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Research Article

From Technology to Talk: A Systematic Review on Intelligent Tutoring Systems and Willingness to Communicate in EFL Contexts

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Abstract

This systematic review aims to synthesize empirical evidence on how Intelligent Tutoring Systems (ITS) and other intelligent technologies influence willingness to communicate (WTC) among learners of English as a foreign language (EFL), with a particular focus on low-exposure contexts. Following the PRISMA 2020 guidelines, twenty peer-reviewed empirical studies published between 2020 and 2025 were retrieved from journals indexed in Scopus, the Web of Science, and the Thai Citation Index (TCI), using a broadened set of keywords that included ITS, AI chatbot, virtual reality (VR), Computer-Assisted Language Learning (CALL), Mobile-Assisted Language Learning (MALL), digital speaking tools, WTC, and EFL. A thematic synthesis was used to analyze the studies according to three guiding objectives: (a) the types of intelligent or technology-based systems used, (b) the cognitive and affective variables (anxiety, motivation, and self-efficacy) involved, and (c) the role of ITS and Technology-Enhanced Collaborative Language Learning (TECLL) in low-exposure EFL contexts. The findings indicate three main patterns. First, intelligent technologies (e.g., AI chatbots, ITS, and VR) seem to expand learners' access to English practice and may foster short-term engagement and confidence. Second, the effectiveness of these systems seems to depend on how teachers integrate them within TECLL designs that emphasize collaboration and meaningful interaction. Third, affective factors, particularly anxiety, motivation, and self-confidence, appear to play a central mediating role in shaping learners' WTC. Studies adopting TECLL frameworks tended to report more sustained gains in WTC, as peer support and teacher mediation may help reduce communication anxiety and strengthen self-confidence. Overall, the findings suggest that technology alone may not be sufficient to ensure communicative readiness; pedagogy-driven integration of intelligent systems appears to be a key condition for promoting WTC among EFL learners in low-exposure environments. Further research should investigate how AI-based systems can be aligned with the social and cultural dimensions of communication.

Keywords: willingness to communicate, intelligent tutoring systems, technology-enhanced collaborative language learning, EFL affective factors, low-exposure contexts

Introduction

Across numerous Asian countries, English is learned in contexts where students have little opportunity to communicate outside the classroom. This context, often called a low-exposure environment, creates challenging circumstances for learners who wish to use or practice their English in real-life scenarios. Although students may have the required grammatical knowledge, they often lack the confidence to speak naturally. This is an issue tied to the concept of willingness to communicate (WTC), proposed by MacIntyre et al. (1998), which links language competence with one's psychological readiness to use a second language.

Nowadays, English teaching programs incorporate digital technology according to both teaching professionals and academic researchers. Computer-assisted language learning (CALL) has gradually evolved toward more integrative and communicative uses of technology (Warschauer & Healey, 1998; Chapelle, 2001), while mobile-assisted language learning (MALL) has expanded opportunities for flexible language practice beyond the classroom (Stockwell & Hubbard, 2013; Reinders & White, 2016). These developments provide a foundation for technology-enhanced collaborative language learning (TECLL), in which digital tools are used to support interaction, collaboration, and meaningful communication in EFL contexts. Within this broader movement, intelligent tutoring systems (ITS) represent an important development because they can provide adaptive feedback, monitor learner performance, and offer individualized support based on learners' progress. Rather than functioning only as instructional platforms, these technologies can create mediated learning environments where students practice language, receive feedback, and gradually build confidence to communicate.

Recent research shows that ITS and AI chatbots establish educational environments that help students build their English-speaking abilities. A study by Zhang et al. (2024) demonstrated that AI tutoring systems enabled shyness-prone students to participate more in classroom discussions while simultaneously decreasing their anxiety levels. In another study, Wang et al. (2024) reported that conversational AI tools improved students' confidence and their willingness to join others' communication. From these examples, intelligent technology is useful for students because it allows them to practice English in an environment where they do not have to be afraid of making mistakes. The technology functions as a communicative partner that enables students to develop their comfort level for speaking and practicing their language skills.

However, the research on this topic is still quite limited and spreads across different areas. Previous reviews have generally examined either a single type of technology, such as AI chatbots (e.g., Guo & Yan, 2025; Peng & Liang, 2025), virtual reality (VR) (Yudintseva, 2024), or telecollaboration (Napiórkowska, 2022), or a single affective dimension (e.g., anxiety or motivation), without integrating ITS, AI tools, and TECLL within a unified framework. Earlier reviews on technology-enhanced WTC have also paid limited attention to low-exposure EFL contexts in Asia, where learners' communicative opportunities outside the classroom are scarce. Thus, this review addresses these gaps by: (a) synthesizing twenty empirical studies between 2020 and 2025 that combine ITS, AI-based, and TECLL approaches; (b) integrating cognitive, affective, and contextual factors that shape students' WTC; and (c) focusing specifically on low-exposure EFL settings. Its novelty lies in linking pedagogy,

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technology, and learner psychology into a single explanatory model rather than treating them as separate research streams.

