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AI-assisted speaking instruction and English as a foreign language learners' oral accuracy and fluency: a quasi-experimental study

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ABSTRACT

This study investigated the effects of artificial intelligence (AI)-assisted speaking instruction using a generative AI (GenAI) chatbot on Chinese vocational college English as a foreign language (EFL) learners' oral accuracy and fluency. A quasi-experimental pretest-posttest control group design was adopted with 80 students. The experimental group engaged in AI-mediated speaking activities, while the control group received conventional instruction. Oral performance was assessed using analytic rubrics adapted from international English language testing system (IELTS) criteria. Results showed significant improvement in oral fluency for the experimental group, while gains in accuracy were not statistically significant. These findings suggest that GenAI chatbots provide interaction-rich environments that enhance fluency development but require complementary form-focused support to improve accuracy. Implications are discussed for integrating AI tools into vocational EFL speaking instruction.

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1. INTRODUCTION

The integration of artificial intelligence (AI) in language education has received growing scholarly attention for its potential to enhance the oral development of English as a foreign language (EFL) learners. Oral proficiency remains a persistent challenge in EFL contexts, where learners often have limited opportunities for authentic interaction, meaningful oral practice, and immediate feedback. Recent advances in AI, especially generative AI (GenAI), have introduced new possibilities for addressing these challenges by simulating human-like interaction, providing real-time feedback, and sustaining learner engagement [1]–[4]. From the perspective of the interaction hypothesis, which emphasizes the role of meaningful interaction and feedback in facilitating language acquisition, AI-assisted speaking instruction may create expanded opportunities for learners to negotiate meaning and modify output beyond traditional classroom constraints [5], [6]. Despite increasing interest in AI-assisted language learning, empirical evidence regarding its effects on key dimensions of oral performance remains limited.

Researchers widely recognize oral development as a complex and demanding aspect of second language acquisition, requiring learners to balance multiple dimensions of performance. Within the field of applied linguistics, oral performance is commonly conceptualized in terms of multiple dimensions, including accuracy and fluency. They reflect learners' control over linguistic forms and their ability to produce speech smoothly and efficiently. In EFL contexts, particularly in classroom-based instruction, learners frequently

struggle to achieve fluency due to insufficient practice opportunities, anxiety about making errors, and limited exposure to interactive speaking environments [7]–[9]. At the same time, efforts to improve fluency may not necessarily lead to parallel gains in accuracy, highlighting the need to examine how instructional interventions influence these dimensions of oral performance [10]–[12].

From a theoretical perspective, the interaction hypothesis provides a useful framework for understanding the potential role of AI-assisted speaking instruction. The hypothesis posits that interaction facilitates language development. It promotes negotiation of meaning, attention to form, and opportunities for modified output. By engaging learners in extended dialogue, adjusting responses, and offering feedback, GenAI-powered chatbots may create interactional conditions that traditional classrooms rarely provide [5]. By enabling learners to participate in repeated, low-anxiety speaking practice, AI-assisted instruction may be particularly conducive to the development of oral fluency, while its impact on accuracy remains an open empirical question [13].

Although a growing body of research has explored the application of AI technologies in language education, much of the existing literature has focused on writing, translation, or general perceptions of AI use. Empirical studies examining the effects of AI-assisted instruction on EFL oral performance remain relatively limited, especially in vocational and tertiary education contexts [4], [10]. Moreover, previous findings suggest that instructional interventions may differentially affect dimensions of oral performance, underscoring the importance of examining accuracy and fluency separately rather than treating oral proficiency as a unitary construct [10].

In response to these gaps, the present study investigates the effects of AI-assisted speaking instruction on EFL learners' oral accuracy and fluency in a Chinese vocational college context. Adopting a quasi-experimental pretest-posttest control group design, the study compares learners who engaged in AI-assisted speaking activities mediated by a GenAI chatbot with those who received conventional speaking instruction. By focusing on accuracy and fluency as two key outcome variables, this study aims to provide empirical evidence on how AI-assisted interaction influences different aspects of oral performance. Specifically, the study addresses the following research questions:

- RQ1: does AI-assisted speaking instruction significantly affect EFL learners' oral accuracy?
- RQ2: does AI-assisted speaking instruction significantly affect EFL learners' oral fluency?

