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Exploring the Human-AI Interactive Negotiation Competence and Interaction Mindsets of University English Learners: A Study in China

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***Abstract*—The integration of Artificial Intelligence (AI) in foreign language teaching is undergoing significant transformation, and as a result, there is a need to conduct research on Human-AI Interactive Negotiation Competence (HAINC) and interaction mindsets. This study conducted a survey at a Project 211 university in China to collect data on the HAINC and interaction mindsets of university English learners. The collected data were then quantitatively analyzed. The results revealed that the HAINC of university English learners is at an above-average level. Although learners have a relatively comprehensive understanding of AI, they lack the practical application skills necessary to reinforce theoretical knowledge. Furthermore, the study uncovered significant differences in interaction mindsets among learners with varying levels of HAINC, with only a small proportion possessing both high-level cognitive abilities and effective interaction strategies. This paper discusses the implications of these findings for foreign language teaching and expands the scope of research on HAINC, aiming to provide insights for the development of human-AI foreign language learning environments.**

***Index Terms*—Artificial Intelligence, human-AI interactive negotiation competence, interaction mindsets, foreign language learning**

I. Introduction

Since the launch of the new artificial intelligence (AI) chatbot ChatGPT by OpenAI in 2022, AI technology has sparked a "catfish effect"—the effects of intense rivalry that motivate the weak to become better versions of themselves—in the tech industry (Zhang, 2023). With the development and widespread use of various AI software, the digital wave has gradually impacted the field of English education (Liu & Qiu, 2024; Yang et al., 2024). In this new context, foreign language teachers in China need to embrace the technology, adopt new approaches in English teaching, and promote curriculum reform (He, 2023). The question of how to integrate AI into foreign language teaching to focus on promoting comprehensive human development has raised widespread discussion among scholars. Topics of interest include the impact of AI on foreign language education and response strategies (Zhou & Li, 2023; Yang et al., 2023; Rahman & Watanobe, 2023; Hu & Qi, 2023; Creely, 2024; Karataş et al., 2024), the innovation and transformation of foreign language teaching models in the AI era (Huang et al., 2023; Wen, 2024a; Jiao & Chen, 2023; Schmidt & Strasser, 2022); EFL university teachers' roles in integrating AI in language education (Yang et al., 2024; Chiu et al., 2023); and AI-assisted English writing instruction (Xu et al., 2024; Guo et al., 2023; Chen & Lu, 2024; Godwin-Jones, 2022).

The emergence of advanced AI in language education means that it can complement and enhance the traditional learning paradigm by fostering a more dynamic and individualized learning experience (Creely, 2024; Mohamed, 2023). Therefore, the technological transformation of foreign language education should place greater emphasis on the cultivation of the digital literacy of students (Huang, 2024; Creely, 2024) and, more specifically, on developing students' ability to interact effectively with AI. Wen and Liang (2024) advocate schools for offering courses that cultivate students' HAINC. Additionally, UNESCO's guidance for generative AI in educational and research (2023) emphasizes the need to build capacity for teachers and students to make proper use of AI. However, there is still a lack of empirical studies investigating the current level of HAINC among university English learners and analyzing it in conjunction with the interaction mindsets that govern this competence. Therefore, this paper will first outline the concepts of HAINC and interaction mindsets. It will then describe and analyze the current state of Chinese university English learners' HAINC and interaction mindsets based on data collected through questionnaires administered at a university in China.

II. Literature Review

A. Human-AI Interactive Negotiation Competence

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Early research on Human-Computer Interaction (HCI) in foreign language teaching primarily focused on how the usability and efficiency of computer systems could drive innovation in language learning tools, such as PiGaiWang[1] and Grammarly. With technological advancements, Human-AI Interaction (HAI) has increasingly played a more multifaceted role in foreign language teaching. Wang et al. (2024) analyzed 49 related studies and found that, since 2018, the application of AI in language learning has shifted towards a more "human-centered" approach. AI can naturally interact with humans, provide instant feedback, deliver personalized learning content, and offer objective assessments of learners (Pokrivcakova, 2019). Lin et al. (2022) also noted that AI can reduce students' anxiety and increase their confidence in foreign language learning.

Indeed, the human-AI collaboration/cooperation teaching model has garnered the attention of many researchers. Notable examples include the Human-AI Collaboration + Double Teacher Classroom model (Wang et al., 2019), the Human-AI Collaboration + Flipped Classroom model (Duan, 2020; Anna et al., 2023), and the multi-mode + Human-AI Collaboration teaching model (Lu et al., 2021). In these models, teachers can co-lead the classroom by working with AI—AI handling certain classroom activities while teachers take on the supervisory roles (Fang et al., 2024; Mohamed, 2023), with each complementing the other's contributions. This cooperative involves continuous bidirectional information exchange (Wu & Tian, 2023), thereby enhancing the role of AI to promote the effectiveness of classroom teaching.

