students have embraced AI tools in their academic practices, particularly for tasks like essay writing, language learning, and independent study. Students perceive AI tools as reliable aids in improving structured language skills, such as vocabulary acquisition and grammar mastery, with learning efficiency and language knowledge cited as the primary benefits. However, the study also identifies the limited impact of AI tools on fostering oral fluency and intercultural communication, areas that require a deeper integration of cognitive and communicative learning approaches.

The study underscores that the effectiveness of AI tools depends not only on their technical capabilities but also on the indispensable role of teacher guidance. Teachers are instrumental in bridging the gap between AI functionality and

effective learning outcomes, emphasizing the pressing need for systematic teacher training and support mechanisms. While AI tools excel in facilitating "instrumental" learning tasks, such as grammar and vocabulary, their broader application in developing communication and cultural competencies remains underutilized, pointing to opportunities for innovation and reform.

Based on these findings, the study proposes a three-dimensional integrated framework encompassing technology, education, and humanities to fully harness the potential of AI in foreign language learning. This model places equal importance on the availability of cutting-edge technology, the pivotal role of empowered teachers, and the active participation of learners. Such an approach aims to ensure that AI tools go beyond test-oriented educational outcomes to foster holistic human development, supporting well-rounded language learners equipped with both technical proficiency and communicative competence. In this vision, AI becomes not merely a tool for efficiency, but a means to realize the broader goal of inclusive, learner-centered, and culturally attuned language education.

To leverage AI tools effectively, this study emphasizes the need for targeted reforms in curriculum design and teaching methodologies. Specifically, integrating AI tools into structured, multimodal learning activities could better replicate authentic communicative contexts, improving listening and speaking skills. For instance, speech recognition and dialogue-based AI systems could be incorporated into language courses to promote real-time oral practice. Similarly, AI-driven cultural immersion platforms, such as virtual reality environments, could facilitate intercultural competence by exposing students to diverse linguistic and cultural scenarios. Teachers should actively guide these integrations, serving as strategic facilitators in creating balanced learning experiences that combine task-oriented efficiency with skills such as communication and cultural awareness. Systematic teacher training programs should therefore focus on techniques for contextualizing AI's use in fostering deeper learner engagement. Teachers must move beyond simply employing AI for routine tasks and instead adopt strategies that prioritize active, reflective, and purposeful learning. For example, they could use AI-generated insights, such as adaptive feedback, to tailor instruction to individual learners' needs and actively mentor students in interpreting and applying those recommendations.

Despite its contributions, this study has certain limitations. The cross-sectional design, for example, does not capture longitudinal changes in learners' attitudes or outcomes. Future research should employ longitudinal studies to examine how learners' engagement with AI tools evolves over time. Additionally, the study primarily focuses on a Chinese university context, which may limit the generalizability of the findings. Comparative studies that explore cultural and institutional differences, particularly in cross-cultural settings, could provide richer insights into the global application of AI in language learning.

In terms of research directions, further exploration of AI tools specifically designed for soft skills development, such as oral communication and cultural competence, is essential. These tools should incorporate features capable of processing nuanced feedback and fostering meaningful interactions. Additionally, research should focus on quantifying the effectiveness of these tools in supporting targeted outcomes, such as gains in oral fluency or improvements in cultural sensitivity, to provide actionable implications for both educators and developers.

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Authors contributions

Professor Zhang was responsible for the project guidance, drafting the outline of the thesis, revising the full text, and reviewing. Zou Yan was responsible for the design of the questionnaire survey for the project, the data analysis, and manuscript preparation. Zhang Ying was responsible for collecting and organizing the references for the thesis. Yu Xiaofei was responsible for the discussion and conclusion of the thesis. Xu Nengqin and Qian Jixing were responsible for revising the thesis. All the authors read and approved the final manuscript.

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The authors declare that they have no known competing financial interests or personal relationships that could have influenced the work reported in this paper.

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