By addressing these research questions, the present study contributes to the growing literature on AI-assisted language learning in several meaningful ways. It offers empirical evidence on the effects of GenAI-assisted speaking instruction in a vocational college context, a setting that remains underrepresented in existing EFL research [4]. In addition, this study does not treat oral performance as a unitary construct; instead, oral accuracy and oral fluency are examined separately, allowing for a more fine-grained understanding of how AI-mediated interaction influences different dimensions of oral performance [13]. Furthermore, the implementation of a widely accessible GenAI chatbot in an authentic classroom setting strengthens the ecological validity of previous findings and yields pedagogically relevant insights into the effective integration of GenAI tools in EFL speaking instruction [10].

2. LITERATURE REVIEW

2.1. AI-assisted instruction in EFL contexts

Recent advances in educational technology have drawn increasing attention to the potential of AI-mediated learning environments to enhance interaction in EFL classrooms. Previous research on technology-supported language learning suggests that digital tools can help overcome constraints of limited classroom interaction by providing learners with additional opportunities for practice beyond teacher-fronted instruction. In particular, technology-enhanced environments have been shown to offer flexible, learner-controlled interactional spaces, allowing repeated engagement with target language input and output in low-anxiety conditions. Studies examining technology-supported autonomous and self-directed learning, especially in listening-focused contexts, indicate that such environments can promote sustained learner engagement and encourage active participation [14]. These studies primarily address listening development and learner perceptions. However, they consistently show that technology can expand interactional opportunities and facilitate learner involvement. This engagement is also essential for developing spoken language.

From a second language acquisition perspective, interaction has long been recognized as a crucial mechanism for language development. Interaction-based approaches emphasize the role of negotiation of meaning, feedback, and modified output in facilitating learners' attention to linguistic form and communicative effectiveness [15]. When learners engage in meaningful interaction, they are more likely to notice gaps between their interlanguage and target language forms, prompting linguistic adjustment and development [16]. AI-powered chatbots, particularly those based on large language models, are capable of sustaining extended dialogue and providing immediate feedback. Such features align closely with

interactionist accounts of language learning, suggesting that AI-mediated speaking activities may create interactional conditions conducive to oral development [17], [18].

2.2. Oral accuracy and fluency as distinct dimensions

Oral performance is widely understood as a multidimensional construct, often analyzed through the complexity, accuracy, and fluency (CAF) framework [19]. Among these dimensions, accuracy and fluency are commonly treated as core indicators of spoken language development [20]. Accuracy reflects learners' control over grammatical and lexical forms, whereas fluency relates to the smoothness, speed, and continuity of speech production [21]. Importantly, previous research suggests that instructional interventions may affect these dimensions differently due to limited cognitive attentional resources [22].

Studies on technology-supported language learning indicate that increased opportunities for interaction often lead to gains in fluency, as learners become more efficient in speech planning [23]. However, improvements in fluency do not necessarily coincide with parallel gains in accuracy, particularly in short-term instructional interventions [24]. This divergence highlights the need to examine accuracy and fluency separately when evaluating the effectiveness of instructional innovations like GenAI.

2.3. Research gaps and theoretical framework

Although growing attention has been paid to the application of GenAI in English language teaching (ELT), existing research has predominantly focused on writing, translation, or learners' perceptions of AI use, with comparatively limited attention to EFL speaking instruction. Current studies on GenAI in ELT can be broadly classified into two strands. One strand examines the pedagogical application of large language model-based tools, such as ChatGPT, in language teaching, with an emphasis on text production, feedback provision, and instructional design. While this line of research has established the instructional potential of GenAI, its focus has largely remained on written language skills rather than spoken performance. The other strand approaches GenAI from a second language acquisition perspective, highlighting its interactional affordances. Drawing on the interaction hypothesis, these studies suggest that GenAI-powered chatbots can facilitate negotiation of meaning and encourage sustained language output [5], [25]. However, empirical evidence from classroom-based speaking instruction remains limited.

More importantly, existing quantitative findings indicate that AI-assisted speaking instruction may exert differential effects on oral performance. Gains in oral fluency are reported more consistently, whereas improvements in oral accuracy are less stable [17]. Furthermore, prior studies have been conducted in general university EFL contexts, leaving vocational education settings underexplored. This is despite the fact that vocational education prioritizes practical communicative efficiency over academic linguistic control [18].

