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# Dynamic Contingency in AI-Supported EFL Speaking: A Literature-Based Analysis

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**Abstract:** This study examines dynamic contingency in AI-supported English as a Foreign Language (EFL) speaking by synthesizing findings from international research literature. While previous studies have widely explored the effectiveness of artificial intelligence (AI) in enhancing speaking skills, limited attention has been given to understanding learning as a dynamic, context-dependent process. Drawing on a literature-based analytical approach, this study reviews selected peer-reviewed articles focusing on AI applications such as chatbots, automatic speech recognition (ASR), and adaptive learning systems in EFL speaking contexts. The analysis reveals that AI-mediated speaking development reflects non-linear and context-sensitive patterns, influenced by factors such as learner characteristics, feedback mechanisms, and task conditions. The reviewed studies indicate variability in learners' performance and engagement, highlighting the role of adaptive interactions and continuous feedback. This study contributes to the field by reframing AI-supported EFL speaking through the lens of dynamic contingency, emphasizing variability, adaptability, and context sensitivity in language development. It further suggests the need for pedagogical approaches that accommodate diverse and evolving learner trajectories in AI-enhanced environments.

***Keywords:*** AI in Language Learning; EFL Speaking; Dynamic Contingency; Complex Dynamic Systems Theory (CDST); Literature-Based Analysis.



## Introduction

Artificial intelligence (AI) has increasingly reshaped English as a Foreign Language (EFL) learning, particularly in the domain of speaking instruction. In recent years, AI-supported tools such as chatbots, automatic speech recognition (ASR), AI-based speech evaluation systems, and adaptive language learning platforms have provided learners with new opportunities to practice oral communication beyond the limitations of conventional classrooms. These tools are especially relevant in EFL contexts, where learners often have limited exposure to authentic English-speaking environments. Through AI-mediated speaking practice, learners can engage in repeated oral production, receive immediate feedback, interact with virtual interlocutors, and develop pronunciation, fluency, confidence, and communicative competence in more flexible ways. Studies have shown that generative AI chatbots can support EFL learners'

speaking development by creating interactive, motivating, and low-pressure communication environments (Fauzi et al., 2025; Tai & Chen, 2024; Yuan, 2024). Similarly, AI-based instruction incorporating speech recognition and personalized feedback has been found to improve learners' speaking skills and self-regulation in EFL contexts (Qiao & Zhao, 2023).

Much of the existing literature has examined AI-supported speaking primarily from an effectiveness-based perspective. Researchers have investigated whether AI chatbots improve oral proficiency, whether ASR tools enhance pronunciation accuracy, whether AI speech evaluation systems offer useful feedback, and whether learners become more motivated or confident when using AI-mediated platforms. For example, studies on ASR have demonstrated its potential to improve pronunciation and speaking performance through immediate corrective feedback, peer-supported practice, and repeated oral production (Dai & Wu, 2023; Sun, 2023). A meta-analysis of ASR in ESL/EFL pronunciation also found that ASR can have a positive effect on pronunciation learning, particularly when explicit corrective feedback and sufficient treatment duration are provided (Ngo et al., 2024). These findings suggest that AI technologies have meaningful pedagogical potential in EFL speaking instruction.

However, an exclusive focus on effectiveness may not fully explain how speaking development occurs in AI-supported environments. Speaking development is not a simple technological outcome that automatically emerges once learners use AI tools. Rather, it is shaped by the interaction of multiple factors, including learner characteristics, feedback quality, task design, technological affordances, affective conditions, and learning context. For instance, learners may respond differently to the same AI tool depending on their proficiency level, motivation, anxiety, digital literacy, and willingness to communicate. Some learners may benefit from AI chatbots because they offer repeated practice and reduce fear of judgment, while others may experience frustration when chatbot responses are unnatural or feedback is insufficient. El Shazly (2021), for example, found that AI-supported speaking activities could improve oral output, yet did not necessarily reduce learners' speaking anxiety. This indicates that AI-mediated speaking development is not always linear, predictable, or uniformly positive.

This issue becomes even more important when considering the limitations of AI feedback. AI speech evaluation systems and ASR-based tools can provide immediate feedback, but their usefulness depends on whether learners understand, trust, and act upon that feedback. Zou et al. (2023) found that AI speech evaluation programs could help EFL learners develop speaking skills through automatic feedback. Nevertheless, later research also highlighted learners' concerns regarding the accuracy of voice recognition, the reliability of scoring, and the limited detail of automated feedback (Zou et al., 2024). These findings show that AI feedback is not merely a technical function; it is also a pedagogical and psychological process. The same feedback may support one learner's progress but confuse or discourage another learner, depending on the learner's needs, expectations, and ability to interpret the system's response.

To address this complexity, the present study adopts the concept of dynamic contingency as an analytical lens. Dynamic contingency refers to the idea that learning outcomes are contingent upon changing interactions among learners, technologies, tasks, feedback, and contexts. This perspective is closely related to Complex Dynamic Systems Theory (CDST), which views second language development as non-linear, adaptive, variable, and context-dependent. CDST has been used in applied linguistics to explain language development as a complex process shaped by multiple interacting conditions rather than by a single cause-effect relationship (Fogal, 2022). From this perspective, variability is not a problem to be ignored but an important feature of language development. Learners may progress, regress, stabilize, or fluctuate depending on how internal and external factors interact over time.

Although recent studies have provided valuable evidence on AI chatbots, ASR tools, AI speech evaluation systems, and informal AI-mediated English learning, limited attention has been given to synthesizing these studies through the lens of dynamic contingency. Existing reviews have mapped the growing use of speech-recognition chatbots and generative AI in language learning (Jeon et al., 2024; Liu et al., 2025), but there remains a need to reinterpret AI-supported EFL speaking as a dynamic, adaptive, and context-sensitive process. Therefore, this study conducts a literature-based analysis of selected peer-reviewed articles on AI-supported EFL speaking. Rather than asking only whether AI improves speaking, this study examines how AI-mediated speaking development varies across learners, feedback mechanisms, task conditions, and learning contexts.

