ISSN: 2710-0170

A Systematic Review of the Impact of Artificial Intelligence on Second Language Willingness to Communicate Among EFL Learners

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Abstract

Against the background of globalization and digital integration, artificial intelligence (AI) provides a new approach to improving second language willingness to communicate (WTC). Following the PRISMA guidelines, this study screened 31 empirical studies and analyzed the influence of AI on EFL learners' WTC from research trends, mediating mechanisms and moderating factors. Research has grown rapidly since 2020, focusing on East Asian university students with interdisciplinary theories and mixed methods. AI enhances WTC through affective and cognitive pathways: it reduces anxiety and builds confidence by creating a low-threat environment, and promotes growth mindset, AI literacy and instrumental cognition. The two pathways function synergistically. Effects are moderated by individual and contextual variables. Learners with lower proficiency and higher technology agency benefit more. Embodied tools, simple interaction scenarios and teacher-student-AI collaboration are more effective. This study suggests differentiated AI strategies, emphasizing teachers' role in human-AI cooperation, cultivating learners' technological agency and positive psychology, and addressing ethics and equity. Limitations lie in relatively concentrated participants and contexts. Future research should expand samples and settings, adopt longitudinal designs to verify causality, and explore dynamic mechanisms with AI development.

Keywords

Second Language Willingness to Communicate; Artificial Intelligence; Foreign Language Learning; Mediating Mechanism; Moderating Factor.

1. Introduction

In an era of deep integration between globalization and digitalization, the status of English as a global lingua franca has become increasingly prominent, and fostering learners' ability to communicate actively and confidently in English has become one of the core objectives of EFL teaching. In the field of second language acquisition, willingness to communicate (WTC) is a key individual difference variable, referring to learners' psychological predisposition to initiate communication in the target language under specific circumstances (MacIntyre & Charos, 1996). This concept originally originated from research on first language (L1) communication. McCroskey and Baer (1985) defined it as a relatively stable personality trait and developed the first measurement scale, arguing that it could explain individual differences in communication tendencies across different communicative contexts and partners. Willingness to communicate has been widely regarded as a key psychological antecedent that drives language output and predicts oral proficiency, fluency, and developmental potential (Peng & Woodrow, 2010; Zhang, 2026). However, important evolutions in its connotation occurred after the concept was introduced into second language (L2) research. MacIntyre et al. (1998) proposed the influential pyramid model and redefined L2 WTC as "a readiness to enter into discourse at a particular

ISSN: 2710-0170

time with a specific person or persons, using a L2 (p. 547)". The core contribution of this model lies in indicating that L2 WTC is not a single trait but a complex psychological state jointly influenced by long-term stable factors and immediate contextual factors.

Existing studies have generally confirmed that the formation of second language willingness to communicate results from the combined effects of internal traits and external environments, among which the mechanism of affective and non-cognitive traits has been explored. Lou et al. (2024) conducted a meta-analysis of the relationship between second language willingness to communicate and second language anxiety, confirming a moderate negative correlation between the two, which is moderated by variables such as country and language type, while Liu and Shi (2023) further integrated anxiety into the system of communicative confidence, verifying it as a negative influencing factor, and also revealed that self-perceived communicative competence is the positive internal factor with the largest effect size on willingness to communicate. On this basis, scholars have further explored the action paths of non-cognitive traits. Jiang and Dong (2026) confirmed that critical thinking tendency can positively influence willingness to communicate through the partial mediating effect of sociocultural well-being, and Wang (2023) revealed that second language grit forms an indirect effect chain through the parallel mediating effects of foreign language enjoyment and anxiety, while persistent effort also exerts a direct predictive effect on willingness to communicate. In addition, the influence of individual differences and deep psychological traits has also been verified. Cheng and Xu (2022) found that gender, major and age have significant effects on willingness to communicate, and MacIntyre and Charos (1996) and Zarrinabadi et al. (2019) pointed out that personality traits and meta-mood indirectly affect the formation of second language willingness to communicate by regulating secondary variables such as language anxiety and enjoyment.