The present study is grounded in the interaction hypothesis, a central framework in second language acquisition research [15]. Building on Krashen's input hypothesis, Long's interaction hypothesis emphasizes that language development is facilitated not only through exposure to comprehensible input, but more importantly through interaction that enables learners to negotiate meaning, receive feedback, and modify their output. Interaction therefore serves as a key mechanism linking input, attention, and output in the language learning process. From an interactionist perspective, communication breakdowns prompt learners to engage in negotiation of meaning through clarification requests, confirmation checks, and reformulations. These interactional processes direct learners' attention to linguistic form and meaning and create favorable conditions for interlanguage development. Opportunities for modified output further allow learners to test hypotheses about the target language and refine their linguistic representations through use [15]. Within this framework, AI-assisted speaking instruction mediated by GenAI chatbots can be conceptualized as an interaction-rich learning environment. By sustaining extended dialogue and providing immediate, responsive feedback, AI chatbots enhance opportunities for comprehensible input, meaningful interaction, and pushed output beyond what is typically available in teacher-fronted classrooms.

The interaction hypothesis also provides a principled explanation for differential effects on oral fluency and accuracy. Frequent interaction and repeated output practice are expected to reduce processing load and promote automatization, thereby facilitating gains in fluency, whereas accuracy development may require sustained attention to form and longer periods of internalization [24]. Accordingly, the interaction hypothesis offers a coherent theoretical basis for examining how AI-assisted speaking instruction influences EFL learners' oral performance.

3. METHOD

3.1. Research design

This study adopted a quantitative quasi-experimental pretest-posttest control group design to investigate the effects of AI-assisted speaking instruction [26]. The design involved assigning two intact

classes as experimental and control groups, with pretest and posttest assessments of the target variables, and statistical control for baseline differences via analyses of covariance (ANCOVA) [27]. This approach facilitated causal inferences about the intervention's impact while addressing practical constraints in classroom-based vocational college research [28].

3.2. Participants

The participants were 80 first-year students from a vocational college in China, drawn from two intact classes of non-English majors enrolled in a compulsory College English course. They were approximately 19 years old on average and shared similar educational backgrounds as native Chinese speakers. The two classes were assigned as the experimental group (n=40) and the control group (n=40). Prior to the intervention, the groups showed comparable English proficiency levels based on their previous semester's final examination results, with no statistically significant differences. Both groups were taught by the same English instructor and followed the same course syllabus. None of the participants had prior experience using AI chatbots for English language learning, ensuring that observed outcomes could be attributed primarily to the intervention [29]. A convenience sampling strategy was employed. Participants were drawn from two intact classes readily available within the institutional setting, a practical and common approach in quasi-experimental classroom research [30].

3.3. The AI chatbot for this study

This study employed Doubao AI, a GenAI chatbot developed by ByteDance, as the instructional tool for AI-assisted speaking practice [10]. Widely accessible via smartphones and computers in China, Doubao AI's conversational interface enables extended dialogue and natural language responses. In this study, the chatbot served as an interactive speaking partner, with students engaging in topic-based prompts and role-play tasks to elicit sustained spoken output. The chatbot generated follow-up questions and contextual responses, promoting elaboration and extended interaction. By offering an on-demand, low-anxiety environment, it provided additional speaking practice beyond classroom constraints [20]. During the intervention, activities were primarily meaning-focused oral tasks, including topic-based conversations, role-plays, and opinion-sharing relevant to vocational contexts. The chatbot occasionally provided corrective feedback and alternative expressions. Experimental group students used it during classroom sessions and for out-of-class practice, averaging 20-30 minutes per session, two to three times weekly.

3.4. Instruments

The primary instrument was a classroom-based speaking test administered as pretest and posttest, aligned with the College English course content. Students performed short speaking tasks on familiar, vocationally relevant topics. Performances were evaluated using an analytic rating rubric adapted from international English language testing system (IELTS) Speaking criteria, focusing on oral fluency (speech continuity and smoothness) and oral accuracy (grammatical and lexical correctness) [30]. Each dimension was rated on a five-point scale, with higher scores indicating better performance. Speaking was assessed in real time by two experienced EFL teachers. A pilot study was conducted to calibrate the raters and examine inter-rater reliability. The results indicated satisfactory agreement for both rating dimensions, with an intraclass correlation coefficient (ICC) of 0.90 for oral accuracy and 0.83 for oral fluency. The same rating procedures were subsequently adopted in the main study.