At the same time, human-AI negotiation offers teachers the possibility to design more complex interactive teaching scenarios. For example, by simulating real-life language use environments, learners can improve their language application skills through negotiation and consultation. Gratch et al. (2016) found that learners feel more comfortable negotiating with AI and put in more effort during practice after receiving instructional feedback.

These studies primarily focus on the teaching methods of AI in foreign language education and their evolution. However, Huang et al. (2023) point out that, with continuous technological advancements and expanding task scopes, the key to achieving effective AI-empowered education lies in the flexible interactive abilities of human users. Against this backdrop, Wen and Liang (2024) introduced the concept of HAINC, which is a crucial skill that human users must possess when interacting and negotiating with AI. It encompasses the ability to understand the capabilities and limitations of AI, make appropriate requests, and adjust communication strategies based on AI's feedback; however, it also encompasses the AI's capacity to interpret user prompts through large language models and adjust its own strategies accordingly. This mutual adaptability is fundamental to fostering effective negotiation between humans and AI. HAINC comprises five key components, which frame a cycle diagram understanding AI, setting goals, issuing prompts, analyzing feedback, and adjusting strategy (see Figure 1) (Wen & Liang, 2024):

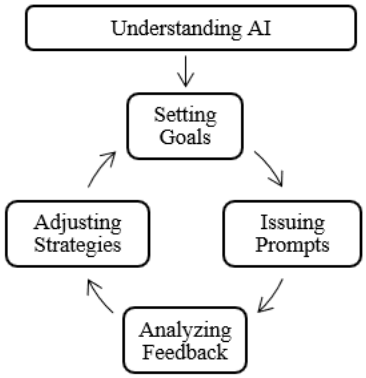

Figure 1. Components Cycle Diagram of HAINC (Wen & Liang, 2024)

According to Wen and Liang (2024), understanding AI involves recognizing AI's capabilities and limitations before interaction. Given that AI's language comprehension has not yet reached human-level proficiency, users must continuously adapt, communicating with prompts that AI can process effectively. Moreover, "Setting Goals" means defining the tasks that the user wants AI to complete. Goals should be clear, feasible, ethical, and within the scope of the AI's operational capacity. "Issuing Prompts," also known as "Prompt Engineering," requires the user to articulate the task with clarity and precision, as this constitutes the most critical phase of the interaction because a well-formulated prompt can help the user unlock the full potential of AI (Giray, 2023). "Analyzing Feedback" refers to meticulous examination of the AI's outputs, with an emphasis on identifying errors and critically evaluating the responses. "Adjusting Strategy" means that once the user finds problems in the feedback, they need to add new prompts for further inquiry or directly modify the original prompt.

In conclusion, HAINC involves humans leveraging AI's powerful generative and learning capabilities to achieve specific goals, placing human users in an absolutely dominant position during this process. The quality of AI's output depends entirely on how well users understand AI and how appropriately they issue prompts. When AI is integrated into

[1] PiGaiWang is an online system that uses computers to automatically grade English essays. Teachers can use it to scan various parameters of students' essays. By comparing the distance between the students' essays and a standard corpus, algorithms are used to map the information into scores and comments.

foreign language teaching, developing students' HAINC becomes the prerequisite and foundation for effectively utilizing AI to support foreign language learning. AI, with its vast corpus and capabilities surpassing those of individual or even multiple teachers, can provide learners with abundant learning resources and offer feedback anytime and anywhere. However, AI's powerful abilities require precise prompts to be activated, and since AI generates feedback automatically, it may contain inaccuracies or even errors. If students fail to recognize these issues and blindly rely on AI, it could lead to counterproductive results (Wen, 2024a; Hu & Qi, 2023; Yang et al., 2023; Creely, 2024). Therefore, cultivating students' HAINC has become an extremely important task at this stage.

B. Interaction Mindsets

In the late 1970s, researchers began to recognize the important role of interaction in foreign language teaching (Lei & Xu, 2022). Wang (2010) argues that interaction allows learners to connect external contexts with the language they are learning, thereby internalizing the content and improving their language proficiency. Thus, studying interaction can offer new perspectives for improving foreign language teaching models.