Based on this background, the study is guided by the following research questions:

1. How is dynamic contingency reflected in AI-supported EFL speaking development?
2. What factors influence variability in learners' speaking performance and engagement in AI-enhanced environments?
3. How can dynamic contingency inform pedagogical practices in AI-supported EFL speaking instruction?

# Literature Review

## 1. AI-Supported EFL Speaking

Artificial intelligence has become an important part of English as a Foreign Language (EFL) learning, particularly in the development of speaking skills. In this context, AI-supported learning refers to the use of technologies such as chatbots, automatic speech recognition (ASR), AI speech evaluation systems, natural language processing (NLP), and adaptive learning platforms to support oral practice, feedback, and learner performance. These tools are especially relevant in EFL settings, where learners often have limited opportunities to communicate in English outside the classroom. By offering repeated practice, immediate responses, and flexible access, AI can help learners develop pronunciation, fluency, confidence, and engagement.

Previous studies show that AI-supported tools may contribute positively to speaking development. Tai and Chen (2024) found that generative AI chatbots supported elementary EFL learners' speaking skills through both individual and paired interaction. Yuan (2024) also reported that chatbot integration improved oral English proficiency and willingness to communicate among primary EFL learners. In a broader AI-based learning context, Fauzi et al. (2026) and Qiao and Zhao (2023) found that AI-supported instruction involving speech recognition, interactive exercises, and personalized feedback improved learners' speaking skills and self-regulation. These studies suggest that AI can expand speaking opportunities and promote learner autonomy. However, AI-supported speaking should not be viewed as a tool that automatically improves performance. Learners' progress depends on proficiency level, motivation, anxiety, digital literacy, interactional needs, and ability to interpret feedback. Therefore, AI-supported EFL speaking is better understood as a dynamic process shaped by learner-tool-context interaction.

## 2. AI Chatbots and Conversational Practice

AI chatbots are among the most widely used technologies in AI-supported EFL speaking because they function as virtual interlocutors for conversational practice. Chatbots can provide learners with opportunities to speak repeatedly without depending entirely on teachers or peers. They may also reduce some barriers to participation, especially for learners who feel anxious about making mistakes in front of others. In this sense, chatbot-mediated learning can create a more flexible and less threatening environment for oral communication.

Tai and Chen (2024) showed that generative AI chatbots improved speaking performance and created enjoyable, motivating, and supportive learning experiences. Their study is important because it demonstrates that different interactional configurations, such as individual and paired chatbot interaction, can shape learners' speaking experiences differently. Yuan (2024) similarly found that chatbot-assisted learning improved oral proficiency and willingness to communicate, while also emphasizing the need for personalized correction and user-oriented features. Voice-based chatbots have also been linked to affective development. Han (2020) found that voice-based AI chatbot interaction supported Korean EFL learners' speaking competence and positively influenced interest, motivation, belief, and anxiety. However, El Shazly (2021) showed that AI-supported speaking practice did not necessarily reduce speaking anxiety, even when it improved oral output. This contrast indicates that chatbots do not affect all learners in the same way. From a dynamic contingency perspective, chatbot-supported speaking depends on interaction quality, task relevance, learner affective condition, digital readiness, and pedagogical support.

## 3. Automatic Speech Recognition and AI Feedback

Automatic speech recognition is another major AI application in EFL speaking instruction. ASR allows learners to produce spoken language and receive automated responses related to pronunciation, fluency, or speech accuracy. In pronunciation learning, ASR is valuable because it can provide immediate feedback, encourage repetition, and help learners notice errors in their oral production. However, the usefulness of ASR depends not only on feedback availability, but also on feedback clarity, accuracy, and learner interpretation.

Several studies support the pedagogical value of ASR. Dai and Wu (2021) examined mobile-assisted pronunciation learning through ASR feedback, peer feedback, and combined peer-ASR feedback, showing that feedback conditions produce different learning experiences. Sun (2023) found that ASR combined with peer correction improved EFL learners' pronunciation and speaking skills. Bashori et al. (2024) compared two ASR-based learning systems and found that both supported pronunciation development, with more detailed phonetic feedback leading to stronger progress. At a synthesis level, Ngo et al. (2023) reported that ASR had a positive effect on ESL/EFL pronunciation, especially when feedback was explicit, practice duration was sufficient, and peer-supported learning was involved.

Nevertheless, AI feedback is not always sufficient by itself. Zou et al. (2023) found that AI speech evaluation programs could support EFL speaking development through automatic feedback, but Zou et al. (2024) also reported learner concerns about recognition accuracy, score reliability, limited feedback detail, and insufficient explanation. These findings show that automated feedback may support learning, but it may also create confusion when learners do not understand or trust it. Therefore, ASR and AI speech evaluation systems reveal an important aspect of dynamic contingency: feedback becomes meaningful only when learners can interpret it, act on it, and use it for revision. Teacher guidance remains important in helping learners transform AI-generated feedback into productive speaking development.

## 4. Complex Dynamic Systems Theory and Dynamic Contingency

This study draws on Complex Dynamic Systems Theory (CDST) to frame AI-supported EFL speaking as a non-linear, adaptive, and context-sensitive process. CDST views language development not as a simple movement from input to output, but as an evolving system shaped by multiple interacting factors. Fogal (2022) explains that CDST contributes to understanding second language development as complex, dynamic, adaptive, and dependent on context. This perspective is useful because AI-supported speaking development does not occur in the same way for all learners, even when they use the same tool.

In this study, dynamic contingency refers to the condition in which speaking development emerges from changing relationships among learner characteristics, AI feedback, task conditions, and learning contexts. For example, ASR may support pronunciation when feedback is clear and explicit, but it may be less effective when feedback is vague or when learners practice without guidance. Similarly, chatbot interaction may improve willingness to communicate for some learners but may not reduce anxiety for others. These differences should not be treated as inconsistency; rather, they show that AI-supported speaking is variable and contingent.