In the study of external environmental factors, classroom-related variables have become the core research focus, and their effects interact with internal factors. Liu and Shi (2023) conducted a meta-analysis on the effects of second language communicative confidence and classroom environment on second language willingness to communicate, dividing classroom environment into three dimensions: teacher support, student cohesiveness, and task orientation, and confirming that all three dimensions exert positive effects on willingness to communicate. Dewaele (2019) further refined the teacher-related influences and found that teachers' frequency of language use in class and teaching behaviors are also key predictors. At the level of teaching intervention, the study by Zare et al. (2022) filled the gap in oral teaching practice, confirming that oral corrective feedback has a significant effect on willingness to communicate, among which heuristic feedback is most recognized by learners, and the effectiveness of feedback interacts with learners' language proficiency, providing specific directions for external teaching intervention.

Overall, existing studies have explored the multi-dimensional influencing system of L2 willingness to communicate, identified the mediating and moderating effects of variables such as emotion and cognition, and provided empirical evidence for improving L2 willingness to communicate, but limitations remain. The effect sizes and action boundaries of some influencing factors are still controversial (Liu & Shi, 2023; Lou et al., 2024). In traditional EFL classrooms, especially in high-context cultural regions such as East Asia, learners often demonstrate low WTC due to anxiety, insufficient confidence, and a lack of authentic, low-risk practice environments (Zhang et al., 2024). In recent years, breakthroughs in artificial intelligence technology, especially the popularity of generative AI, such as ChatGPT, and intelligent conversational agents (e.g., various AI oral assistants and chatbots), have provided new possibilities for reshaping the EFL learning environment. Such technologies can offer non-judgmental, repeatable, and personalized interactive experiences, which theoretically create ideal conditions for alleviating learner anxiety and enhancing confidence (Fathi et al., 2024; Tai

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et al., 2020). In view of this, this study adopts a systematic review method to systematically review and sort out empirical studies on how artificial intelligence affects EFL learners' willingness to communicate from the dimensions of research trends, mediating mechanisms, and moderating factors, and to explore the application of artificial intelligence in L2 teaching and the implementation effects of current technical tools. Specifically, this study aims to address the following questions:

1. In the AI-assisted language learning environment, how do affective and cognitive factors mediate the relationship between AI use and learners' second language willingness to communicate?
2. In the AI-assisted language learning environment, which learner individual factors and contextual factors can moderate the effect of AI on willingness to communicate?

2. Methods

2.1. Data Sources

This study adopted the PRISMA guidelines (Page et al., 2021) in identifying and retrieving relevant studies for analysis, and the four-stage procedure included identification, screening, eligibility assessment, and inclusion. In the identification stage, synonyms adopted in previous studies on chatbots and related literature (Ge & Zheng, 2025) were referenced to construct the keyword list for literature retrieval. The screening stage involved examining the retrieved papers against the inclusion/exclusion criteria, taking into account such criteria as the time frame set by the review and publication types. Eligibility assessment consisted of evaluating the identified records against the research questions and objectives, leading to the final decision for the inclusion stage.

The databases searched covered Web of Science, Elsevier, EBSCO, ProQuest, and prominent journals in linguistics and education, including System, Computer Assisted Language Learning, and Language Learning & Technology, with the search period ending in March 2026. The search terms were "AI OR Artificial Intelligence OR AI-assisted OR Large Language Model OR LLM" AND "Willingness to communicate OR WTC". Meanwhile, a snowball search was conducted on the references of the included studies to minimize the omission of key literature and ensure comprehensive coverage, yielding a total of 156 records.

Inclusion criteria were established to ensure the quality and accuracy of literature screening, which specifically included: (1) removing duplicate publications; (2) including only English-language publications; (3) including only empirical studies (including experimental, quasi-experimental, correlational, and mixed-methods studies) while excluding theoretical discussions, commentaries, or pure narrative reviews; (4) studies that explicitly investigated the relationship between AI and WTC among EFL learners; and (5) studies whose participants were learners of English as a foreign or second language. The process of literature identification and screening is illustrated in Figure 1. Following screening based on titles, abstracts, and full texts, a total of 31 studies met all criteria and were included in the final analysis.