Early studies focus on the educational, social, and specific aspects of teacher-student interaction in traditional teaching models (Ye & Pang, 2001; Nassaji & Wells, 2000). Later, Xu and Ye (2014) argue that peer interaction increases opportunities for learners to correct language mistakes, promoting language fluency. Sato (2013) indicates that students hold positive attitudes towards peer interaction and demonstrate both a willingness and confidence in providing feedback to their peers.

With the development of artificial intelligence technology, human-AI interaction, characterized by AI's vast amount of language data and interactive conversational models, has further expanded the possibilities for foreign language teaching (Chen & Lu, 2024). Although research on interaction has produced substantial results, offering valuable support and guidance for foreign language instruction, the study of interaction mindsets, which govern interactive behaviors, has received comparatively less attention. Interaction mindsets are purposeful, strategic, proactive, and dynamic, exerting control over interactive behaviors. Therefore, investigating the cognitive aspects is crucial for a deeper understanding of interactive behaviors (Lei & Xu, 2022).

The concept of interaction mindsets was initially introduced by Sato (2017), who defines it as "a disposition toward the task and/or the interlocutor prior to and/or during the interaction." Sato posits that different interaction mindsets could evoke corresponding emotions in learners during the learning process, thereby influencing their interactive behaviors and leading to varying outcomes in second language learning. McDonough et al. (2022) found a significant correlation between interaction mindsets and task completion outcomes, further emphasizing the important role of mindsets in shaping learning outcomes. Sato and McDonough collaboratively developed the Interaction Mindset Scale (2020) to assess learners' perceptions and attitudes during interaction. However, their series of studies on interaction mindsets primarily focused on peer interaction and did not extend to human-AI interaction mindsets.

Building on Sato's work, Lei and Xu (2022) expanded the dimensions of interaction mindsets, and using Chinese EFL learners as subjects, they developed a scale for measuring interaction mindsets from a multidimensional perspective. They tested this scale with data from 1,414 EFL learners and analyzed the current state of interaction mindsets among Chinese university English learners. This expanded scale considers not only peer and teacher-student interaction mindsets but also human-AI interaction mindsets. However, the items related to human-AI interaction in this scale were still relatively limited, and further research is needed to explore how human-AI interaction mindsets influence negotiation behaviors specifically in such contexts.

In summary, while cultivating students HAINC is crucial and interaction mindsets offer a valuable perspective for understanding the interaction behaviors, there remains a significant research gap in both the practical exploration of HAINC and the specific mindsets that drive human-AI interactions, which have been largely overlooked in existing studies that focus primarily on traditional classroom interaction models. Therefore, this study will reference the components of HAINC proposed by Wen and Liang (2024) and integrate elements from Lei and Xu's (2022) multidimensional interaction mindset scale to form a combined HAINC and interaction mindset scale, which will be used to assess the overall level of HAINC and the current state of human-AI interaction mindsets among university English learners.

III. Methodology

A. Research Questions

This study primarily explores two questions:

1. What is the overall level of HAINC among university English learners?
2. How do university English learners with varying levels of HAINC differ in their human-AI interaction mindsets?

B. Participants

In July 2024, the researchers conducted an online-based questionnaire survey at a university in China. A total of 553 responses were collected for the study. However, two were excluded as the duplicate responses, and 14 were excluded due to the excessively short response time. As a result, the analysis included a final sample of 537 respondents who

provided valuable responses, yielding a validity rate of 97%. Among the participants, 206 were male and 331 were female. All participants had experience with human-AI interaction negotiation in their foreign language learning process.

The questionnaire employed in this study was designed based on elements from previous interaction mindset scales (Lei & Xu, 2022) and the five components of HAINC (Wen & Liang, 2024). The questionnaire consists of two main parts: the first part is personal information, and the second part is about HAINC and interaction mindsets. The second part is divided into five sub-sections based on the five components of HAINC: Understanding AI, Setting Goals, Issuing Prompts, Analyzing Feedback, and Adjusting Strategy. The initial version of the questionnaire included 32 items, with each item rated on a Likert scale from 1 ("Strongly Disagree") to 5 ("Strongly Agree").

Before conducting the formal survey, researchers conducted a pilot study of the initial questionnaire with 30 responses. They then entered the data into SPSS for reliability and validity analysis. The results showed a Cronbach's α coefficient of 0.959 with an average reliability of 0.854, indicating good internal consistency. Furthermore, the factor analysis yielded an average KMO value of 0.78, suggesting strong content validity for the initial questionnaire.