Dynamic contingency also emphasizes that learner trajectories are not fixed. Learners may experience progress, hesitation, stabilization, or fluctuation depending on the interaction between internal factors, such as motivation and anxiety, and external factors, such as task design, feedback quality, and teacher mediation. Thus, CDST helps move the discussion beyond whether AI works toward a more meaningful question: how AI works, for whom, under what conditions, and through what forms of interaction.

# Research Method

## 1. Research Design

This study employed a literature-based analytical method to examine dynamic contingency in AI-supported English as a Foreign Language (EFL) speaking. A literature review can function as a research methodology when it is conducted through a transparent process of identifying, selecting, evaluating, and synthesizing relevant scholarly works (Snyder, 2019). In this study, the literature review was not used merely to summarize previous findings, but to synthesize and reinterpret selected studies through the lens of dynamic contingency and Complex Dynamic Systems Theory. This approach is also consistent with the view that integrative literature reviews can generate new conceptual understanding by critically analysing and connecting existing research (Torraco, 2005).

## 2. Data Sources and Collecting Technique

The data were obtained from peer-reviewed articles published within the last seven years, from 2019 to 2026. The search focused on reputable academic databases and publisher platforms, including *Scopus, Web of Science, ERIC, ScienceDirect, Taylor & Francis Online, SpringerLink, SAGE Journals*, and other indexed scholarly sources relevant to applied linguistics, computer-assisted language learning, educational technology, and AI-supported language education.

The search used combinations of keywords related to artificial intelligence, EFL speaking, and dynamic language learning processes. The main keywords included “artificial intelligence,” “AI,” “chatbot,” “AI chatbot,” “generative AI,” “automatic speech recognition,” “ASR,” “speech evaluation system,” “adaptive learning system,” “EFL speaking,” “ESL speaking,” “English speaking skills,” “pronunciation,” “fluency,” “oral communication,” “speaking performance,” “feedback,” “learner engagement,” “speaking anxiety,” and “self-regulation.”

The search strings were adjusted according to the search system of each database. For example, in *Scopus*, the search could be formulated using TITLE-ABS-KEY combinations, while in *Web of Science*, topic search was used. The search was limited to articles written in English and published in peer-reviewed journals or reputable conference proceedings.

## 3. Screening and Data Selection Procedure

The article selection followed several stages: identification, duplicate removal, title and abstract screening, full-text eligibility assessment, and final inclusion. At the identification stage, 100 records were initially collected from the selected databases and publisher platforms. After checking the records, 21 duplicates were removed because they appeared in more than one database or had the same title, author, DOI, or publication metadata. This left 79 unique records for further screening.

The next stage involved title and abstract screening. At this stage, 39 articles were excluded because they were not directly related to AI-supported EFL/ESL speaking, did not involve AI-based tools, focused mainly on non-speaking language skills, or discussed AI in education too generally. After this screening process, 40 articles were retained for full-text assessment.

During the full-text assessment, each article was examined based on its relevance to AI-supported speaking development and dynamic contingency. The assessment focused on whether the article discussed learner variability, AI-mediated feedback, task conditions, adaptive interaction, learner engagement, speaking anxiety, self-regulation, or context-sensitive speaking development. At this stage, 22 articles were excluded because they did not provide sufficient relevance to the analytical focus of this study. Finally, 18 articles were selected as the fixed data corpus for analysis.

The screening process is summarized as follows:

**Table 1.** The screening process of the articles

| Screening Stage | Number of Articles | Result |
|---|---|---|
| Initial records identified | 100 | Articles collected from academic databases and publisher platforms |
| Duplicates removed | 21 | Same title, author, DOI, or publication metadata |
| Records after duplicate removal | 79 | Unique records retained |
| Excluded after title and abstract screening | 39 | Not directly related to AI-supported EFL/ESL speaking |
| Articles assessed in full text | 40 | Potentially relevant articles reviewed |
| Excluded after full-text assessment | 22 | Weak relevance to feedback, adaptation, speaking outcomes, or dynamic contingency |
| Final corpus | 18 | Articles selected for thematic analysis |

## 4. Data Analysis Procedure

The selected articles were analysed using thematic analysis informed by Complex Dynamic Systems Theory. The analysis focused on identifying recurring patterns related to non-linearity, variability, adaptability, feedback responsiveness, learner characteristics, task conditions, and context sensitivity. Each article was read and coded according to several analytical dimensions: type of AI application, speaking focus, learner characteristics, feedback mechanism, task condition, learning context, and dynamic contingency element.

The first analytical dimension was the type of AI application, including chatbots, ASR, AI speech evaluation systems, adaptive learning platforms, and robot-assisted language learning. The second dimension was the speaking focus, such as pronunciation, fluency, accuracy, speaking performance, oral interaction, anxiety, confidence, or willingness to communicate. The third dimension concerned learner characteristics, including proficiency level, motivation,

anxiety, autonomy, digital literacy, and self-regulation. The fourth dimension examined feedback mechanisms, such as automated corrective feedback, pronunciation feedback, scoring feedback, peer-supported feedback, and conversational feedback. The fifth dimension focused on task conditions, including task type, interaction mode, task difficulty, topic relevance, and the degree of teacher mediation.

After coding, the findings were synthesized into broader themes. These themes included non-linear speaking development, learner variability, adaptive feedback, task and context sensitivity, and the pedagogical role of teachers in AI-enhanced speaking environments. The analysis did not treat AI as a single causal factor that automatically improves speaking performance. Instead, it examined how AI-supported speaking development emerges from the interaction of multiple factors that change across learners and contexts.

### 5. Analytical Trustworthiness

To strengthen the trustworthiness of the analysis, the selection and coding procedures were conducted transparently. The inclusion and exclusion criteria were clearly defined before finalizing the corpus. The final articles were selected based on their relevance to the research questions and their contribution to understanding AI-supported speaking as a dynamic and contingent process. In addition, the thematic analysis was consistently guided by the key concepts of dynamic contingency and CDST, namely variability, adaptation, non-linearity, learner trajectory, feedback interaction, and context sensitivity.

