Application of AI Technologies in Second Language Learning in India: Opportunities Challenges and Pedagogical Implications.

Abstract

This research paper examines the utilization, opportunities, challenges, and pedagogical implications of artificial intelligence (AI) technologies in second language acquisition within the context of education in India. Specifically, this study focuses on the role of AI technologies in the development of speaking skills.AI powered tolls, highlighting the evolution from computer-assisted language learning (CALL) to modern AI-based tools, it elucidates the transformative potential of technologies such as automatic speech recognition (ASR), Text-to-speech (TTS), intelligent personal assistants (IPAs), and AI-powered chatbots. In the Indian contextwhere challenges such as multilingualism, the digital divide, and resource disparities persistAI technologies can play a pivotal role in fostering personalized learning, immediate feedback, and self-directed learning. This research presents the potential for enhancing the effectiveness of language learning through various AI applications, including speech assessment tools, conversational chatbots, and AI-based grammar checking systems.Furthermore, this study highlights potential challenges, such as technological disparities, excessive reliance on AI, ethical concerns, data privacy issues, and the need for a critical evaluation of AI-generated content. Ultimately, the study emphasizes that, to effectively utilize AI technologies in the field of language education in India, it is essential to maintain a balance between traditional teaching methods and modern technologies, and to promote the responsible and mindful use of these technologies among both teachers and learners.

Keywords: Artificial intelligence**,** Second language, Pedagogical implications,Text-to-speech (TTS)

INTRODUCTION

Over the past few decades, significant changes have occurred in the field of second language acquisition, made possible primarily through technological advancements. Computer-assisted language learning (CALL) marked a pivotal shift in this direction, ushering in a new era characterized by the convergence of technology and pedagogy, and opening up new avenues for language learning. Early CALL initiatives introduced a diverse range of computer-based tools and resources designed to complement traditional classroom instruction. These early programs featured interactive exercises, multimedia content, and self-paced learning

activities, thereby integrating technology into the learning process and bringing about significant transformations in traditional methods of language education.The advent of OpenAI's ChatGPT in 2022 marks a significant milestone in the use of technology within second/foreign language education. Compared to traditional CALL methods, AI-assisted language learning leverages machine learning, Natural Language Processing, and adaptive algorithms, thereby fundamentally transforming the entire language learning environment.

Although language teaching has always been viewed as preparation for language use outside the classroom, its primary focus in the past has often remained centred on classroom-based study (Richards, 2015). As internet technologies have evolved, it has become possible for students to strengthen their English language learning process by effectively utilizing various computer and internet resources during their leisure time. Attaining proficiency in the English language is not limited solely to classroom instruction; rather, it is also essential to make effective use of the time spent outside the structured study environment.Technology-based activities offer excellent opportunities for second language acquisition and foster the development of linguistic, communicative, and pragmatic competence (Zhao & Lai, 2023). Learners are expected to enhance their accuracy and fluency, gain extensive linguistic exposure, utilize multimodal learning tools, and cultivate autonomous learning skills. Furthermore, activities conducted outside the classroom can be highly beneficial for teachers as well, as they provide genuine and authentic learning opportunities beyond the confines of the traditional classroom. These activities bridge the gap between classroom instruction and external learning, thereby assisting teachers in connecting classroom-based learning with real-life tasks.

In light of these benefits, it is recommended that teachers actively encourage and guide their students to utilize technology outside the classroom as well, thereby strengthening their language learning process. Teacher support can take various forms, such as sharing information regarding useful technologies and resources, and providing guidance on their proper application (Lai & Gu, 2011). Regardless of the specific approach adopted, the primary objective should be for teachers to prioritize this encouragement and integrate it as a fundamental component of their teaching practice, ensuring that students can effectively leverage the benefits of technology in their language learning endeavours.