Subsequently, the researchers distributed the formal questionnaire via the Wenjuanxing[2] platform, with 537 valid responses collected. Based on this data, the reliability and validity of the scale were reassessed. The results showed an overall Cronbach's α value of 0.978 for the scale, with dimension-specific coefficients of 0.896 (Understanding AI), 0.920 (Setting Goals), 0.927 (Issuing Prompts), 0.938 (Analyzing Feedback), and 0.944 (Adjusting Strategy), all meeting statistical standards. The KMO value was 0.974, and the Bartlett's test of sphericity had a p-value of .000, indicating that the questionnaire's reliability and validity are both satisfactory.

IV. Results

A. Mastery of Human-AI Interactive Negotiation Competence Among University English Learners

To understand the overall level of HAINC among university English learners, descriptive statistics were first conducted. The results are presented below in Table 1.

Table 1
Descriptive Statistics of HAINC Dimensions

Dimension	M	SD	Minimum	Maximum	N
Understanding AI	3.713	0.741	1	5	537
Setting Goals	3.711	0.692	1	5	537
Issuing Prompts	3.639	0.714	1	5	537
Analyzing Feedback	3.625	0.719	1	5	537
Adjusting Strategy	3.684	0.724	1	5	537

Table 1 shows that the mean scores for the dimensions of Understanding AI, Setting Goals, Issuing Prompts, Analyzing Feedback, and Adjusting Strategy are all above 3, indicating that the overall level of the HAINC among the participants is moderately high. Among these dimensions, Understanding AI has the highest mean score at 3.713, followed closely by Setting Goals at 3.711, while Analyzing Feedback has the lowest mean score at 3.625. The standard deviations, as well as the maximum and minimum values, reveal substantial individual differences across all five dimensions. The largest individual differences are observed in the dimensions of Understanding AI and Adjusting Strategy, with standard deviations of 0.741 and 0.724, respectively. The dimension with the next largest individual difference is Analyzing Feedback (standard deviation of 0.719), while the dimensions of Issuing Prompts (0.714) and Setting Goals (0.692) show relatively smaller variations. An independent samples t-test was conducted to explore potential gender differences. The results indicate that females have slightly higher mean scores than males in the dimensions of Understanding AI, Setting Goals, and Adjusting Strategy (females: 3.717, 3.719, and 3.698; males: 3.707, 3.696, and 3.661). Conversely, males scored higher than females in the dimensions of Issuing Prompts and Analyzing Feedback (males: 3.644 and 3.645; females: 3.636 and 3.611). However, no significant gender differences were found across any of the five dimensions (p-values > 0.05).

To further investigate learners' performance across different dimensions of HAINC, the mean values for each item within these dimensions are reported below.

Table 2
Mean Values and Standard Deviations for Items in the Dimension of Understanding AI

Dimension	Item	M	SD
Understanding AI	3. I often use AI to assist me in learning English.	3.71	1.021
	4. I am very aware of AI's potential uses in assisting English learning.	3.65	0.938
	5. When seeking help, I understand AI's capabilities and limitations.	3.77	0.888
	6. I can adjust my learning strategies based on AI's understanding.	3.63	0.905
	7. I am able to use the feedback provided by AI to improve my English proficiency.	3.69	0.865
	8. I understand the challenges that might arise when interacting with AI.	3.82	0.853

Understanding AI scored the highest among the five dimensions, indicating that university English learners generally demonstrate a good level of understanding of AI. As shown in Table 2, all six items have mean scores above 3, but the

[2] Wenjuanxing is an online platform for designing, distributing, and managing questionnaires.

standard deviations reveal significant individual differences in understanding AI. Most learners have a moderately high understanding of AI's capabilities and limitations. They recognize that interacting with AI can be challenging, and a high score on Item 8 means that learners are more knowledgeable of this.

However, despite the high level of theoretical understanding and acceptance of AI, learners exhibit relatively weaker abilities in adjusting strategy based on AI's capabilities. In other words, while learners are well-informed theoretically, there is a lack of practical experience to solidify this theoretical knowledge.