3.5. Experiment procedure and data analysis

The intervention lasted 16 weeks. In week 1, all participants completed a speaking pretest assessing baseline. The experimental group received an introduction to Doubao AI and guidance on its use for speaking practice; the control group did not. From weeks 2 to 15, the experimental group integrated AI-assisted speaking activities into classroom and out-of-class sessions, involving topic-based tasks and role-plays with the chatbot for extended interaction. The control group received traditional instruction, including teacher-led explanations, classroom practice, and peer interaction without AI. In week 16, all participants completed a parallel speaking posttest to measure changes. The experimental procedure of the present study is illustrated in Figure 1.

Speaking scores on oral accuracy and oral fluency from the pretest and posttest were analyzed quantitatively using statistical package for the social sciences version 26.0. (SPSS 26.0.) Descriptive statistics were first calculated for both the experimental and control groups. To examine whether AI-assisted speaking instruction had a significant effect on posttest performance between groups while controlling for initial differences, ANCOVA were conducted separately for oral accuracy and oral fluency, with posttest scores as the dependent variables, group as the fixed factor, and corresponding pretest scores as covariates. Statistical significance was set at $p<.05$ for all analyses.

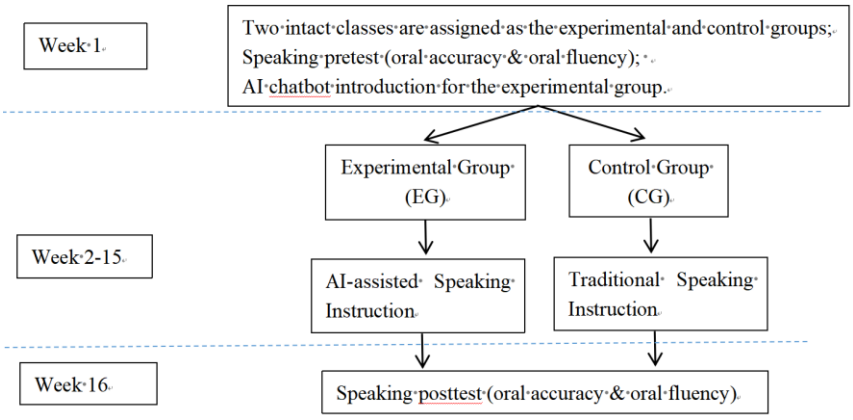

Figure 1. Experiment procedure of the study

4. RESULTS

This section reports the quantitative findings regarding the effects of AI-assisted speaking instruction on EFL learners' oral accuracy and oral fluency. Descriptive statistics are first presented to illustrate overall trends in pre-test and post-test performance. To examine whether post-test differences between the experimental and control groups remained significant after controlling for pre-test scores, ANCOVA was conducted separately for oral accuracy and oral fluency [10].

4.1. Descriptive statistics

Table 1 presents the descriptive statistics for oral accuracy and oral fluency in the experimental group and the control group at the pre-test and post-test stages. As shown in the table, the two groups demonstrated comparable levels of oral accuracy and oral fluency at the pre-test. Following the instructional intervention, the experimental group demonstrated a substantial improvement in oral fluency, whereas changes in oral accuracy were relatively small. The control group demonstrated only slight improvements in oral fluency and a slight decrease in oral accuracy at the post-test stage [26].

Table 1. Descriptive statistics of oral accuracy and oral fluency in the experimental and control groups

Group	Measure	Pre-test		Post-test	
		Mean	S.D.	Mean	S.D.
EG	Accuracy	3.75	1.10	3.78	1.17
	Fluency	3.23	0.86	4.30	0.94
CG	Accuracy	3.48	1.15	3.33	1.16
	Fluency	3.03	0.86	3.50	1.13

4.2. Inferential statistics

With regard to oral accuracy, the ANCOVA results indicated that, after controlling for pre-test accuracy scores, there was no statistically significant difference between the experimental group and the control group on the post-test, $F=2.74$, $p=0.102$, partial $\eta^2=0.034$, as shown in Table 2. The adjusted mean accuracy score of the experimental group was slightly higher than that of the control group; however, this difference did not reach statistical significance.

In contrast, the ANCOVA results for oral fluency revealed a significant main effect of group on post-test performance after controlling for pre-test fluency scores, $F=13.29$, $p<0.001$, partial $\eta^2=0.147$, as seen in Table 3. The experimental group obtained a substantially higher adjusted mean score in oral fluency than the control group, indicating that learners who received AI-assisted speaking instruction outperformed those who received conventional instruction in terms of oral fluency.