Currently, AI technologies hold significant potential to transform traditional teaching methods, as they provide personalized learning experiences tailored to the specific needs and interests of each student (Hwang et al., 2020). The adaptability and personalization inherent in AI-based learning extend beyond the traditional CALL era, pointing toward a more

individualized and learner-centred approach. The application of AI in language education is not limited solely to personalized instruction; it also encompasses adaptive feedback, instant evaluation, and immersive learning experiences. AI-based chatbots, Natural Language Processing (NLP) algorithms, and virtual tutors can revolutionize the learning process and foster autonomy and self-directed learning among students.

With the advancement of AI, significant progress has also been made in automatic speech recognition (ASR) technology. Although ASR is not a new technology, the accuracy and functionality of current systems are highly impressive. These tools provide L2 (second language) learners with rapid corrective feedback, enabling them to self-assess their pronunciation and speaking skills without the need for additional assistance from a teacher (García et al., 2020). These tools interact patiently with learners and quickly and accurately identify errors in their oral expression. If learners have access to these tools, they can identify and correct their mistakes.A few years ago, Intelligent Personal Assistants (IPAs) gained immense popularity and began to be widely utilized across various fields. AI and natural language processing (NLP) technologies enable IPAs to comprehend and generate human-like language, thereby making interactions more natural and user-friendly. By leveraging ASR and other NLP techniques, IPAs facilitate communication through voice interaction. These tools are particularly beneficial for learning second and foreign languages, as learners can engage in conversations with them in the target language. Through examples such as Siri, Google Assistant, and Alexa, learners can access authentic language input anytime and anywhere, making the language acquisition process significantly more effective.

This chapter primarily focuses on two areas ofspeaking tools. The first section discusses tools such as ASR, Text-to-Speech (TTS), and smart speakers. Additionally, it introduces an AI-based chatbot named Hello English app, which assists students in practicing spoken English and incorporates a concise grammar-checking system. The second part focuses on implications related to pedagogy, highlighting a ChatGPT-based grammar-checking system; this system improves the quality of automated feedback during second-language learning.

USE OF AUTOMATIC SPEECH RECOGNITION (ASR) IN THE INDIAN CONTEXT

Within the Indian educational landscape, automatic speech recognition (ASR) technology is playing a pivotal role in second language acquisition, particularly in the development of English speaking skills. In a multilingual country like Indiawhere the majority of students learn English as a second languagepronunciation, fluency, and the practice of accurate speech remain significant challenges.ASR-based mobile applications such as Hello English, Elsa Speak, and other language-learning platforms offer personalized and immediate feedback to

learners in this context. These apps identify learners' voices, analyze their acoustic patterns, and provide corrective suggestions based on pronunciation, accuracy, and fluency.

Particularly in rural and resource-constrained areaswhere there is a shortage of trained English teachersASR technology provides learners with an effective opportunity for self-study. Through these apps, students can engage in continuous practice even outside the classroom, identify their errors, and make corrections.Furthermore, ASR technology proves beneficial for teachers as well, since providing personalized feedback to every student in large classes is challenging. In such scenarios, AI-based systems bridge this gap and make the teaching process more effective.Nevertheless, the Indian context presents several challenges, including poor internet connectivity, low digital literacy rates, and an imbalance in the availability of technical resources. Additionally, the accuracy of feedback from ASR systems is sometimes questioned, especially when learners have local language accents.

However, different research studies have presented varying conclusions regarding its results. For example, McCrocklin (2019) found no significant difference in pronunciation performance between the experimental and control groups. Conversely, Gorjian et al. (2013) showed that participants who practiced pronunciation via ASR performed better than those who received traditional training. According to the analysis by Ngo et al. (2024), ASR technology is proving to be extremely useful in language learning. Furthermore, it was observed that ASR-assisted pronunciation training in peer groups is more effective than the use of ASR alone.Research indicates that within ASR feedback characteristics, pronunciation acquisition is enhanced when explicit corrective feedback is given, as opposed to simple transcription or correct/incorrect signals.Thus, it can be said that ASR technology has the potential to make second language learning in India more accessible, personalized, and effective, provided it is integrated in a balanced manner with appropriate pedagogical strategies and traditional teaching methods.