TABLE 3
MEAN VALUES AND STANDARD DEVIATIONS FOR ITEMS IN THE DIMENSION OF SETTING GOALS

Dimension	Item	M	SD
Setting Goals	9. I clarify my English learning goals before interacting with AI.	3.63	0.892
	10. I can choose appropriate AI software based on learning needs.	3.69	0.874
	11. I can select the appropriate AI interaction method (voice or text) based on learning goals.	3.69	0.842
	12. The goals I set are achievable within the scope of AI's capabilities.	3.66	0.829
	13. I can break down large learning goals into smaller, manageable goals for AI to accomplish.	3.55	0.845
	14. I ensure that my learning goals adhere to ethical and academic standards.	3.96	0.825
	15. I adjust my learning goals based on my learning progress.	3.80	0.790

From Table 3, it can be observed that most university English learners clarify their learning goals before the interaction with AI (mean = 3.63) and are able to choose appropriate AI software and interaction methods to aid their language learning (mean = 3.69). This suggests that learners possess a certain level of goal-setting capability and awareness of choosing appropriate tools. Furthermore, due to the relatively high average score in the "Understanding AI" dimension, learners are also able to set achievable goals based on their understanding of AI tools (mean = 3.66). Most importantly, learners are generally able to ensure that their learning goals adhere to ethical and academic standards (mean = 3.96).

All items in the "Setting Goals" dimension have average scores above 3, indicating that learners generally possess a good ability to set goals. However, there is room for improvement. For instance, the item on "breaking down large learning goals into smaller, manageable tasks" has a lower score (mean = 3.55), highlighting that learners still lack practical experience in practicing their interaction with AI to enhance their competence.

TABLE 4
MEAN VALUES AND STANDARD DEVIATIONS FOR ITEMS IN THE DIMENSION OF ISSUING PROMPT

Dimension	Item	M	SD
Issuing Prompt	16. I can describe goals clearly using precise language.	3.67	0.823
	17. I know how to construct effective prompts to guide the AI.	3.52	0.894
	18. I can modify parts of the instructions based on AI feedback.	3.65	0.827
	19. When the AI fails to understand intentions, I can provide additional context or rephrase the prompt.	3.69	0.812
	20. I can identify unclear or ineffective prompts.	3.61	0.848
	21. I can formulate corresponding prompts based on different learning goals.	3.70	0.801

From the average scores for each item in this dimension, it is evident that the university English learners show good language expression abilities when issuing prompts to AI. They can describe goals clearly using precise language (mean score of 3.67), indicating that learners can convey their intentions, which is crucial for effective negotiation and interaction with AI.

Although the score for "constructing effective prompts" is relatively low (mean score of 3.52), learners are able to make appropriate modifications to prompts based on AI's feedback (mean score of 3.65). When AI fails to understand task requirements, learners can also provide additional information or rephrase prompts to ensure AI comprehends the task (mean score of 3.69). This suggests that while most learners cannot achieve ideal feedback from AI on the first attempt, they are capable of refining prompts during the interaction process, aligning with previous research (Jin et al., 2024). This indicates that students can guide and question AI to generate satisfactory feedback results. Additionally, most learners can identify unclear or ineffective prompts (mean score of 3.61).

In summary, respondents demonstrate good language expression abilities in issuing prompts, but there is still a need to develop skills for constructing effective prompts.

TABLE 5
MEAN VALUES AND STANDARD DEVIATIONS FOR ITEMS IN THE DIMENSION OF ANALYZING FEEDBACK

Dimension	Item	M	SD
Analyzing Feedback	22. I am able to deeply analyze the feedback provided by AI in my English learning.	3.62	0.815
	23. I can identify errors or inaccurate information in AI's feedback.	3.58	0.854
	24. I can evaluate the impact of AI's feedback on the effectiveness of my English learning.	3.66	0.799
	25. When AI fails to produce good feedback, I will deeply analyze the reasons and avoid similar situations in the next time.	3.63	0.841
	26. I summarize the strengths of my instructions based on AI's feedback.	3.64	0.794
	27. I scrutinize all AI's feedback with a critical eye.	3.61	0.839

From Table 5, one can observe that most respondents exhibit good critical thinking skills. They can evaluate the impact of AI's feedback on their English learning (mean score of 3.66), summarize the strengths and weaknesses of their prompts (mean score of 3.64), and analyze AI's feedback (mean score of 3.62). However, given that AI generates feedback based on large language models, the feedback may contain inaccuracies or errors (Wen & Liang, 2024). The two items with the lowest scores in the "Analyze Feedback" dimension are "I can identify errors or inaccurate information in AI's feedback" (mean score of 3.58) and "I scrutinize all AI's feedback with a critical eye" (mean score of 3.61). This indicates that respondents have a high level of dependence on AI and lack well-established critical review standards.