Through this methodological procedure, the study aimed to provide a rigorous literature-based analysis of AI-supported EFL speaking. The method allowed the study to move beyond a simple effectiveness-based review and instead examine how AI-mediated speaking development is shaped by the complex interaction of learners, technologies, feedback, tasks, and pedagogical environments.

## Findings

The findings of this study are derived from the thematic analysis of 18 selected peer-reviewed articles that constituted the final data corpus. The corpus consisted of 18 peer-reviewed articles that directly addressed AI-supported EFL/ESL speaking, pronunciation, oral communication, AI feedback, learner engagement, speaking anxiety, self-regulation, or adaptive learning interaction. These articles covered several types of AI applications, including generative AI chatbots, voice-based AI chatbots, automatic speech recognition systems, AI speech evaluation programs, robot-assisted language learning, and broader AI-mediated English learning platforms.

**Table 2.** Results of final data corpus

| No. | Article | Main AI focus | Why it fits your corpus |
|---|---|---|---|
| 1. | Tai & Chen, 2024, *Computers & Education*, "Improving elementary EFL speaking skills with generative AI chatbots…" | Generative AI chatbot + ASR | Strong fit because it directly examines EFL speaking development through individual and paired chatbot interaction. |
| 2. | Yuan, 2024, *Interactive Learning Environments*, "An empirical study of the efficacy of AI chatbots…" | AI chatbot | Relevant for oral proficiency, willingness to communicate, and adaptive chatbot-supported learning paths. |
| 3. | Han, 2020, *Asia-Pacific Journal of Convergent Research Interchange*, "The Effects of Voice-based AI Chatbots…" | Voice-based AI chatbot | Useful for analysing speaking competence, motivation, interest, belief, and anxiety in Korean EFL learners. |

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|---|---|---|---|
| 4. | El Shazly, 2021, *Expert Systems*, "Effects of artificial intelligence on English speaking anxiety and speaking performance…" | Conversational AI chatbot | Important for your dynamic-contingency angle because it shows that AI may improve performance while not necessarily reducing anxiety. |
| 5. | Qiao & Zhao, 2023, *Frontiers in Psychology*, "Artificial intelligence-based language learning…" | AI-based instruction, Duolingo, NLP, speech recognition | Relevant for speaking skills, self-regulation, autonomy, and personalized feedback. |
| 6. | Zhang et al., 2026, *Journal of Educational Computing Research*, "The Influence of Natural Language Processing on EFL Speaking Skills…" | NLP tools, chatbots, adaptability, fluency | Very strong fit because it explicitly includes learner adaptability, accuracy, and fluency. |
| 7. | Kemelbekova et al. (2024), *XLinguae*, "AI in teaching English as a foreign language…" | AI chatbots in higher education | Useful for comparing AI-supported speaking outcomes and learner attitudes in a higher education EFL context. |
| 8. | Liu, Darvin, & Ma, 2025, *Computer Assisted Language Learning*, "Exploring AI-mediated informal digital learning of English…" | Generative AI, ChatGPT, Bing Chat | Fits the context-sensitive dimension because it examines how EFL learners negotiate AI affordances and constraints in informal learning. |
| 9. | Zou et al., 2023, *SAGE Open*, "An Investigation Into Artificial Intelligence Speech Evaluation Programs…" | AI speech evaluation system | Strongly relevant to automated feedback, speaking development, and learner perceptions. |
| 10. | Zou et al., 2024, *System*, "Exploring EFL learners' perceived promise and limitations…" | AI speech evaluation system, EAP Talk | Important for analysing the limitations of AI feedback, recognition accuracy, learner trust, and feedback detail. |
| 11. | Sun, 2023, *Frontiers in Psychology*, "The impact of automatic speech recognition technology…" | ASR + peer correction | Very relevant to pronunciation, speaking skills, peer correction, and mixed-method evidence. |
| 12. | Dai & Wu, 2021, *Computer Assisted Language Learning*, "Mobile-assisted pronunciation learning with feedback from peers and/or ASR…" | Mobile ASR + peer feedback | Strong fit for comparing autonomous ASR feedback, peer feedback, and combined feedback conditions. |
| 13. | Bashori et al., 2024, *Innovation in Language Learning and Teaching*, "I Can Speak…" | ASR-based pronunciation systems | Useful for analysing different feedback types: global corrective feedback versus phonetic-detail feedback. |
| 14. | Jakonen, Duran, & Peltonen, 2025, *Language Teaching Research*, "Situated L2 pronunciation instruction…" | Robot-assisted language learning, ASR | Very strong for dynamic contingency because it shows how teachers and learners respond to ASR breakdowns in real interaction. |
| 15. | Jeon, Lee, & Choi, 2023, *Interactive Learning Environments*, "A systematic review of research on speech-recognition chatbots…" | Speech-recognition chatbots | Useful as a synthesis article for mapping chatbot roles, intervention duration, target language, and speaking/listening outcomes. |
| 16. | Ngo et al., 2024, *ReCALL*, "The effectiveness of automatic speech recognition in ESL/EFL pronunciation…" | ASR meta-analysis | Important for supporting claims about ASR effectiveness, treatment duration, feedback type, and learner grouping. |
| 17. | Koç & Savaş, 2025, *ReCALL*, "The use of artificially intelligent chatbots in English language learning…" | Voice-based AI chatbots | Useful for identifying broader chatbot trends, theoretical frameworks, and pedagogical implications. |

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|---|---|---|---|
| 18. | Son et al., 2025, *Journal of China Computer-Assisted Language Learning*, "Artificial intelligence technologies and applications for language learning and teaching" | AI technologies: NLP, ASR, chatbots, ITS | Useful as a conceptual anchor for locating ASR, chatbots, and intelligent tutoring systems within AI-supported language learning. |

The final corpus provided meaningful insights into how speaking development varies across learners, feedback mechanisms, task designs, and learning contexts. Therefore, the selected articles were considered suitable for analysing dynamic contingency in AI-supported EFL speaking. These articles covered several AI-supported EFL speaking applications, including generative AI chatbots, voice-based chatbots, automatic speech recognition systems, AI speech evaluation programs, robot-assisted language learning, and broader AI-mediated English learning platforms. The analysis was guided by the three research questions and focused on identifying how dynamic contingency appears in AI-supported speaking development, what factors influence learner variability, and how these insights can inform pedagogical practice.