The review process especially holds significant value for teachers and students in low-exposure settings as they rarely encounter English usage beyond their classroom environment. Students in these contexts primarily learn English through classroom instruction, which is mostly teacher-centered. However, through intelligent systems and AI tools, students can freely communicate in a risk-free environment, enabling them to further develop their English-speaking confidence. The study investigates this information deficit by compiling academic publications that emerged between 2020 and 2025, and focuses on the connection between ITS and WTC in English learning within the TECLL framework.

Objectives

1. To identify the types of intelligent or technology-based systems (e.g., ITS, AI chatbots, VR, CALL, MALL, and TECLL platforms) reported in the reviewed studies as supporting WTC in EFL learning;

2. To examine how cognitive and affective variables, including anxiety, motivation, and self-efficacy, shape EFL learners' communicative behavior in technology-mediated environments; and

3. To investigate how ITS and TECLL approaches support EFL learners in low-exposure contexts where opportunities for authentic English interactions are limited.

Literature Review

The literature reviewed below is organized around the three constructs that frame this study: WTC, technology-enhanced learning, and ITS. These constructs are critically synthesized to show how each strand contributes to understanding learners' communicative behavior in low-exposure EFL contexts. Rather than describing each line of research in isolation, this section identifies converging and conflicting findings that justify the integrative perspective of the present review.

Willingness to Communicate (WTC) in EFL

The research on students' WTC shows how students use their second language skills to perform actual communicative tasks. MacIntyre together with Clément et al. (1980) proposed a pyramid model which shows that WTC depends on multiple factors. The model contains two sections: a bottom section that represents personality and motivation elements, and an upper section that shows short-term emotional states, including confidence and anxiety, and perceived competence. The pyramid's upper section also shows the decision to speak, which depends on the current situation and environment.

In EFL learning, learners often show low WTC because they have few opportunities to speak and are afraid of making mistakes (MacIntyre & Charos, 1996; Clément, 1980). However, Yashima (2002) found that students who keep positive views about international communication—termed international posture—will normally achieve higher WTC.

Taken together, these foundational works establish WTC as a dynamic, situated construct, implying that any technology designed to support communication must address not only linguistic competence, but also the affective and contextual conditions under which learners decide to speak.

Technology-Enhanced Collaborative Language Learning (TECLL)

The use of technology in language learning has come a long way from simple drills to more interactive and intelligent systems today. Warschauer and Healey (1998) described three stages of CALL development, which began with a structural stage, followed by a communicative stage and then culminating in integration whereby genuine learner-driven communication is supported through technology. In other words, the integrative stage moves CALL beyond mechanical practice toward meaningful language use. Chapelle (2001) reinforces this view by arguing that CALL activities should be evaluated according to their pedagogical quality, including learning potential, learner fit, and opportunities for authentic language use.

Within the broader development of technology-enhanced language learning (TELL), collaborative approaches have become increasingly important. This shift provides the basis for TECLL, which focuses specifically on the use of digital tools to support peer interaction, collaborative tasks, and meaningful communication in language learning. Hubbard (2017) argued that contemporary technology should support not only content delivery but also the design of interactive learning experiences. Similarly, Stockwell and Hubbard (2013) emphasized that online and mobile learning environments can promote learner autonomy by offering flexible and adaptable opportunities for language practice.

Recent technology-enhanced language learning environments increasingly integrate AI chatbots, VR, and online exchanges to create more authentic opportunities for communication. These tools may reduce learners' anxiety by providing protected spaces for speaking practice and experimentation (Reinders & White, 2016). From a TECLL perspective, however, the value of these tools lies not only in their technical features, but also in how they are embedded within collaborative tasks, pedagogical support, and meaningful interaction.

Across these strands, a recurring tension emerges: while CALL, MALL, and TELL studies emphasize learner access, flexibility, and autonomy, they also suggest that technology may produce only short-lived gains without pedagogical scaffolding. This tension provides the rationale for examining ITS, which can add adaptive, individualized scaffolding to technology-mediated language learning.

Intelligent Tutoring Systems (ITS) in Language Learning

One of the most advanced innovations in learning technology is the ITS. Using artificial intelligence to analyze learners' performance and give individual feedback (Graesser et al., 2011), ITS provide different feedback responses over typical CALL software because it adapts its responses based on what learners enter into the system.

Heift and Schulze (2015) described ITS as educational systems that merge teaching expertise with natural language processing capabilities to provide customized learning support to students. The system behind ITS provides students with tools to improve their pronunciation skills, their grammar understanding, and even their ability to have conversations. Essentially, ITS operate as an individual tutor that delivers educational experiences that match those of a conventional classroom teacher (Woolf, 2010).

According to Vygotsky (1978), learning occurs most effectively within the Zone of Proximal Development (ZPD), where learners are guided just beyond their current level of understanding. ITS support this process by offering personalized support, enabling users to develop their accuracy and fluency through activities that directly connect their practice to real-life communicative requirements.