TABLE 6
MEAN VALUES AND STANDARD DEVIATIONS FOR ITEMS IN THE DIMENSION OF ADJUSTING STRATEGY

Dimension	Item	M	SD
Adjusting Strategy	28. I can adjust my prompt strategy based on the degree of goal completion.	3.69	0.795
	29. I can recognize when to change the way I interact with AI.	3.66	0.805
	30. I can respond flexibly to AI's performance in different situations.	3.62	0.825
	31. I can add new prompts or modify existing ones based on issues in AI's feedback.	3.71	0.805
	32. I reflect on the strategies and methods I use in interactions and regularly optimize my interaction strategies.	3.75	0.776

From Table 6, one can see that most respondents indicated they could adjust their prompts based on the degree of goal completion (mean = 3.69), which suggests they possess the ability to dynamically adjust strategies and make corresponding changes according to the actual situation (mean = 3.66). Additionally, they are also capable of reflecting on the strategies and methods they use (mean = 3.75) and continuously improving their prompts (mean = 3.71). The lowest score in this dimension was for "I can respond flexibly to AI's performance in different situations" (mean = 3.62), indicating that the respondents lack extensive experience interacting with AI, are not yet familiar with various forms and feedback patterns of AI, and are accustomed to a fixed interaction mode. As a result, when AI changes, learners might struggle to quickly adjust their strategies.

B. Differences in Interaction Mindsets Among University English Learners with Different Levels of HAINC

To explore the differences in interaction mindsets among university English learners with varying levels of HAINC, divided all respondents into three groups based on their total questionnaire scores out of 150. The high-score group (120-150 points) consisted of 179 participants, accounting for 33%; the medium-score group (90-120 points) consisted of 317 participants, accounting for 59%; and the low-score group (below 90 points) consisted of 41 participants, accounting for 8%. The distribution of group numbers followed a normal distribution, making it suitable to perform variance analysis for more detailed data. The descriptive statistics are presented in Table 7.

From Table 7, one can observe that, firstly, most respondents' HAINC is at a moderate level (N=317), while a few have excellent abilities and thinking skills (N=179), and some need improvement (N=41). Secondly, there are significant differences across the five dimensions among the three groups (see Table 8), with p-values all less than 0.05. This indicates that university English learners at different HAINC levels have varying attitudes and tendencies towards AI before and during interaction. To further clarify the differences, one can find in Table 7 that the highest-scoring dimension for the high-score group is "Understanding AI" (4.389), while the lowest is "Analyzing Feedback" (4.299). For the middle-score group, "Setting Goals" has the highest score (3.505), and "Issuing Prompts" has the lowest score (3.394). In the low-score group, "Setting Goals" is also the highest (2.515), while "Analyzing Feedback" is the lowest (2.415).

TABLE 7
DESCRIPTIVE STATISTICS OF DIFFERENT GROUPS

Dimension	Group	N	M	Min	Max	SD
Understanding AI	High-score	179	4.389	3.000	5.000	0.489
	Medium-score	317	3.499	1.833	5.000	0.464
	Low-score	41	2.423	1.000	3.833	0.689
Setting Goals	High-score	179	4.350	3.000	5.000	0.446
	Medium-score	317	3.505	2.143	4.571	0.416
	Low-score	41	2.515	1.000	3.714	0.742
Issuing Prompts	High-score	179	4.334	3.333	5.000	0.456
	Medium-score	317	3.394	2.000	4.333	0.434
	Low-score	41	2.500	1.000	3.500	0.671
Analyzing Feedback	High-score	179	4.299	3.000	5.000	0.480
	Medium-score	317	3.401	2.617	4.500	0.433
	Low-score	41	2.415	1.000	3.500	0.707
Adjusting Strategy	High-score	179	4.334	3.000	5.000	0.475
	Medium-score	317	3.481	2.400	5.000	0.458
	Low-score	41	2.419	1.000	3.400	0.712