## 1. Dynamic Contingency in AI-Supported EFL Speaking Development

The first finding shows that dynamic contingency is reflected in the non-linear and context-sensitive nature of AI-supported EFL speaking development. The reviewed studies suggest that AI tools can support speaking improvement, but this improvement does not occur in a fixed or identical pattern across learners. Instead, speaking development emerges from the interaction between learners, AI systems, feedback, tasks, and learning environments.

Studies on AI chatbots demonstrate this dynamic pattern clearly. Tai and Chen (2024) found that generative AI chatbot interaction improved elementary EFL learners' speaking skills, both in individual and paired interaction settings. However, the study also implies that the learning process was shaped by different interactional configurations. Individual chatbot interaction encouraged personalized engagement and self-directed learning, while paired interaction involved peer collaboration, shared problem-solving, and social negotiation. This suggests that the same AI tool may generate different learning experiences depending on how learners interact with it.

Similarly, Yuan (2024) found that chatbot use improved oral English proficiency and willingness to communicate among primary EFL learners. Yet, the study also emphasized the importance of tailored chatbot features, personalized correction, and adaptive learning pathways. This indicates that AI-supported speaking development is contingent upon the responsiveness of the system and the suitability of the learning design. In other words, AI does not function merely as a speaking practice machine; its value depends on how well it adapts to learners' needs and how learners respond to its affordances.

The non-linear nature of AI-supported speaking development is also visible in studies on learner affect. Han (2020) reported positive effects of voice-based AI chatbots on learners' speaking competence and affective domains, including motivation and interest. However, El Shazly (2021) found that AI-supported speaking activities did not necessarily reduce speaking anxiety, even though they supported oral performance. This contrast is important because it shows that AI-mediated environments do not always produce uniformly positive affective outcomes. For some learners, AI interaction may reduce pressure; for others, it may maintain or even intensify anxiety depending on task difficulty, system responsiveness, and learner expectations.

From the perspective of Complex Dynamic Systems Theory, these findings indicate that speaking development is not caused by AI alone. Rather, AI-supported speaking emerges from a dynamic relationship between learner agency, technological affordance, feedback quality, task structure, and learning context. This supports the core argument of the study: AI-

supported EFL speaking should be understood as a contingent developmental process rather than a direct technological effect.

## 2. Factors Influencing Variability in Learners' Speaking Performance and Engagement

The second finding concerns the factors that influence variability in learners' speaking performance and engagement. The analysis identified four major factors: learner characteristics, feedback mechanisms, task conditions, and social-pedagogical mediation. First, learner characteristics play a significant role in shaping AI-supported speaking outcomes. The reviewed studies indicate that learners' proficiency level, motivation, anxiety, autonomy, self-regulation, and digital literacy affect how they engage with AI tools. Qiao and Zhao (2023), for example, found that AI-based instruction improved not only speaking skills but also self-regulation among Chinese EFL learners. This suggests that learners who can manage their learning, monitor their progress, and respond actively to AI feedback may benefit more from AI-supported speaking environments. Liu et al. (2025) also showed that EFL learners' use of generative AI tools was shaped by perceived usefulness, ease of use, experimentation, and the negotiation of affordances and constraints. This finding reinforces the idea that learner engagement with AI is not passive, but interpretive and adaptive.

Second, feedback mechanisms strongly influence speaking development. ASR and AI speech evaluation tools provide immediate feedback, but the reviewed studies show that feedback is useful only when it is accurate, understandable, and actionable. Dai and Wu (2021) found that ASR-supported pronunciation learning produced different outcomes depending on whether learners received autonomous ASR feedback, peer feedback, or combined peer-ASR feedback. Sun (2023) also found that ASR combined with peer correction improved pronunciation and speaking skills more effectively than traditional instruction. These studies suggest that feedback becomes more powerful when it is embedded in social interaction and reflective practice.

The importance of feedback quality is further supported by Bashori et al. The importance of feedback quality is further supported by Bashori et al. (2024), who found that ASR-based pronunciation systems with more detailed phonetic feedback produced stronger learning progress than systems offering only global corrective feedback. Similarly, Ngo et al. (2023) reported that ASR was more effective when it provided explicit corrective feedback and was used over sufficient treatment duration. However, Zou et al. (2024) found that learners had concerns about the accuracy of voice recognition, scoring reliability, and limited feedback detail in AI speech evaluation systems. These findings reveal that AI feedback is dynamic: it can support learning, but it can also create uncertainty when learners do not trust or understand it.

Third, task conditions influence learners' speaking performance and engagement. The reviewed studies suggest that task type, topic relevance, interaction mode, task difficulty, and duration of practice shape the effectiveness of AI-supported speaking. For example, chatbot-based role-play, pronunciation repetition, read-aloud tasks, spontaneous conversation, and presentation practice require different forms of learner engagement. Zhang et al. (2026) found that chatbot-supported NLP activities improved adaptability, accuracy, and fluency, especially when conversational practice was structured through repeated role-play. This suggests that speaking tasks must be carefully designed to connect AI interaction with communicative goals.

Fourth, teacher mediation and social support affect how learners benefit from AI. Jakonen et al. (2025) showed that in robot-assisted language learning, teachers played a key role in transforming ASR recognition problems into pronunciation learning opportunities. This finding is especially significant because it shows that AI limitations can become pedagogically useful when teachers help learners interpret, repair, and reflect on interactional breakdowns. Therefore, AI-supported speaking development depends not only on the tool itself, but also on

how teachers and peers mediate the learning process. Overall, learner variability in AI-supported EFL speaking is shaped by the interaction of individual, technological, task-based, and contextual factors. This finding answers the second research question by showing that variability is not accidental; it is a central feature of AI-mediated speaking development.