Figure.1: Assessment and Pronunciation Feedback in Hello English App

In recent years, the Indian educational landscape has witnessed the rapid growth of artificial intelligence (AI)-based language learning platforms; Hello English as a prime example. This application has been developed specifically with Indian learners in mindthose who are acquiring english as a second language. The app offers a variety of interactive features, including exercises designed to practice speaking, listening, reading, and writing skills. Within the Hello English application, instant feedback is provided regarding pronunciation, accuracy, and fluency. Notably, its dedicated "Speaking Practice" feature offers ESL/EFL learners the opportunity to speak english via a microphone, allowing the system to analyze their voice and provide corrective suggestions. Furthermore, the app features a chatbot-based interaction facility. This technology not only renders the learning process more accessible and engaging but also extends equal opportunities for language acquisition to students in rural and resource-constrained regions. Figure-1 show a screenshot of the AI-based and ASR Assessment and Pronunciation Feedback in Hello English Application.

TEXT-TO-SPEECH (TTS) TECHNOLOGY IN SECOND LANGUAGE LEARNING

Text-to-Speech (TTS) technologyis closely related to automatic speech recognition (ASR)possesses the capability to convert written text into audio, incorporating natural pronunciation and intonation. Although this technology has proven to be highly effective for Second Language (L2) acquisition globally, India is a multilingual and multicultural nation where the linguistic backgrounds of learners are extremely diverse. Consequently, the application of TTS technology in L2 learning, particularly in the teaching of englishcan be instrumental in strengthening pronunciation, listening skills, and phonological awareness. It serves as a complement to traditional reading activities by providing auditory reinforcement and familiarizing learners with a variety of global accents.

However, in the Indian context, the effectiveness of this technology is constrained by several challenges. First, most TTS systems are not yet fully developed for all Indian languages, thereby limiting their utility for learners of regional languages. Second, available TTS models are often restricted to English or a few major Indian languages, giving rise to a situation of linguistic inequality. Furthermore, although TTS technology promotes self-paced learning, it is not practically reasonable to assume that all learners will be able to utilize it effectively. The scarcity of digital resources, issues with internet connectivity, and a lack of digital literacy in rural and underprivileged areas pose significant barriers to its adoption.Although

the integration of ASR and TTS can make second language learning more interactive and effective through intelligent personal assistants (IPAs) and chatbots, it is essential that these technologies be integrated in a balanced manner with traditional teaching methods.

In recent times, Text-to-Speech (TTS) technology has been widely utilized across various digital platforms. Many systems on the internet combine Google Speech-to-Text, Machine Translation, and TTS (or gTTS) to create voice-to-voice translators, web apps, and video translators for multilingual communication(Athas&Pirapuraj,2024;Manoj et al.,2025).Such as Google Translate enable learners to convert written text into speech, thereby allowing them to practice their pronunciation and listening skills.As illustrated in Figure 2, Google Translate's TTS feature enables any student to listen to any written text, thereby allowing them to grasp correct pronunciation and intonation. This is particularly beneficial for second language (L2) learners, as they can compare their own pronunciation against standard pronunciation and correct their errors.

Additionally, this kind of TTS tech offers learners the chance for self-paced study, allowing them to grasp the phonetic structure of a language more effectively by repeatedly hearing any given text.As technology advances, integrating TTS and ASR makes language learning more effective and interactive. This integration is also key to developing IPAs and chatbots, which offer learners real-time language practice and feedback. Analysis of the potential benefits and challenges related to the use of IPAs in L2 education will be presented in the next section.