Table 2. ANCOVA results for oral accuracy

Group	N	Adjusted mean	F	p	partial η^2
EG	40	3.41	2.74	0.102	0.034
CG	40	3.26			

Table 3. ANCOVA results for oral fluency

Group	N	Adjusted mean	F	p	partial η^2
EG	40	4.22	13.29	<0.001	0.147
CG	40	3.58			

5. DISCUSSION

The present study examined the effects of AI-assisted speaking instruction. The findings revealed that AI-assisted instruction significantly enhanced learners' oral fluency, whereas its impact on oral accuracy was not statistically significant [10]. From the perspective of the interaction hypothesis, the significant gains in oral fluency may be explained by the interaction-rich environment afforded by the GenAI chatbot. AI-mediated speaking activities provided learners with abundant opportunities for sustained interaction, negotiation of meaning, and repeated oral output [5], [15]. Moreover, the relatively low-pressure and non-evaluative nature of AI-mediated interaction may have reduced learners' speaking anxiety, thereby encouraging greater speech continuity and willingness to communicate [7]. In line with the affective filter hypothesis, such affective conditions are conducive to fluent language production [31].

In contrast, the absence of significant improvement in oral accuracy may be explained by the cognitive demands associated with accuracy development. Accuracy-oriented gains typically require sustained attention to linguistic form, explicit feedback, and extended opportunities for noticing form-meaning relationships [20]. In the present study, AI-assisted speaking tasks primarily emphasized meaning-focused interaction, which may have led learners to priorities communicative effectiveness over form monitoring [19]. This finding is consistent with the trade-off hypothesis, which suggests that learners' limited attentional resources during language production may result in improvements in fluency occurring without parallel gains in accuracy [19]. Overall, these findings suggest that AI-assisted speaking instruction may differentially support dimensions of oral performance, with particular strengths in promoting fluency development [30]. To facilitate improvements in oral accuracy, AI-mediated speaking practice may need to be pedagogically complemented by more explicit form-focused support and guided feedback.

6. CONCLUSION

From a pedagogical standpoint, several implications can be drawn for EFL instruction in vocational college settings. First, AI-assisted speaking activities can be integrated into regular classroom teaching to provide learners with additional opportunities for meaningful oral interaction. Second, given the observed limitations in accuracy development, AI-mediated speaking practice should be complemented with form-focused instructional support. Third, English teachers are encouraged to design tasks that progressively direct learners' attention to both fluency and accuracy, thereby promoting more balanced oral development. Finally, vocational institutions may consider developing blended learning environments that combine AI chatbots with teacher-led instruction to create optimal conditions for speaking practice.

Several limitations should be acknowledged. The instructional intervention was conducted over a relatively short period and involved learners from a single vocational college, which may limit the generalizability of the findings. In addition, oral accuracy was assessed using global measures, which may not capture fine-grained changes in specific linguistic features. Future research may adopt longitudinal designs, incorporate more detailed accuracy measures, and explore how different types of AI feedback influence learners' attention to linguistic form. Furthermore, additional variables such as motivation, anxiety, and learner beliefs could be examined to provide a more comprehensive understanding of individual differences in AI-assisted speaking instruction.

To sum up, this study contributes to the growing body of research on GenAI in language education by providing empirical evidence of its differentiated effects on oral accuracy and fluency among vocational college EFL learners. The findings offer practical insights for educators seeking to integrate AI tools into speaking instruction while highlighting the need for pedagogical scaffolding to support accuracy development. The research framework and methodology may also inform future studies investigating technology-mediated L2 oral development in similar educational contexts.

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AUTHOR CONTRIBUTIONS STATEMENT

This journal uses the Contributor Roles Taxonomy (CRediT) to recognize individual author contributions, reduce authorship disputes, and facilitate collaboration.

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Xiaolin Wang	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓
Malini Ganapathy	✓	✓		✓			✓	✓		✓	✓	✓		

C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

CONFLICT OF INTEREST STATEMENT

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

INFORMED CONSENT

Informed consent was obtained from all participants, and their privacy rights were strictly observed.

ETHICAL APPROVAL

The study was conducted in accordance with relevant institutional policies and ethical guidelines.

DATA AVAILABILITY

The data are available from the corresponding author, [MG], upon reasonable request.

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