Prior ITS scholarship has commonly framed intelligent tutoring around adaptive feedback, individualized support, and performance improvement (Graesser et al., 2011; Woolf, 2010). In language learning, however, Heift and Schulze (2015) noted that such systems have often emphasized linguistic accuracy and error correction more than learners' communicative readiness. This gap is precisely where the WTC construct becomes central, since accuracy gains alone do not guarantee that learners will choose to speak.

Affective Variables in ITS-Based WTC

Students' decisions to communicate in technology-mediated environments are strongly influenced by affective conditions. Horwitz et al. (1986) proved through their research that foreign language anxiety creates a major barrier that prevents students from developing their oral communication skills effectively. MacIntyre and Gardner (1991) also demonstrated that anxiety creates memory problems, rendering people less likely to share information with others. Positive emotions, such as enjoyment and pride, can also influence speaking practice because they help learners feel more confident, engaged, and willing to continue communicating. These emotional conditions are directly relevant to ITS because feedback may shape how learners perceive their progress and ability to communicate (Pekrun, 2006).

The feedback system in ITS can support emotional development by adapting feedback in a way that enables students to develop self-assurance while working in private settings, and avoid feelings of being judged by others. According to Deci and Ryan (2000), students develop intrinsic motivation through their experience of three core elements, namely, autonomy, competence and relatedness. Immediate individualized feedback can support these needs by helping students recognize their progress and meet their learning needs. Moreover, Dörnyei (2005) established self-confidence and vision as fundamental factors that motivate learners. Students who use ITS to track their progress may therefore become more likely to attempt speaking during actual conversations. These intelligent systems therefore serve a broader purpose by supporting linguistic accuracy, reducing anxiety, and enhancing WTC.

Low-Exposure EFL Contexts

English serves as a school subject throughout most Asian nations because people do not use it for their regular conversations. Students cannot practice with actual input because of their current situation (Nunan, 2003). Students master grammar rules during their studies, yet they struggle to express themselves in spontaneous speech. Dörnyei and Kormos (2000) explained that large class sizes and exam-oriented teaching methods have created conditions that ultimately prevent students from holding actual conversations.

However, technology provides solutions that mitigate the occurrence of these issues. Lee and Drajati (2020) showed that students can practice their language skills through online and mobile learning, allowing them to study freely outside the classroom, where they can choose to work independently or with their peers. In addition to this flexibility, ITS also enable students to receive individualized practice and instant feedback, thereby reducing their fear of committing errors.

Methodology

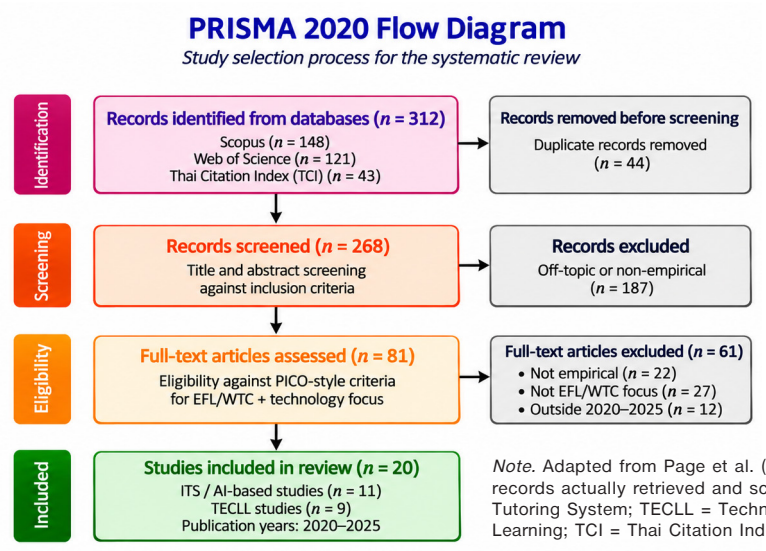
Review Design

This study is a systematic review that follows the PRISMA 2020 guidelines (Page et al., 2021). The research aims to present current findings about ITS, TECLL and WTC in EFL learning environments.

The review process followed a set procedure, producing both exact and reliable assessment results according to the four PRISMA stages: identification, screening, eligibility, and inclusion, as illustrated in Figure 1 below. Each stage was carefully documented to ensure transparency and reliability. The screening process also required two independent reviewers to assess records against the inclusion criteria, with disagreements resolved through discussion.

Figure 1

PRISMA 2020 Flow Diagram of the Study Selection Process



Note. Adapted from Page et al. (2021). The reported numbers reflect the records actually retrieved and screened by the authors. ITS = Intelligent Tutoring System; TECLL = Technology-Enhanced Collaborative Language Learning; TCI = Thai Citation Index.