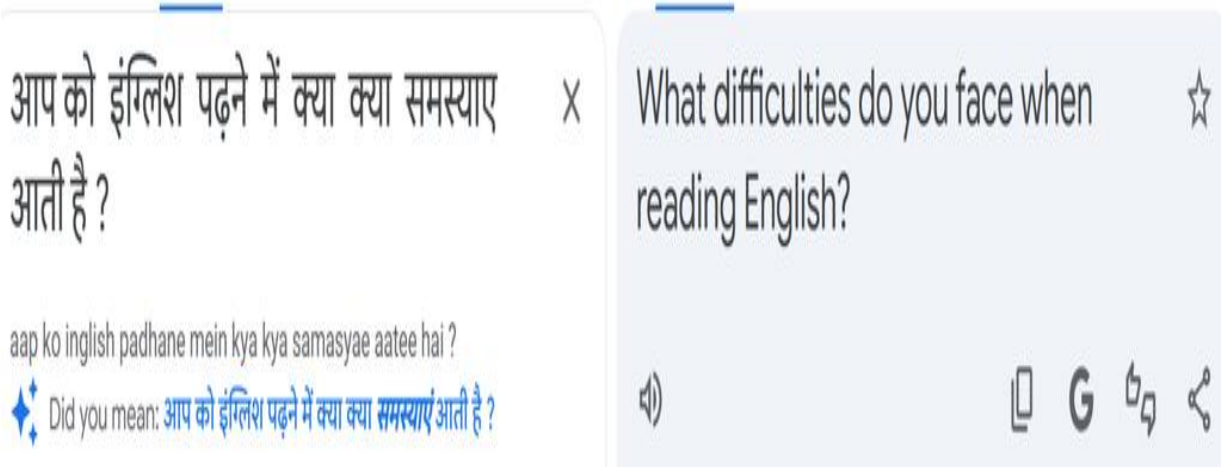

Figure.2TTS tool provided by Google Translate

INTELLIGENT PERSONAL ASSISTANTS IN SECOND LANGUAGE LEARNING

The use of Intelligent Personal Assistants (IPAs) is emerging as a technological trend for second language acquisition in the Indian educational sphere (Santhosh, 2025). In a diverse linguistic environment such as India, where students' first languages vary and English is studied as an L2, tools like Google Assistant, Siri, and Amazon Alexa present new

possibilities for language education(Dizon 2021).However, the effectiveness of these techniques in the Indian context is constrained by several limitations(Wu et al.,2020). Firstly, most IPAs experience difficulty in accurately comprehending non-native pronunciation, particularly when learners' pronunciation is influenced by their mother tongues (such as Hindi, Chhattisgarhi, Tamil, etc.). This creates barriers to communication and can foster a sense of frustration among learners.Secondly, in India, the digital dividecharacterized by unequal internet availability and a scarcity of technological resourcesalso poses a hindrance to the widespread adoption of IPAs. Access to these technologies remains limited for students in rural and underprivileged areas (Winson et al,2023: Jain.2020), thereby creating disparities in learning opportunities.

Furthermore, although IPAs are capable of facilitating simple dialogue and providing information, their capacity for free-flowing conversation remains limited. Due to their restricted knowledge base, they are unable to engage in effective dialogue across all subjectsparticularly when learners employ sentences containing grammatical errors.Nevertheless, IPAs prove helpful in enhancing learners' interest in language learning, their self-confidence, and their willingness to communicate. They provide a low-anxiety environment where learners can practice without hesitation.

PEDAGOGICAL USE OF CHATBOTS IN LANGUAGE LEARNING

The pedagogical use of chatbots in language learning has emerged as a significant area of study, supported by advancements in artificial intelligence (AI) and natural language processing(Huang et al.,2023;Şahin et al.,2025; Huiling et al.,2024).Chatbotsparticularly those powered by Large Language Models (LLMs) and Generative AI (GenAI)offer interactive and adaptive learning experiences that can enhance various aspects of second language (L2) learning (Wiboolyasarin et al., 2025;Min et al.,2026;Li et al.,2025;Zhang et al.,2024;Jeon et al.,2023).A major advantage of chatbots in language learning is that they provide the opportunity for regular conversational practicesomething that is often expensive and difficult to achieve through traditional methods(Petrović& Jovanović,2021).This is particularly important for improving speaking skills, where learners often hesitate to make grammatical errors when conversing with human friends (Hsu et al.,2021).