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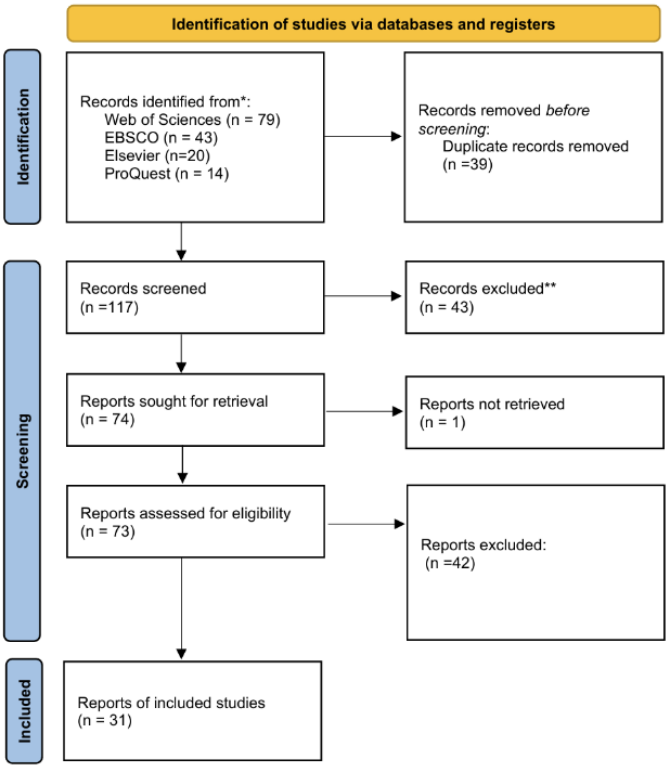

Fig. 1 PRISMA flow diagram for study selection

2.2. Literature Coding

Based on the screened literature and research questions, this study developed a content analysis framework for conducting the systematic literature review. The analysis of research trends was mainly structured according to three subcategories proposed by Ge and Zheng (2025) in their systematic review of intelligent chatbot-supported oral English teaching, including basic trends, theoretical foundations, and research methods.

Table 1.Coding scheme

Main Category	Subcategory	Analytical Focus
Research Trends	Basic Trends	Publication time, country/region, disciplinary field, research participants
	Theoretical Foundations	Theories from linguistics, Psychology, Education, etc.
	Research Methods	Sample size, experimental intervention duration, data collection and analysis methods
Mediating Mechanisms	Affective Mediations	Foreign Language Enjoyment, Foreign Language Anxiety, Self-confidence, Sense of Security, Learning Interest and Motivation, Regulation of Negative Emotions
	Cognitive Mediations	Cognitive Ability, Cognitive Regulation, Cognitive Ability, Cognitive Beliefs, Tool Cognition
Moderating Factors	Learner Individual Factors	Gender, Personality, Age, Major, Language Proficiency, Technology acceptance, AI usage
	Contextual Factors	Teaching Modes, Task Difficulty and Types, Practice Scenarios, AI Tool Characteristics, Feedback forms

ISSN: 2710-0170

The coding procedure is briefly described as follows: (1) designing and defining an initial coding dimension framework; (2) conducting axial coding to categorize themes and dimensions, discussing and revising the coding dimensions to form a applicable coding scheme; (3) inviting two postgraduate students to code the first 10 articles based on the finalized framework, with a Cohen's Kappa coefficient of 0.931 for inter-coder reliability, and after discussing discrepancies with the research assistants, the author reached a consensus and completed the coding of the remaining literature. The specific coding dimensions are presented in Table 1.

3. Results and Discussion

3.1. Research Trends

With the increasingly widespread application of artificial intelligence technology in second language education, related studies exploring its impact on learners' willingness to communicate have shown a gradual growth trend since 2020. In terms of disciplinary distribution, empirical studies in this field are characterized by interdisciplinary integration with psychology as the core and education, linguistics and other disciplines as supplements, presenting both concentration and diversity in disciplinary coverage. The geographical distribution of research participants includes countries such as China, Korea, Iran, and Pakistan, and the population is mainly composed of university students, while relatively less attention has been paid to primary and secondary school students and adult groups. The sample sizes of the studies are mainly small to medium scale, among which small to medium samples of 51–100 participants account for the highest proportion at 38.71%. Large samples of 201–500 participants and extra large samples of 501 or more participants account for 19.35% and 16.13% respectively. The distribution of experimental intervention duration is distinctive. Medium to long term interventions (7–12 weeks) account for the largest proportion at 50%, medium term interventions (3–6 weeks) account for 40.91%, while short term interventions (0–2 weeks) and long-term interventions (13 weeks or more) each account for less than 5%.