Search Strategy

Data were retrieved from three primary databases: Scopus, Web of Science, and the Thai Citation Index (TCI), between January and March 2025. To address the breadth of the research field and avoid overly narrow retrieval, the search string was expanded to include conceptually related terms identified from prior reviews and pilot searches. The final Boolean string used was:

("Intelligent Tutoring System" OR "ITS" OR "AI chatbot" OR "artificial intelligence" OR "virtual reality" OR "CALL" OR "MALL" OR "digital speaking tool*" OR "telecollaboration") AND ("Willingness to Communicate" OR "WTC") AND ("EFL" OR "ESL" OR "English as a Foreign Language").

This expanded keyword set was applied across titles, abstracts, and author keywords. Reference lists of related studies were also screened to identify additional relevant sources. The search covered both international and local studies in order to capture diverse EFL learning contexts.

Inclusion and Exclusion Criteria

With regards to the selection process, only empirical research that investigated EFL learners' WTC or related emotional factors in technology-based environments were included. Conceptual or theoretical papers were not selected. The purpose was to focus on studies that provided real data and practical findings. Conceptual papers and theoretical discussions without data were excluded due to their lack of empirical evidence. All included papers were published in peer-reviewed journals between 2020 and 2025.

Data Extraction and Analysis

Information from each study was summarized using a structured coding sheet. The method of thematic synthesis by Thomas and Harden (2008) guided the analysis. Each article was carefully reviewed and grouped according to the type of technology, participants, research design and instruments, and findings related to WTC. Table 1 below presents the twenty studies included in this review.

Table 1

Summary of Selected Studies

Authors/Year	Country	Participants	Technological Integration	Students' Engagement	Main Findings on WTC	Research Design/ Method
Zhang et al. (2024)	China	80 university EFL students	ITS	Actively interacted with AI tutor	ITS increased speaking confidence and reduced anxiety.	Quasi-experimental; pre-/post-test + interview
Dakhil et al. (2025)	Iraq	60 university students	ITS	Engaged in AI-mediated oral tests	AI assessment improved performance and WTC.	Experimental; AI-mediated speaking test (8-week intervention)
Aladini et al. (2024)	Malaysia	120 EFL learners	ITS	Motivated by adaptive feedback	Needs satisfaction and teacher support enhanced WTC.	Survey-based correlational study (questionnaire)
Zhang et al. (2025)	China	205 EFL students	ITS	Positive attitude toward AI learning	AI literacy and self-efficacy predicted WTC.	Quantitative survey; SEM analysis
Peng and Liang (2025)	China	46 university students	ITS	Frequent chat interaction	AI dialogue system promoted communicative willingness.	Mixed-methods longitudinal (chat-log + survey)
Chaisiri (2023)	Thailand	40 EFL students	TECLL	More confident in oral tasks	Virtual classroom increased WTC and participation.	Action research; oral task observation + survey
Rattanasaeng and Sukavatee (2021)	Thailand	55 undergraduates	TECLL	Active group discussion	Flipped classroom improved speaking skill and WTC.	Quasi-experimental; flipped classroom (1 semester)
Lee and Drajati (2020)	Indonesia /Korea	412 students	TECLL	High digital engagement	Digital context produced higher WTC levels.	Cross-sectional survey; scale development & validation
Mulyono and Saskia (2021)	Indonesia	120 university students	TECLL	Positive peer interaction	Peer support and motivation increased WTC.	Quantitative survey (regression analysis)
Han et al. (2024)	Iran	89 intermediate learners	TECLL	Consistent online participation	Digital activities enhanced engagement and WTC.	Mixed-methods (questionnaire + interview)
Waluyo (2020)	Thailand	150 EFL students	TECLL	Engaged in ICT-supported talk	ICT exposure raised confidence and WTC.	Survey-based correlational study
Wang et al. (2024)	China	108 EFL learners	ITS	Relaxed during AI conversation	Chatbots reduced speaking anxiety and improved WTC.	Quasi-experimental; AI chatbot intervention + WTC scale
Tai and Chen (2023)	Taiwan	40 adolescent students	ITS	Enjoyed using mobile AI	Google Assistant encouraged oral communication.	Quasi-experimental; mobile AI assistant (10-week)
Yudintseva (2024)	Canada/ China	90 ESL/EFL students	TECLL	Immersed in VR environment	VR immersion reduced fear and increased WTC.	Experimental; VR immersion comparison

Table 1
(continued)

Authors/Year	Country	Participants	Technological Integration	Students' Engagement	Main Findings on WTC	Research Design/ Method
Napiórkowska (2022)	Poland/ Spain	56 secondary students	TECLL	Regular telecollaboration	Cross-school contact improved English WTC.	Telecollaboration project; mixed-methods
Zhou (2023)	China	50 university learners	TECLL	Engaged in online exchanges	Online interaction raised confidence and WTC.	Mixed-methods online exchange study
Cui et al. (2025)	China	96 EFL students	ITS	Positive perception of AI scenarios	WTC linked to technology acceptance and low anxiety.	Survey-based; technology acceptance model (TAM)
Guo and Yan (2025)	China	70 young EFL learners	ITS	Playful AI engagement	AI partner increased fun and WTC frequency.	Quasi-experimental; AI chatbot intervention
Zou et al. (2025)	China	180 university students	ITS	Consistent speaking practice	Regular AI sessions improved fluency and WTC.	Survey + observation; AI speaking practice
Rahimi and Fathi (2024)	Iran	42 university students	TECLL	Active peer cooperation	E-tandem learning enhanced social interaction and WTC.	Quasi-experimental; e-tandem (12-week)

Results

The synthesis of the twenty empirical studies was organized around the three objectives of this review and highlights the most consequential findings rather than describing each study individually.