## 3. Pedagogical Implications of Dynamic Contingency in AI-Supported Speaking Instruction

The third finding concerns how dynamic contingency can inform pedagogical practice. The reviewed literature suggests that teachers should not treat AI as a replacement for instruction, but as a flexible support system that must be integrated into meaningful pedagogical design. Since learners follow different trajectories, AI-supported speaking instruction should avoid a one-size-fits-all approach.

First, teachers need to design differentiated AI-supported speaking tasks. Learners with lower proficiency may require structured prompts, vocabulary support, pronunciation modelling, and guided repetition. More advanced learners may benefit from open-ended chatbot dialogue, role-play, debate, presentation practice, or spontaneous conversation. The findings from Tai and Chen (2024) and Yuan (2023) suggest that chatbot-based learning becomes more useful when interaction is supported by appropriate task design and learner guidance. Therefore, task design should respond to learners' developmental needs rather than simply asking students to "use AI" for speaking practice.

Second, teachers need to develop learners' AI feedback literacy. Since AI feedback may be incomplete, inaccurate, or difficult to interpret, learners should be trained to evaluate feedback critically. The findings from Zou et al. (2023, 2024) show that AI speech evaluation can support speaking development, but learners may also experience uncertainty when feedback lacks detail or when scoring appears unreliable. Therefore, teachers should help learners understand what AI feedback can and cannot do. Learners need guidance on how to revise pronunciation, improve fluency, and use automated feedback as one source of learning rather than as an unquestioned authority.

Third, AI-supported speaking should be integrated with peer and teacher interaction. Studies by Dai and Wu (2021), Sun (2023), and Jakonen et al. (2025) suggest that AI feedback becomes more meaningful when combined with peer correction, teacher mediation, or classroom discussion. This means that the most effective AI-supported speaking environment may not be fully autonomous, but blended. AI can provide repeated practice and immediate response, while teachers and peers can provide interpretation, emotional support, contextual explanation, and communicative authenticity.

Fourth, assessment should recognize learner trajectories rather than only final performance. A dynamic contingency perspective encourages teachers to observe learners' progress over time, including moments of hesitation, regression, adaptation, and improvement. Since AI-supported speaking development is variable, assessment should include process-based evidence such as speaking logs, reflection journals, repeated recordings, AI feedback histories, peer comments, and learner self-evaluation. This approach allows teachers to understand how learners develop, not only whether they improve.

In summary, the findings suggest that dynamic contingency provides a useful pedagogical lens for AI-supported EFL speaking. It encourages teachers to design adaptive tasks, support feedback interpretation, combine AI with human mediation, and recognize diverse learner trajectories. Therefore, AI-supported speaking instruction should be understood as a flexible, responsive, and context-sensitive practice.

# Discussion

This study examined dynamic contingency in AI-supported EFL speaking through a literature-based analysis of selected peer-reviewed articles. The central finding is that AI-supported speaking development should not be understood as a fixed, linear, or universally predictable outcome of technology use. Rather, it is a dynamic process shaped by the interaction of learner characteristics, AI feedback, task design, affective conditions, interactional arrangements, and pedagogical support. This interpretation responds directly to the three research questions of the study: how dynamic contingency appears in AI-supported EFL speaking, what factors influence learner variability, and how this understanding can inform pedagogical practice. The discussion therefore argues that AI is not simply a tool that "improves" speaking by itself, but a learning resource whose impact depends on the conditions under which it is used.

The findings related to the first research question show that dynamic contingency is reflected in the non-linear and context-sensitive nature of AI-mediated speaking development. This interpretation is consistent with Complex Dynamic Systems Theory, which views second language development as adaptive, variable, and dependent on multiple interacting conditions rather than as a simple movement from input to output (Fogal, 2022). In AI-supported EFL speaking, learners' progress emerges from the relationship between the learner, the AI system, the type of feedback, the task condition, and the broader learning environment. This means that the same AI tool may produce different forms of learning for different learners or even for the same learner under different conditions.

The reviewed studies support this interpretation. Tai and Chen (2024), for instance, found that generative AI chatbots supported EFL learners' speaking skills, but the learning experience differed between individual and paired interaction. Individual chatbot interaction tended to support self-directed and personalized practice, while paired interaction created opportunities for peer collaboration, shared problem-solving, and social negotiation. Similarly, Yuan (2024) showed that chatbot use improved oral proficiency and willingness to communicate, but its pedagogical value was closely connected to personalization, adaptive support, and meaningful interaction. These studies suggest that AI-supported speaking development does not depend merely on the presence of AI, but on how the technology creates interactional opportunities that match learner needs.

At the same time, the findings also challenge overly optimistic assumptions about AI-supported speaking. Han (2020) reported positive effects of voice-based AI chatbots on speaking competence and affective development, whereas El Shazly (2021) found that AI-supported speaking practice did not necessarily reduce speaking anxiety, even when it supported oral performance. This contrast is important because it shows that AI does not automatically create a safe or anxiety-free speaking environment. Learners' emotional responses may vary depending on their confidence, task pressure, expectations, and perceptions of the system's accuracy. From a dynamic contingency perspective, such variation is not a weakness of the research field; it is evidence that speaking development unfolds through multiple trajectories.

The second research question concerned the factors that influence variability in learners' speaking performance and engagement. The analysis indicates that learner characteristics play a vital role. Learners differ in proficiency level, motivation, anxiety, confidence, autonomy, self-regulation, and digital literacy, and these differences shape how they engage with AI tools. Qiao and Zhao (2023) found that AI-based learning improved both speaking skills and self-regulation, suggesting that learners who can monitor their learning and respond actively to feedback may benefit more from AI-supported practice. Liu et al. (2025) similarly showed that

learners' use of generative AI in informal English learning was influenced by perceived usefulness, ease of use, experimentation, and negotiation of affordances and constraints. These findings indicate that learners are not passive users of AI; they actively interpret, accept, reject, or adapt what the technology provides.