TABLE 8
POST-HOC TESTS

Dependent Variable	(I)Group	(J)Group	Mean Difference	Std. Error	Sig.	95% Confidence Interval	
						Lower limit	Upper Limit
Understanding AI	High-score	Medium-score	0.890*	0.461	0.000	0.777	1.003
		Low-score	1.966*	0.854	0.000	1.757	2.176
	Medium-score	High-score	-0.890*	0.046	0.000	-1.000	-0.777
		Low-score	1.076*	0.085	0.000	0.875	1.277
	Low-score	High-score	-1.966*	0.046	0.000	-2.180	-1.757
		Medium-score	-1.076*	0.082	0.000	-1.277	-0.875
Setting Goals	High-score	Medium-score	0.844*	0.042	0.000	0.739	0.949
		Low-score	1.834*	0.076	0.000	1.639	2.030
	Medium-score	High-score	-0.844*	0.043	0.000	-0.949	-0.739
		Low-score	0.989*	0.076	0.000	0.803	1.176
	Low-score	High-score	-1.834*	0.079	0.000	-2.028	-1.639
		Medium-score	-0.989*	0.076	0.000	-1.176	-0.803
Issuing Prompts	High-score	Medium-score	0.940*	0.043	0.000	0.834	1.046
		Low-score	1.834*	0.080	0.000	1.637	2.031
	Medium-score	High-score	-0.940*	0.043	0.000	-1.046	-0.834
		Low-score	0.893*	0.076	0.000	0.705	1.082
	Low-score	High-score	-1.834*	0.080	0.000	-2.031	-1.637
		Medium-score	-0.893*	0.076	0.000	-1.082	-0.705
Analyzing Feedback	High-score	Medium-score	0.898*	0.044	0.000	0.789	1.007
		Low-score	1.884*	0.082	0.000	1.682	2.085
	Medium-score	High-score	-0.898*	0.044	0.000	-1.007	-0.789
		Low-score	0.986*	0.078	0.000	0.793	1.179
	Low-score	High-score	-1.884*	0.082	0.000	-2.086	-1.682
		Medium-score	-0.986*	0.078	0.000	-1.179	-0.792
Adjusting Strategy	High-score	Medium-score	0.853*	0.045	0.000	0.741	0.965
		Low-score	1.914*	0.084	0.000	1.707	2.121
	Medium-score	High-score	-0.853*	0.045	0.000	-0.965	-0.741
		Low-score	1.061*	0.080	0.000	0.862	1.259
	Low-score	High-score	-1.914*	0.084	0.000	-2.123	-1.707
		Medium-score	-1.061*	0.080	0.000	-1.259	-0.863

V. DISCUSSION

A. University English Learners' Overall HAINC is Moderately High, but There Are Deficiencies in Analyzing Feedback

From the data, it is clear that university English learners generally have a moderately high level of HAINC. They exhibit a good understanding of AI, with some learners frequently using AI to assist with English language learning, indicating a high frequency of human-AI interaction. This finding is consistent with previous research (Lei & Xu, 2022), suggesting that the widespread use of mobile devices and technological advancements, combined with the non-threatening nature of human-AI interactions (Creely, 2024), makes such interactions more appealing compared to interpersonal interactions. However, due to the lack of lectures emphasizing HAINC development in various educational designs (Wen & Liang, 2024; Huang, 2024), students are unable to effectively apply theories in practice to aid in their language learning.

Besides, although the data shows that participants generally understand the capabilities and limitations of AI, their ability to analyze AI's feedback is relatively weak. This suggests that students may be over-relying on AI because they have not developed strong critical thinking abilities (Karatas et al., 2024), assuming the information provided by AI is correct. Therefore, they may unconsciously lower their standards for critical evaluation when receiving feedback, consistent with the findings of Nguyen et al. (2024). Another possibility is that students lack practical experience in negotiating and interacting with AI, leading to inadequate understanding and assessment of AI's feedback (Xu et al., 2024), which results in weaker analytical skills.

Furthermore, because they lack practical skills, learners struggle to apply their theoretical knowledge in adjusting their learning strategies effectively. This includes breaking down large goals into smaller, manageable tasks, constructing effective prompts to guide AI, and adapting flexibly to AI's performance in different contexts.

It is noteworthy that the researchers observed a disparity with the previous concerns about academic dishonesty and educational ethics risks (Chen & Lu, 2024; Halaweh, 2023; Wen, 2024b), and the results show that participants generally ensure that their learning goals adhere to ethical and academic standards. This is evident from the highest-scoring item among the 32 questions (Item 14: "I can ensure that my learning goals conform to ethical and academic standards"), which aligns with previous research (Xu et al., 2024; Jin et al., 2024). This indicates that participants have a correct understanding and rigorous attitude regarding the use of AI in language learning.

In summary, the quality of AI-generated feedback is collectively determined by the levels of various dimensions of HAINC. Largely due to the lack of practical application skills despite a good theoretical understanding, the moderate level of HAINC observed in participants is also a key factor affecting learning efficiency. Therefore, learners should focus

on enhancing their practical experience while maintaining a good understanding of AI. They should clearly identify their own problems and needs, issue precise prompts to AI, and improve the effectiveness of the human-AI interaction process (Xu et al., 2024).

B. The Level of HAINC in University English Learners Is Closely Related to Their Interaction Mindsets

There were significant differences in attitudes towards AI among participants with different levels of HAINC. For example, learners in the high-score group exhibited an excellent understanding of AI's role in assisting English learning before interaction and had a positive attitude towards using AI for language learning. Learners in the middle-score group held a more neutral attitude towards AI's role in foreign language learning. Learners in the low-score group were skeptical about the effectiveness of AI's feedback in assisting foreign language learning.