The overall synthesis shows that technology, although powerful for extending access and practice, cannot by itself create or sustain WTC among EFL learners in low-exposure contexts.

Learners benefit from technology-enhanced tools, but the decisive element behind sustainable WTC growth is pedagogy—how technology is structured, mediated, and connected to meaningful social interaction.

Technological Tools and Communicative Access

Most studies confirmed that intelligent and mobile technologies increased short-term access to English practice. Adaptive systems like those in Zhang et al. (2024) and Dakhil et al. (2025) provided personalized feedback and automatic speech evaluation. Learners appreciated such private, judgment-free spaces and reported initial confidence gains. The studies by Guo and Yan (2025) and Zou et al. (2025) attribute to this as well, as they found that AI chatbots and digital speaking apps enabled students to improve their repetition and fluency skills because these tools offered students unlimited practice time.

Research findings also show that students learn better through independent work on technology platforms than they do when using these platforms for team collaboration. Students would spend most of their time using the systems instead of working with their fellow students. Though the research by Wang et al. (2024) demonstrated that students became less nervous when using chatbots, their desire to speak decreased after their initial enthusiasm for the new technology wore off.

Another study by Yudintseva (2024) showed that students were able to develop natural conversation skills through VR activities, yet needed extra teaching to connect their experiences with real language usage.

In general, technology can reduce problems such as time, distance, and fear of pronunciation. However, it is not enough to keep students motivated in the long term. As MacIntyre et al. (1998) mentioned, situational WTC depends on emotion and context. Technology can support these conditions only when teachers use it within a suitable teaching plan. In short, ITS and AI tools may make learning easier, but real communication happens when teachers design meaningful tasks around them.

Pedagogical Mediation and Collaborative Dynamics

Across the reviewed studies, two pedagogical patterns emerged consistently. First, teacher mediation amplified the effect of intelligent technologies. Studies in which teachers explained system feedback, scaffolded online tasks, or coupled digital practice with classroom reflection (Aladini et al., 2024; Rattanasaeng & Sukavatee, 2021; Waluyo, 2020) reported stronger and more sustained gains in WTC than studies in which technology was used in isolation. Second, collaborative task structures, including virtual oral tasks, online group work, e-tandem exchanges, and telecollaboration (Chaisiri, 2023; Mulyono & Saskia, 2021; Napiórkowska, 2022; Rahimi & Fathi, 2024) were associated with the largest and most durable improvements in WTC. In these contexts, learners spoke more frequently and elaborated their ideas more fully because peer support reduced communication anxiety and reinforced shared learning goals.

Taken together, these findings indicate that human guidance transforms technology from a delivery tool into a communicative scaffold, and that collaborative designs are particularly effective for low-exposure EFL learners who lack out-of-class opportunities to practice English.

Feedback and social support

Across the reviewed collaborative studies, the students received continuous feedback together with emotional support through their work in collaborative learning environments. This support came from their classmates who shared their learning experiences, as well as teachers and AI systems, who evaluated their pronunciation, grammar, and vocabulary usage. As a result, the students achieved improvements through the combined aspects of social learning and academic development.

Zhang et al. (2025) also showed that students who learned to utilize AI tools achieved superior feedback results because they dedicated more time to social interactions. Additionally, the research conducted by Chaisiri (2023) and Rahimi and Fathi (2024) demonstrated that group work activities helped students decrease their anxiety while raising their self-confidence at the same time. According to their feedback, they described their learning space as both secure and pleasant. Hence, it can be said that technology has evolved from its basic function as a tool into a social platform where people can exchange knowledge and experiences.

The research results also demonstrated that people value their social relationships more than they do the particular technology devices they use. Teachers who provide emotional support to their students along with feedback will help their students develop better communication skills. People find connection through technology, which unites them rather than distance them.

Learning Contexts and Affective Outcomes

Low-exposure conditions

Students across Thailand, Indonesia, China, and Iraq face restrictions when they want to use English outside their school environment. How teachers mediate classroom activities determines how technology affects student communication during these events.

Studies by Waluyo (2020) and Chaisiri (2023) demonstrated that ICT-based lessons that incorporated local and cultural content enabled students to connect their classroom education to their actual life experiences. Students from Thailand became more engaged during their lessons when teachers taught subjects they knew and used storytelling methods. Similarly, students from Indonesia, according to Mulyono and Saskia (2021), maintained their English language usage in online groups throughout the entire class period. These examples illustrate that students develop motivation through technology aligned with local and cultural content to build on their language identities.