Feedback is another major factor shaping learner variability. ASR and AI speech evaluation systems are often valued because they provide immediate feedback, but immediacy alone does not guarantee learning. Feedback must be accurate, specific, understandable, and usable for revision. Dai and Wu (2021) found that pronunciation outcomes differed across ASR feedback, peer feedback, and combined peer-ASR feedback conditions, while Sun (2023) showed that ASR combined with peer correction could support pronunciation and speaking development. Bashori et al. (2024) further demonstrated that ASR systems with detailed phonetic feedback produced stronger pronunciation improvement than systems offering only global correction. These findings are consistent with Ngo et al. (2023), who reported that ASR is more effective when feedback is explicit and when learners have sufficient time for practice. However, studies by Zou et al. (2023, 2024) also show that AI feedback may become problematic when learners question voice recognition accuracy, scoring reliability, or the limited detail of automated comments. Thus, AI feedback is not merely a technical output; it is an interpretive and pedagogical process.

Task conditions also influence how learners perform and engage in AI-supported speaking. Different speaking tasks require distinct levels of cognitive effort, topic familiarity, interactional demand, and communicative authenticity. Structured repetition tasks may be useful for learners who need pronunciation support, while open-ended role-play or chatbot conversation may better support fluency, adaptability, and communicative confidence. Zhang et al. (2026) showed that chatbot-supported NLP activities improved adaptability, accuracy, and fluency when learners engaged in structured conversational practice. This suggests that AI-supported speaking tasks need careful instructional design. Without meaningful task structure, AI use may become superficial and disconnected from genuine communicative development.

The role of social and pedagogical mediation is equally important. Jakonen et al. (2025) showed that teacher mediation was crucial in robot-assisted language learning when ASR recognition problems occurred. Rather than treating technological breakdowns as simple failures, teachers helped transform them into opportunities for noticing, repair, and pronunciation learning. This finding strengthens the argument that AI should not be positioned as a replacement for teachers. AI can provide practice, feedback, and interaction, but teachers and peers provide interpretation, emotional support, contextual judgment, and communicative authenticity. In this sense, the most productive AI-supported speaking environment may be blended rather than fully autonomous.

The third research question asked how dynamic contingency can inform EFL speaking pedagogy. The findings suggest that AI-supported instruction should be differentiated, feedback-literate, socially mediated, and process-oriented. Since learners respond differently to AI tools, teachers should not design one uniform AI speaking activity for all learners. Lower-proficiency learners may need structured prompts, vocabulary scaffolding, pronunciation modelling, and guided repetition, while more advanced learners may benefit from debate, role-play, problem-solving dialogue, and presentation rehearsal. Learners also need AI feedback literacy so that they can interpret automated feedback critically rather than accept it unconditionally. They should be encouraged to compare AI feedback with teacher feedback, peer comments, and self-reflection.

Overall, this discussion shows that AI-supported EFL speaking is best understood as a dynamic and contingent process. Theoretically, the study contributes by connecting AI-supported speaking with Complex Dynamic Systems Theory and by emphasizing learner-tool-

task-context interaction. Practically, it suggests that the success of AI in EFL speaking depends not only on technological sophistication, but also on pedagogical planning, learner preparation, meaningful task design, feedback interpretation, and teacher mediation. Thus, this study does not reject the effectiveness of AI in EFL speaking; rather, it deepens the understanding of that effectiveness by explaining why AI works differently for different learners and under different conditions.

# Conclusion

The study concludes that AI-supported EFL speaking development is a dynamic and contingent process, not a fixed or linear outcome of technology use. Although AI tools such as chatbots, automatic speech recognition systems, AI speech evaluation programs, and adaptive learning platforms can support speaking practice, pronunciation, fluency, confidence, and engagement, their impact varies across learners and contexts. This variation is shaped by learner characteristics, feedback quality, task design, and pedagogical support. Therefore, AI feedback becomes meaningful only when learners can understand, trust, and use it for revision and repeated practice. Pedagogically, AI should not be treated as a replacement for teachers, but as a flexible learning resource that requires differentiated tasks, guided feedback interpretation, human interaction, and process-based assessment to support diverse learner trajectories in EFL speaking instruction.

The findings of this study imply that EFL learners can benefit from AI-supported speaking environments when they use AI tools actively and critically. Learners should not depend entirely on AI correction but should treat AI feedback as one source of learning that needs to be evaluated, compared, and practiced further. AI tools can provide valuable opportunities for repeated speaking practice, low-pressure interaction, pronunciation monitoring, and autonomous learning. However, learners also need awareness of the limitations of AI, especially in relation to recognition accuracy, feedback detail, and contextual understanding.

This study is limited by its literature-based design, as it does not include primary data from learners, teachers, or classroom observations. Consequently, the findings should be understood as interpretive and conceptual rather than direct empirical field evidence. The corpus was also restricted to selected peer-reviewed articles published within the last seven years, which means that relevant older studies or non-indexed publications may have been excluded. In addition, the study focused specifically on AI-supported EFL speaking through tools such as chatbots, ASR, speech evaluation systems, and adaptive learning platforms, so it did not provide an in-depth analysis of other language skills such as listening, reading, writing, vocabulary, or grammar.

Future research should examine AI-supported EFL speaking through longitudinal and classroom-based studies to trace how learners' pronunciation, fluency, confidence, anxiety, and feedback engagement develop over time. Further studies should also investigate how different learner groups respond to different AI tools and how teachers mediate AI-supported speaking practice in real classroom contexts. Comparing fully autonomous AI practice with blended models involving AI feedback, peer interaction, and teacher guidance would provide deeper insight into AI-supported speaking as a dynamic and pedagogically mediated process.