The attitudes of the three groups towards AI before interaction significantly influenced their subsequent human-AI interaction behaviors. The high-scoring group, with an excellent understanding of AI and a high level of interaction mindset awareness, were more confident and skilled in their interactions with AI. This group received substantial assistance from AI and utilized it effectively for foreign language learning, which aligns with the previous studies (Wen & Liang, 2024; Wang et al., 2023). In contrast, the middle-scoring group held a neutral attitude towards AI's role in foreign language learning and encountered some difficulties during interaction. As a result, their lowest scores were found in the" Issuing Prompts" dimension, indicating that their pre-interaction mindset directly affected their ability to initiate effective interactions. The low-scoring group, with average scores below 3 across all dimensions, demonstrated a relatively negative attitude towards AI-assisted foreign language learning. They may be concerned about potential unknown effects on their academic development (Jin et al., 2024), because AI is still a novel technology in the context of language learning (Yang et al., 2024). This might have impacted their engagement in human-AI interaction and reflection. Their limited understanding of operational aspects resulted in less effective assistance from AI, consistent with the findings of Wen and Liang (2024) and Wang et al. (2023).

From the distribution of group sizes, it is evident that most learners have a moderate level of human-AI interaction mindsets. While they have a basic understanding of AI, their critical thinking and ability to explore new technologies independently are not yet sufficient to fully integrate AI into their foreign language learning process. This finding aligns with previous research (Xu & Yang, 2024), which indicates that learners have not mastered effective interaction skills and abilities, making it difficult for them to internalize knowledge through AI's feedback. Consequently, many learners maintain a neutral or cautious attitude towards AI-assisted foreign language learning, with only a small proportion of learners possessing both strong HAINC and interaction mindsets. This suggests that the level of HAINC among university English learners is closely related to their interaction mindset, which has a dominant influence on their human-AI interaction behaviors.

C. Insights for Language Teaching

Based on the data and results obtained in this study, the researchers believe that to enhance learners' HAINC and cultivate interaction mindsets, it is crucial to integrate theory with practice. Foreign language teachers should encourage students to solve practical problems, as the challenges encountered in practice are the best teaching material (Wen & Liang, 2024). By engaging in practical experiences, students can internalize and transfer knowledge, accumulating experience in real human-AI interaction and negotiation processes (Xu et al., 2024).

Secondly, although AI provides learners with a quick way to obtain answers, it does not guarantee the accuracy and reliability of the feedback. This places higher demands on learners' ability to discern information (Zhang, 2023). Teachers should focus on strengthening students' critical thinking and innovative abilities (Yang et al., 2023; Mohamed, 2023).

Third, the essence of learning a foreign language involves engaging with a new culture. Regardless of technological advancements, the function of cultural exchange in language learning will not disappear (Wen, 2024a). The focus of cultivating HAINC should be on the students themselves, as their development is the primary focus and outcome of technological progress (Liu & Qiu, 2024). Therefore, AI-driven foreign language teaching can never replace the humanistic and emotional role that teachers play (Mohamed, 2023). Integrating AI with traditional teaching methods and enabling students to actively develop their HAINC can avoid the pitfalls of being constrained or enslaved by technology; it can also ensure the combination of human values and scientific technology and that technological advancement acts as an assistor for human development (Liu & Qiu, 2024).

VI. Conclusion

Through a questionnaire survey, this study summarized the overall level of HAINC among university English learners and examined the differences in interaction mindsets across various levels of HAINC. The findings revealed that (1) university English learners have a moderately high overall level of HAINC, with good theoretical knowledge of AI, but lack of practical application to internalize and consolidate this knowledge; (2) interaction mindsets play an important role in human-AI interaction behaviors, and different views and attitudes towards AI before and during interactions affect learners' HAINC levels. Based on the research data, the study suggests several implications for future foreign language teaching: theoretical accumulation and practical training should be integrated, the cultivation of learners' critical thinking should be emphasized, and both teachers and students should take initiative in the integration of AI with traditional foreign

language teaching and learning to make human-AI interactive negotiation more beneficial for foreign language education.

This study also has some limitations, such as using a single data collection method, which cannot explore whether interaction mindsets have an impact on human-AI interaction behaviors over time, and the web-based questionnaire collection method may not ensure the honesty of respondents. These issues need to be addressed and improved in future research.

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