Other research findings showed that self-paced ITS programs, which operate without teacher or peer support, do not lead to enduring learning achievements. The participants showed initial self-assurance, but their interest in the activity would quickly dissipate when it came to an end. The results indicate that technology fails to substitute human relationships and social backing, which people need during situations with minimal exposure.

Emotional regulation

Several studies also looked at how technology influenced learners' emotions. Studies by Wang et al. (2024) and Tai and Chen (2023) demonstrated that AI chatbots created an environment that reduced students' anxiety about receiving peer judgments or making errors. Furthermore, Guo and Yan (2025) and Han et al. (2024) mentioned that students would continue their learning activities outside of school when they find their academic work both enjoyable and interesting. These results support Pekrun (2006) control–value theory; because students develop positive emotions, driving them to continue their work, they obtain improved academic results.

Research findings also indicated that individualized feedback delivered through private channels helps most participants decrease their anxiety levels. Without support from peers or teachers, students' WTC did not continue to grow. Motivation needs to be channeled by positive emotions and social support before it can develop into actual communication.

Integrated pattern

The results from all studies suggest a two-stage process in developing WTC through technology. First, technology-supported practice helps learners build initial confidence by reducing fear, anxiety, and concern about making mistakes. Second, collaborative work with teachers and peers allows learners to move from private practice into more active communication within a supportive learning environment. In this process, emotional readiness appears to develop before learners can build stronger self-assurance through purposeful communication.

Overall Synthesis

Rather than restating section-level results, this synthesis highlights the integrated findings of the review: ITS-type tools and TECLL-type pedagogies operate on different but complementary mechanisms. ITS support competence and accuracy through adaptive feedback (Dakhil et al., 2025; Zhang et al., 2024), while TECLL supports relatedness and confidence through collaborative interaction (Chaisiri, 2023; Napiórkowska, 2022; Rahimi & Fathi, 2024). When combined, the two approaches yielded the strongest reported effects on WTC, consistent with MacIntyre et al. (1998), Vygotsky (1978), and Deci and Ryan (2000): accuracy gains alone do not produce communicative readiness, and social interaction alone does not provide the linguistic precision that learners need to feel competent. Pedagogy that integrates both layers therefore appears to be the most promising path for promoting sustainable WTC in low-exposure EFL contexts.

Discussion

Similar to the results, the discussion below is organized based on the three objectives of the review as well. Overall, the findings indicate that intelligent technologies alone may not create WTC; rather, communication develops when these tools are embedded in pedagogically sound, socially mediated learning designs. This is consistent with MacIntyre et al. (1998) view of WTC as a situated readiness shaped by confidence, motivation, and context.

Objective 1: Types of Intelligent and Technology-Based Systems Supporting WTC

Across the reviewed studies, three broad clusters of systems were associated with gains in WTC: (a) AI-based ITS and chatbots (e.g., Dakhil et al., 2025; Wang et al., 2024; Zhang et al., 2024), (b) immersive and mobile environments such as VR and Google Assistant (Tai & Chen, 2023; Yudintseva, 2024), and (c) TECLL platforms supporting telecollaboration, flipped classrooms, and e-tandem exchanges (Chaisiri, 2023; Napiórkowska, 2022; Rattanasaeng & Sukavatee, 2021). Programs that relied mainly on drills and automatic correction tended to produce only short-term gains (Guo & Yan, 2025; Wang et al., 2024), while collaborative TECLL designs reported more long-term effects, suggesting that sustained WTC depends on whether the technology supports authentic, meaningful interaction (Vygotsky, 1978).

Objective 2: Affective and Cognitive Mediation

The reviewed evidence indicates that emotional and motivational mediation is central to how intelligent systems influence WTC. Adaptive feedback delivered in private and low-stakes settings appeared to lower anxiety (Horwitz et al., 1986; MacIntyre & Gardner, 1991), while peer interaction supports the three psychological needs proposed by Deci and Ryan (2000): autonomy, competence, and relatedness. Studies such as Han et al. (2024), Tai and Chen (2023), and Zhang et al. (2025) showed that learners built confidence when adaptive feedback was combined with emotional support from peers. These findings extend Pekrun (2006) control–value theory by showing that positive emotions generated through technology must be reinforced socially before they translate into stable WTC.

Objective 3: ITS and TECLL in Low-Exposure EFL Contexts

In low-exposure settings such as Thailand, China, and Indonesia, ITS and TECLL tools provide alternative spaces for English communication that the wider environment does not offer. Studies by Chaisiri (2023), Waluyo (2020), Yudintseva (2024), and Zhou (2023) reported that digital and VR platforms enabled learners to practice English using locally relevant content, which improved both confidence and conversational fluency. However, technology did not replace human interactions. Gains were generally stronger when teachers mediated digital activities and when peer interaction was intentionally structured. These findings are consistent with Yashima (2002) finding that international posture is associated with L2 willingness to communicate in the Japanese EFL context. They also suggest that effective technology-enhanced learning design requires localized content, peer-supported tasks, and teacher mediation rather than simply increasing practice time.