The theoretical foundations of existing empirical studies focus on sociocultural theory, as shown in Figure 2, willingness to communicate theory, social cognitive theory, etc. Among them, sociocultural theory emphasizes that language communication is an interactive behavior realized through mediational tools in social contexts. As a new cultural tool, artificial intelligence reconstructs learners' communicative contexts by constructing low anxiety interactive environments and providing scaffolding support. Willingness to communicate theory directly defines the core research construct of how artificial intelligence affects second language learning, defining willingness to communicate as a state of communicative readiness formed by the interaction between individuals and the environment. Social cognitive theory reveals the mechanism of artificial intelligence from the perspective of cognitive interaction, highlighting the central role of self efficacy and feedback in shaping individual language behaviors.

In terms of research methods and data collection, the mixed methods approach is dominant in this field, with 14 relevant studies accounting for 45.2%. It can be seen from Figure 3 that most studies employ questionnaires as the main data collection method, showing an overall trend of verifying the effect of artificial intelligence on willingness to communicate through experimental or survey methods, supplemented by qualitative methods such as interviews and learning logs to deeply analyze the underlying mechanisms. As illustrated in Figure 4, qualitative coding and descriptive analysis are the most prevalent techniques in the data analysis phase, serving primarily to supplement and interpret quantitative data analysis.

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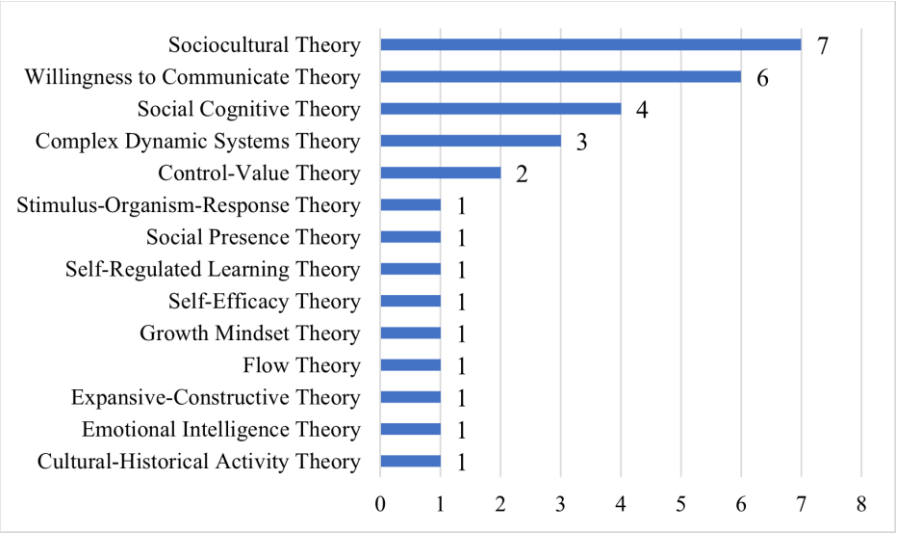