# References

Bashori, M., van Hout, R., Strik, H., & Cucchiarini, C. (2024). I Can Speak: improving English pronunciation through automatic speech recognition-based language learning systems. *Innovation in Language Learning and Teaching*, *18*(5), 443–461. https://doi.org/10.1080/17501229.2024.2315101

Dai, Y., & Wu, Z. (2023). Mobile-assisted pronunciation learning with feedback from peers and/or automatic speech recognition: A mixed-methods study. *Computer Assisted Language Learning*, *36*(5–6), 861–884. https://doi.org/10.1080/09588221.2021.1952272

El Shazly, R. (2021). Effects of artificial intelligence on English speaking anxiety and speaking performance: A case study. *Expert Systems*, *38*(3). https://doi.org/10.1111/exsy.12667

Fauzi, I., Hartono, R., Rukmini, D., & Pratama, H. (2025). AI Applications for EFL Learners: Enhancing Speaking Performance and Reducing Anxiety with Gender-Based Analysis. *Forum for Linguistic Studies*, *7*(9), 282–301. https://doi.org/10.30564/FLS.V7I9.10192

Fauzi, I., Hartono, R., Rukmini, D., & Pratama, H. (2026). *AI-SUPPORTED EFL LEARNING: Advancing Speaking Performance and Reducing Anxiety* (First edition). Zukzez Express. https://www.researchgate.net/publication/405147992_AI-SUPPORTED_EFL_LEARNING_Advancing_Speaking_Performance_and_Reducing_Anxiety

Fogal, G. G. (2022). Second language writing from a complex dynamic systems perspective. *Language Teaching*, *55*(2), 193–210. https://doi.org/10.1017/S0261444821000410

Han, D.-E. (2020). The effects of voice-based AI chatbots on Korean EFL middle school students' speaking competence and affective domains. *Asia-Pacific Journal of Convergent Research Interchange*, *6*(7), 71–80. https://web.archive.org/web/20201106004752id_/http://fucos.or.kr/journal/APJCRI/Articles/v6n7/7.pdf

Jakonen, T., Duran, D., & Peltonen, P. (2025). Situated L2 pronunciation instruction during small-group robot-assisted language learning activities. *Language Teaching Research*, 1–26. https://doi.org/10.1177/13621688251367852

Jeon, J., Lee, S., & Choi, S. (2024). A systematic review of research on speech-recognition chatbots for language learning: Implications for future directions in the era of large language models. *Interactive Learning Environments*, *32*(8), 4613–4631. https://doi.org/10.1080/10494820.2023.2204343

Kemelbekova, Z., Degtyareva, X., Yessenaman, S., Dariga, I., & Guldana, S. (2024). AI in teaching English as a foreign language: Effectiveness and prospects in Kazakh higher education. *XLinguae*, *17*(1), 69–83. https://xlinguae.eu/files/XLinguae1_2024_5.pdf

Koç, F. Ş., & Savaş, P. (2025). The use of artificially intelligent chatbots in English language learning: A systematic meta-synthesis study of articles published between 2010 and 2024. *ReCALL*, *37*(1), 4–21. https://doi.org/10.1017/S0958344024000168

Liu, G. L., Darvin, R., & Ma, C. (2025). Exploring AI-mediated informal digital learning of English (AI-IDLE): A mixed-method investigation of Chinese EFL learners' AI adoption and experiences. *Computer Assisted Language Learning*, *38*(7), 1632–1660. https://doi.org/10.1080/09588221.2024.2310288

Ngo, T. T.-N., Chen, H. H.-J., & Lai, K. K.-W. (2024). The effectiveness of automatic speech recognition in ESL/EFL pronunciation: A meta-analysis. *ReCALL*, *36*(1), 4–21. https://doi.org/10.1017/S0958344023000113

Qiao, H., & Zhao, A. (2023). Artificial intelligence-based language learning: illuminating the impact on speaking skills and self-regulation in Chinese EFL context. *Frontiers in Psychology*, *14*, 1255594. https://doi.org/10.3389/FPSYG.2023.1255594

Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of Business Research*, *104*, 333–339. https://doi.org/10.1016/j.jbusres.2019.07.039

Son, J.-B., Ružić, N. K., & Philpott, A. (2025). Artificial intelligence technologies and applications for language learning and teaching. *Journal of China Computer-Assisted Language Learning*, *5*(1), 94–112. https://doi.org/10.1515/jccall-2023-0015

Sun, W. (2023). The impact of automatic speech recognition technology on second language pronunciation and speaking skills of EFL learners: a mixed methods investigation. *Frontiers in Psychology*, *14*, 1210187. https://doi.org/10.3389/FPSYG.2023.1210187

Tai, T. Y., & Chen, H. H. J. (2024). Improving elementary EFL speaking skills with generative AI chatbots: Exploring individual and paired interactions. *Computers & Education*, *220*, 105112. https://doi.org/10.1016/J.COMPEDU.2024.105112

Torraco, R. J. (2005). Writing integrative literature reviews: Guidelines and examples. *Human Resource Development Review*, *4*(3), 356–367. https://doi.org/10.1177/1534484305278283

Yuan, Y. (2024). An empirical study of the efficacy of AI chatbots for English as a foreign language learning in primary education. *Interactive Learning Environments*, *32*(10), 6774–6789. https://doi.org/10.1080/10494820.2023.2282112

Zhang, J., Liao, Q., Li, L., & Luo, J. (2026). The Influence of Natural Language Processing on EFL Speaking Skills: Investigating Learner Adaptability, Language Accuracy, and Fluency. *Journal of Educational Computing Research*, *64*(1), 59–91. https://doi.org/10.1177/07356331251377414

Zou, B., Du, Y., Wang, Z., Chen, J., & Zhang, W. (2023). An investigation into artificial intelligence speech evaluation programs with automatic feedback for developing EFL learners' speaking skills. *Sage Open*, *13*(3), 21582440231193816. https://doi.org/10.1177/21582440231193818

Zou, B., Liviero, S., Ma, Q., Zhang, W., Du, Y., & Xing, P. (2024). Exploring EFL learners' perceived promise and limitations of using an artificial intelligence speech evaluation system for speaking practice. *System*, *126*, 103497. https://doi.org/10.1016/J.SYSTEM.2024.103497