Integrating Cognitive, Affective, and Social Dimensions

The results also show that WTC is developed through three related dimensions: cognitive, affective, and social. ITS support the cognitive aspect by providing feedback and correction (Heift & Schulze, 2015; Woolf, 2010), while TECLL strengthens affective and social aspects by creating interaction, peer support, and shared learning (Rahimi & Fathi, 2024; Napiórkowska, 2022). When these three work together, communication becomes both fluent and confident.

This supports Dörnyei's (2005) view that self-confidence and social validation are important for maintaining motivation. When learners see improvement through feedback and peer encouragement, they begin to view themselves as capable speakers. In short, technology expands the learning environment, but teaching methods provide meaning to it. Sustainable WTC is therefore a result of pedagogy supported by technology.

Implications for Practice

The findings of this review show that the effectiveness of intelligent and technology-enhanced systems depends more on teaching design than on technical features. Teachers, researchers, and developers should work together so that technology becomes a tool for communication, rather than merely a medium for instruction. Based on the review results, the following recommendations are proposed.

Integration of ITS within TECLL

Teachers and course designers should use ITS as part of TECLL activities, not only as extra teaching tools. When used in this way, ITS can provide feedback, guidance, and interaction that support real communication. ITS should be seen as a learning partner that helps learners build confidence and WTC. Teaching plans should be designed to ensure that every digital activity supports a communicative goal and that students see technology as part of a shared learning environment.

Communicative Teaching in Low-Exposure Contexts

The classroom environment needs technology to create direct peer-to-peer communication for EFL students. The combination of online discussions with virtual exchanges and small mobile projects creates an environment that makes language use more authentic and purposeful. Students who discussed local topics and worked with their friends, according to Chaisiri (2023) and Waluyo (2020), experienced reduced stress, which led them to maintain their speaking activities. In essence, students need to practice English through technology, which in turn, would also motivate them to develop their speaking abilities.

Teacher Mediation and Emotional Support

Teachers should continue to serve as essential guides who provide emotional support to their students. Teachers could explain system feedback to students while demonstrating how online practice relates to natural and actual communication. As MacIntyre and Gardner (1991) have established, emotional control is a vital element that allows students to maintain their learning progression. As such, teacher training programs need to supply teaching methods that enable the integration of intelligent systems in facilitating emotional support and active participation among students.

Localization for Low-Exposure Contexts

The implementation of technology in Asian settings requires modifications that match the native language patterns, cultural elements, and educational standards of each region. Students may feel comfortable and show more interest when they study familiar subjects and receive help in both languages. AI tools can only produce superior outcomes through collaborative efforts between teachers and researchers, and developers who create systems that support national educational objectives and promote international educational partnerships. If students can connect their individual life experiences from their home environment to global communication systems through technological advancements, they may become more inclined to put in more effort and develop their WTC.

Long-Term and Multi-Method Research

Future research should focus on studying students' longitudinal development of communication readiness skills from their first day of school until they graduate. Researchers can only understand technology's complete impact on student learning through research that combines system records with classroom observation data and emotional feedback. This research would demonstrate how ITS and TECLL users develop their motivation and confidence through the combined results from different data points.

Wider Research Contexts and Participants

Most current studies come from East and Southeast Asia. Future studies should also investigate additional EFL domains, which include small educational institutions and distant countryside schools or areas that lack sufficient resources. Researchers would be able to use students' learning data from different educational environments to study how cultural origins and teaching environments influence the success of ITS-based educational approaches.

Emotion-Responsive ITS

Developers need to create intelligent systems that can detect student emotions, including nervousness, hesitation and lack of confidence, so as to provide appropriate support. The detection systems for student emotions would help sustain students' motivation because they tend to lose interest as soon as their emotional state changes. Combining emotional awareness with good teaching design will make ITS more effective and more responsive to learners' affective needs.

Connecting Teaching, Psychology, and Technology

The future of TECLL research demands that researchers establish links between language education theories, psychological theories, and technological systems. This can be achieved through the combined application of MacIntyre et al. (1998), Deci and Ryan (2000), and Vygotsky (1978) theoretical frameworks. Integrating these fields allows developers to build intelligent educational tools that can potentially boost students' learning achievements.

Teachers also need to plan the creation of their educational materials accordingly, in order for intelligent systems to achieve their full educational potential. The tools can succeed only when teachers and developers create interactive learning spaces that provide an emotional safety net for students. The integration of ITS and TECLL approaches with defined learning objectives would also enable technology to function as a communicative tool instead of an automated practice device.

Thus, the main principle for low-exposure classrooms continues to be:

The learning environment is shaped by technology, but pedagogy decides what learning experiences students will have.

The English learning process should shift from students working alone in silence to actual time-based communication with other people.

Limitations of the Review

Several limitations should be acknowledged when interpreting the findings of this review.

First, the search was restricted to studies only published between 2020 and 2025 and indexed in three databases (i.e., Scopus, Web of Science, and TCI). Although these databases provide broad coverage of peer-reviewed work in applied linguistics and educational technology, relevant or significant studies in regional databases, dissertations, conference proceedings, or non-English-language outlets may have been missed.