Fig. 2 The theoretical basis of the impact of AI on EFL learners' WTC

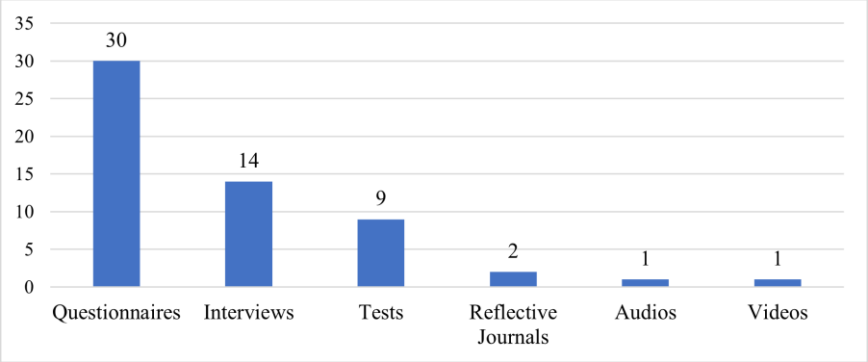

Fig. 3 Data collection methods

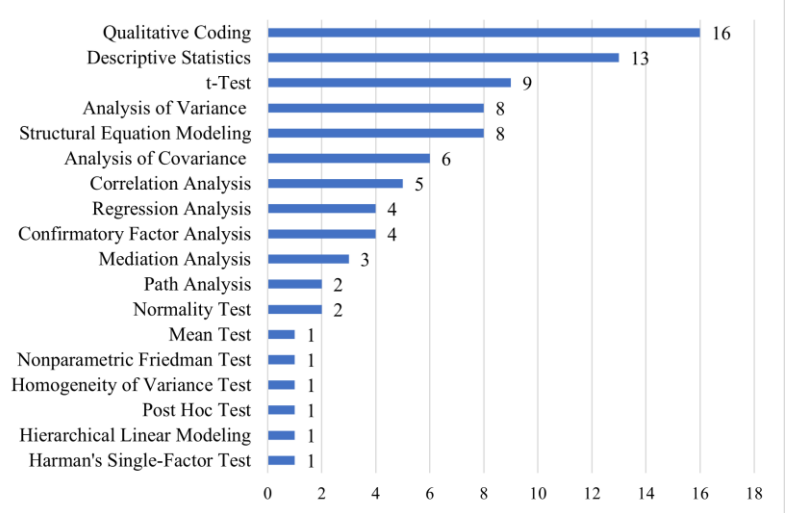

Fig. 4 Data analysis methods

3.2. Mediation mechanism

Data analysis shows that the facilitating effect of AI-assisted learning on willingness to communicate is not a direct linear relationship but is mainly achieved indirectly by regulating learners' internal psychological states, namely affective and cognitive processes. Jiang and Chen (2025) explicitly indicated that affective factors account for as much as 83.9% of the variance in L2 WTC, while the direct effect of AI use, though significant, is relatively weak. Data analyses of mediating effects and path significance were conducted in 10 empirical studies.

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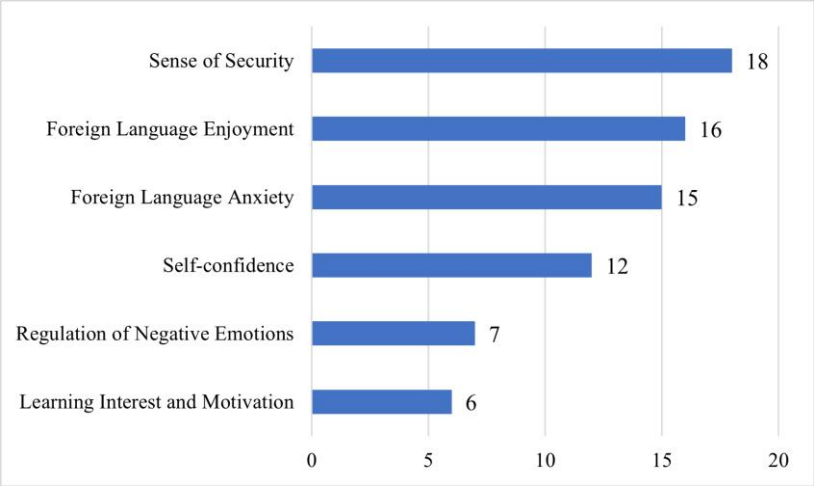