Second, the review covered only twenty empirical studies, and the majority were conducted in East and Southeast Asia. While this concentration is consistent with the review's focus on low-exposure EFL contexts, it limits the generalizability of the findings to other regions, such as Sub-Saharan Africa, the Middle East, or Latin America, where EFL learning conditions may differ in significant ways.

Third, the included studies varied in research design, intervention duration, and outcome measures. This heterogeneity allowed for a thematic synthesis but precluded a meta-analytic comparison of effect sizes. Reported gains in WTC therefore reflect convergent qualitative patterns rather than quantitatively comparable effects.

Fourth, most of the reviewed studies relied on self-report instruments, such as WTC scales and anxiety questionnaires, and observed relatively short intervention periods. Long-term behavioral evidence of sustained WTC, particularly in actual face-to-face communication, remains limited. In addition, self-report data may be affected by social desirability bias.

Finally, the rapid development of generative AI and large language models means that some intelligent technologies discussed here may evolve more quickly than the literature can keep up. Findings should therefore only be interpreted as a snapshot of the 2020–2025 period, with the expectation that future reviews will need to revisit these conclusions as new tools and pedagogical practices emerge.

Conclusions

The research shows that ITS and TECLL approaches generally enable EFL students to develop their WTC. Their first encounter with English at school usually creates the most significant impact on their learning. However, the growth of communication would require more than technology because it needs additional elements to sustain itself. For instance, appropriate teaching methods that combine cooperation with reflective and emotional support are vital for students to achieve long-term success. With regards to technology, ITS enable students to achieve better accuracy and self-assurance through a personalized learning process and a critique-free safe zone. On the other hand, the TECLL-oriented designs encourage students to learn together with others as they develop their ability to share ideas. Taken together, ITS tools and TECLL approaches operate as a single unit that helps students develop the digital and communicative skills needed for natural communication. The findings also demonstrated that while technology enables these learning opportunities, teachers hold the key, distinct responsibility of transforming these possibilities into actual communication between students with their lesson designs. Only under the guidance of pedagogy-informed teachers would the classroom peer-to-peer interactions mediated by technology be meaningful for students aiming to develop their daily English communication skills.

Overall, the findings suggest a gradual pedagogical shift in EFL teaching. Teachers can now make use of intelligent systems to adjust their approach and move from teacher-centered instruction towards a student-centered learning style, allowing students to take control of their own educational journey. Suffice to say, the learning environment is best facilitated when students take charge and independently develop their communicative abilities. This transition process would also enable students to develop their self-assurance as they become more motivated and establish social connections through their language development. Such pedagogical shifts may even encourage students to use English more frequently in and beyond the classroom. Therefore, future

classrooms may support stronger language development achieved through ITS accuracy, while TECLL support may develop students' communicative abilities, self-assurance, and positive outlook on speaking. Technology would then serve as a connection that bridges students' learning with active social interaction, ultimately leading to the autonomous development of their own communicative competence.

From an academic perspective, this review contributes to both applied linguistics and educational technology by integrating three previously disparate strands: ITS research, TECLL pedagogy, and WTC theory. These strands were then brought together within a single framework that linked the cognitive, affective, and social dimensions of communication. The review also extends the literature on low-exposure EFL contexts by illustrating that technology and pedagogy must operate together in order to sustain students' WTC.

From a societal perspective, the findings present implications for educational equity in low-exposure regions of Asia. Well-designed ITS–TECLL integration can broaden access to authentic English communication for learners in rural, under-resourced, and exam-oriented contexts, supporting national goals for English proficiency and global citizenship. The review therefore offers practical guidance for teachers, course designers, policymakers, and EdTech developers seeking to utilize intelligent systems as bridges to genuine communication, rather than as replacements for human interaction.

The present review therefore: (a) restates that pedagogy-driven integration of ITS within TECLL appears to be a key condition for sustainable WTC; (b) acknowledges the review limitations outlined in the preceding section; and (c) proposes longitudinal, mixed-methods, and culturally diverse studies, particularly those focusing on emotion-responsive ITS designs, as priority areas for future research.

Ethics

This study was conducted as a systematic review of previously published research and did not involve direct participation of human subjects, primary data collection, or access to identifiable personal information. Therefore, ethical approval and informed consent were not required.

Declaration of Generative AI

The authors used ChatGPT and Gemini to assist with language polishing, grammatical refinement, and improving the clarity and readability of author-written text. All AI-assisted revisions were reviewed and verified by the authors, who assume full responsibility for the accuracy, originality, and integrity of the final manuscript.

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Declaration of Competing Interest

The authors declare that they have no competing interests related to this study.

Author Contributions

Suchaya Wisnuwong: Writing – original draft, Writing – review & editing, Conceptualization, Methodology, Formal analysis. **Pornsook Tantrarungroj:** Writing – review & editing and Conceptualization. **Noawanit Songkram:** Writing – review & editing, Methodology, and Supervision.

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