Fig. 5 Frequency of subcategories of affective mediation

Specifically, as shown in Figure 5, on the affective mediating path, Sense of Security and Foreign Language Enjoyment appear most frequently. Zou et al. (2026) pointed out that learners can avoid the embarrassment of face-to-face interpersonal communication when talking with AI, thus feeling more relaxed. The comparative experiment by Wang and Zou (2025) also found that, compared with human teachers and peers, AI can more effectively improve learners' WTC and oral performance, because the AI-based online environment reduces social pressure, strengthens sense of security and self-expression. Such enhanced sense of security directly alleviates Foreign Language Anxiety. Zhang et al. (2024) experimentally confirmed that the use of AI oral assistants can significantly reduce learners' anxiety levels. Furthermore, sense of security and a low-anxiety environment jointly foster Foreign Language Enjoyment and Self-confidence. The path analysis by Jiang and Chen (2025) further revealed that traits such as confidence and grit influence WTC mainly through Foreign Language Enjoyment as a powerful mediator, forming a core mechanism driven by affective experience. At the same time, Learning Interest and Motivation and Regulation of Negative Emotions appear relatively infrequently in the studies, which may reflect that these factors are more likely to be outcomes rather than initial driving forces in the affective mediation chain, or that this is the case for their direct measurements in current AI interaction contexts.

On the cognitive mediation path, Figure 6 shows that Cognitive Beliefs and Instrumental Cognition are dominant. Cognitive Beliefs focus on learners' cognitive judgments of themselves and their learning, constituting the deep cognitive basis affecting learning behaviors, including self-perceived communicative competence, self-perceived oral ability, self-perceived expressive ability, self-perceived language proficiency, L2 growth mindset, and so on. The structural equation model established in the study by Huang et al. (2025) indicates that the perceived usefulness and presence of generative AI chatbots can significantly improve learners' L2 growth mindset. Secondly, Instrumental Cognition focuses on the cognitive evaluation of the external learning environment, representing learners' rational cognitive judgments of external stimuli such as tasks and tools, which influence the adaptability and effectiveness of tool or task use. Instrumental Cognition includes perceived usefulness of tools, perceived effectiveness of feedback, AI literacy, and so on. A study by Liu and Fan (2025) based on the S-O-R framework found that AI literacy plays a significant mediating role between teacher support and WTC. AI literacy not only acts as an important cognitive mediator in itself (Liu & Fan, 2025) but also forms a serial mediation with affective factors. A study by Zou et al. (2026) showed that engagement in generative AI-mediated informal learning can improve AI literacy, which in turn enhances foreign language enjoyment, and both jointly promote WTC. Furthermore, flow experience, as an immersive state integrating deep cognitive engagement and positive affect,

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has also been verified as a key psychological mechanism linking the affordance of AI tools to WTC (Tang, 2026).

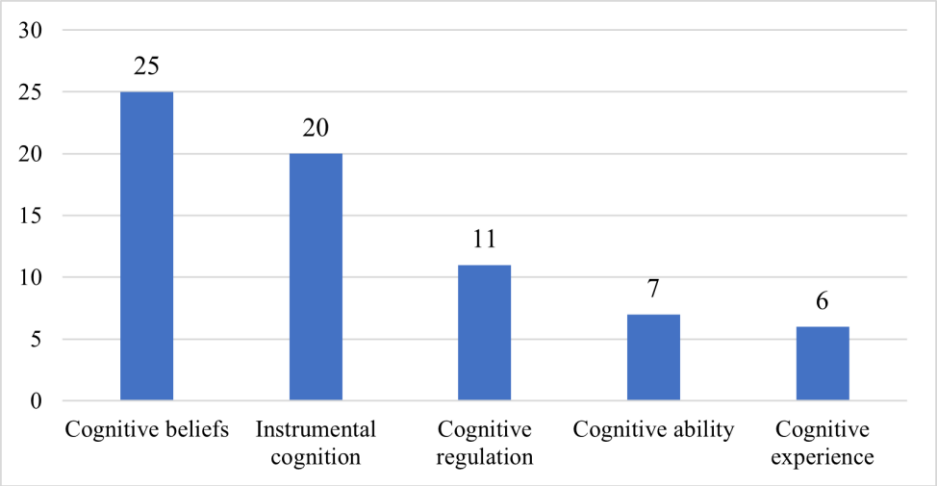

Fig. 6 Frequency of subcategories of cognitive mediation

In summary, the analysis of the mediating mechanisms confirms that AI indirectly drives the improvement of learners' willingness to communicate mainly by fostering positive affective experiences, especially enjoyment and security, and shaping positive cognitive beliefs and instrumental literacy. The affective and cognitive paths are not isolated but often intertwined, jointly forming a complex psychological transmission network through which AI influences WTC. A study by Liu and Fan (2025) based on the Stimulus-Organism-Response (S-O-R) framework found that teacher support directly affects learners' willingness to communicate, whereas technical support has no such direct effect. Instead, AI literacy and foreign language enjoyment play significant mediating roles between external support and willingness to communicate, which clearly reveals the dual pathways of cognitive and affective factors as key mediating variables.

3.3. Moderating Mechanisms

The effects of the affective and cognitive mediating mechanisms are not constant but are significantly moderated by learners' individual factors and external contextual factors. A total of 18 studies (58.1%) examined moderating effects either formally or through comparative experiments. Moderating factors are mainly divided into individual and contextual categories, with complex moderating effects. Figure 7 and Figure 8 summarize the frequencies of these two types of moderating factors in the empirical studies, respectively.

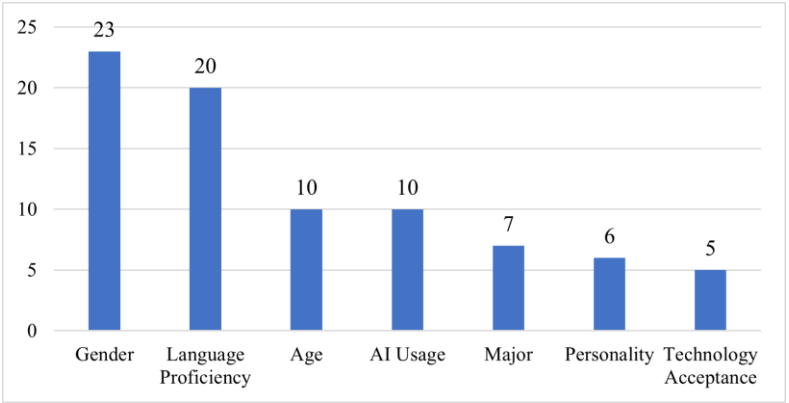

Fig. 7 Frequency of subcategories of learner individual factors

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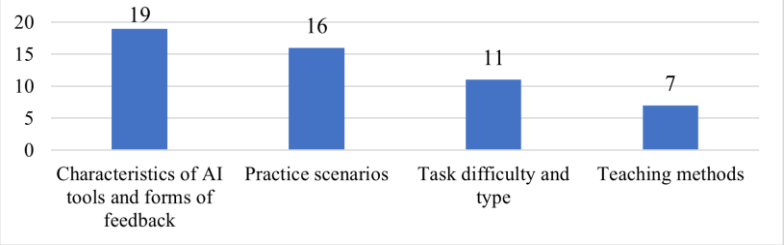

Fig. 8 Frequency of subcategories of contextual factors

Regarding individual moderating factors of learners, Language Proficiency is one of the most significant moderators. Wang et al. (2025) found that GenAI tools yield significantly greater improvements in oral proficiency for low-level (A1-A2) learners than for intermediate and advanced learners. Xun et al. (2025) also revealed that learners from different academic backgrounds benefit from AI interventions across different dimensions. The second moderating factor is Technology Acceptance. Tang (2026) discovered that learner agency, namely the ability and willingness to actively utilize AI resources, significantly moderates the mediating path of affordance → flow → WTC. This path holds only for learners with medium-to-high agency and is not significant for those with low agency, who may even experience negative effects due to cognitive overload. In addition, learners' initial attitude and acceptance toward AI influence their depth of use and learning outcomes. Mei (2025) confirmed that AI affinity serves as an important antecedent variable affecting WTC. The moderating effect of gender is not significant in most studies (Jiang & Chen, 2025; Yan, 2024), whereas Grade/Age (Yan, 2024) and household registration (Wang & Fang, 2026) exhibit moderating effects in specific studies.

In terms of contextual factors, Figure 8 shows that Characteristics of AI Tools and Forms of Feedback is the most frequently occurring variable and also the most influential contextual variable. First, the characteristics of AI tools exert a significant moderating effect. A comparison by Wang et al. (2024) revealed that the D-ID Agent with a virtual avatar can significantly improve WTC and SPCC and reduce anxiety because it provides stronger immersive experience and emotional support, whereas the text-to-speech Type Bot has no such effect. Second, Practice Scenarios and Task difficulty and Types also exert certain influences. A systematic study by Cui et al. (2025) indicated that the impact of AI on WTC is scenario-dependent. Scenarios of fact retrieval with low complexity and clear objectives are most conducive to improving WTC and perceived usefulness, while highly complex scenarios of language skill support or consultative interaction produce weaker effects. Peng and Liang (2025) also found that interaction topics related to personal interests better stimulate WTC, reflecting the moderation of task types on cognitive engagement and affective experience. Furthermore, Teaching Methods also play a moderating role. A study by Zou et al. (2026) confirmed that students receiving the teacher-student-GenAI collaborative model achieved significantly higher WTC than those engaging only in student-GenAI interaction, highlighting the irreplaceable role of teachers in AI-integrated environments. Teachers play a crucial role during learners' interaction with AI. Liu and Fan (2025) also found that teacher support has a direct and strong impact on WTC, while technical support functions indirectly through mediating variables.

In summary, the analysis of moderating mechanisms shows that the facilitating effect of AI-assisted learning on WTC is subject to clear boundary conditions. Learners' existing language proficiency, affective traits, and acceptance of technology, together with the design characteristics of AI tools, the setting of interaction scenarios, and the integration of teaching models, jointly determine whether the affective and cognitive mediating pathways function effectively and how strong their effects are. This requires that individual differences and contextual variables be fully considered in practical application to maximize the effectiveness of AI-assisted language learning.

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4. Conclusion

Based on a systematic analysis of 31 empirical studies, this research reveals multiple mediating pathways and key moderating variables through which AI influences the willingness to communicate of EFL learners. The core conclusion is that AI promotes WTC mainly by improving learners' affective experiences and enhancing cognitive beliefs, and this process is significantly moderated by learners' individual characteristics and specific usage contexts. Accordingly, we propose the following recommendations for EFL teaching.

Firstly, educators should adopt differentiated and integrated application strategies. Before introducing AI, it is necessary to assess learners' major obstacles, language proficiency, and technological literacy; match different types of AI tools according to instructional objectives; and integrate them organically into the teaching process rather than using them in isolation.

Secondly, teachers play a central role in human–AI collaboration, as AI cannot replace teachers' interpersonal interaction and emotional care. Teachers should act as a bridge: before class, they screen and design AI-based tasks. During class, they guide learners to transfer interaction experience from AI to human communication and provide encouragement and humanistic feedback that AI cannot offer; after class, they use AI-generated data to conduct personalized diagnosis and guidance for learners. The pedagogical framework for human-agency-integrated AIED proposed by Guan et al. (2025) provides a valuable reference.

In addition, emphasis should be placed on cultivating learner agency and positive psychology. Beyond technical training, instruction should focus on developing learners' agency to actively explore and utilize AI resources for problem-solving. Meanwhile, instructional design should deliberately create successful experiences via AI to nurture learners' foreign language enjoyment, self-efficacy, and growth mindset, as these positive psychological traits constitute the fundamental driving force for long-term and autonomous willingness to communicate.

Finally, ethical and equity issues require continuous attention. Caution should be exercised against communication skill disconnection or weakened critical thinking that may result from over-reliance on AI. Meanwhile, all learners should be guaranteed necessary support and guidance regardless of their initial technological access or socioeconomic background to benefit equitably from AI-assisted learning.

The limitations of this study lie in the relatively concentrated publication language and participant backgrounds of the included literature. Future research should expand to multicultural contexts, extend research samples to primary and secondary school students and other adult populations, and adopt more longitudinal experimental designs to verify causal relationships in mediating and moderating models. Furthermore, with the rapid advancement of AI technology, its mechanisms influencing WTC will continue to evolve and thus require sustained investigation.

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