Studies have shown that the independent use of AI chatbots can significantly increase the amount of practice and improve English-speaking proficiency (Hou,2025).For example, a study conducted on Chinese primary school students demonstrated the potential of chatbots in 'English as a Foreign Language' (EFL) settings, resulting in improvements in the students' English speaking proficiency and an increase in their willingness to communicate

(Yuan,2023).Another study observed that, over the course of a semester, an AI chatbot had a positive impact on the WTC (Willingness to Communicate) of learners studying Korean as a foreign language(Kim & Su,2024).Chatbots assist with various important language-learning skillsincluding speaking, writing, reading, and vocabulary acquisition (Wiboolyasarin et al.,2025).In the field of vocabulary learning, LLM-based chatbots have demonstrated significant potential in automating and enhancing educational tasks, and they effectively handle the complexity and diversity of human language (Zhang,2025).They can also improve students' 'English for Specific Purposes' (ESP) vocabulary (Silitongaet.,2024).

Pedagogical methods involving chatbots often involve task-based interactions, where the chatbot is designed to provide corrective feedback(Shin et al.,2024; Yang et al.,2022).Learner engagement with chatbots constitutes a critically important aspect of their educational effectiveness. Research grounded in Self-Determination Theory (SDT) has investigated how the perceived support provided by GenAI chatbots influences learners' multidimensional engagement in EFL contexts (Wu et al., 2025).The evolution of chatbot technology—including speech-recognition chatbots and Large Language Models(LLMs)necessitates the development of a conceptual framework to understand the various types of chatbots and their educational potential (Jeon et al.,2023).

However, there are also some significant limitations associated with the use of these chatbots. First, most chatbots are not yet capable of effectively handling complex and free-flowing conversations. Second, technical difficulties arise in understanding the pronunciation and code-mixing of Indian learners, which can compromise the quality of the interaction.Furthermore, the digital divide, issues regarding internet connectivity, and the unequal availability of technical resources also hinder their effective utilization, particularly in rural and underprivileged areas.Even so, modern AI-powered chatbots such as ChatGPT have created new opportunities in the area of language education, because they are able to offer more context-aware and in-depth dialogue.

PEDAGOGICAL IMPLICATION

The educational implications of chatbots, Intelligent Personal Assistants (IPAs), Text-to-Speech (TTS) technology, and Automatic Speech Recognition (ASR) are highly significant; collectively, they enhance accessibility, personalization, interactivity, and constructive feedback within the educational environment(Yarlagadda,2025;Barua,2025;Looi& Jia2025). Chatbots and smart personal assistants serve as robust educational support tools by providing personalized learning experiences and smart tutoring capabilities. They can streamline

immediate assistance, adaptive tutoring, and conversational learning, thereby significantly enhancing student engagement and metacognitive development.

- AI-based tools (Chatbots, IPAs, TTS, ASR) adapt content and pace to suit the needs of each learner. This leads to the development of individualized learning paths.
- ASR and chatbots provide immediate feedback to learners. This leads to improvements in error correction and language accuracy.
- Chatbots and IPAs create a conversational setting. This leads to better speaking and listening skills.
- Learners can progress at their own speed. They can also practice outside of the classroom setting.
- TTS technology is beneficial for students with visual impairments, dyslexia, or reading difficulties. It promotes multimodal learning.
- AI tools provide a non-judgmental environment. This reduces speaking anxiety and boosts confidence.
- AI systems analyze learners' performance data. This leads to the development of targeted teaching strategies.
- Issues such as data privacy, algorithmic bias, and a reduction in human interaction warrant attention.The use of AI should be pedagogically guided.

CHALLENGES OF AI IN SECOND LANGUAGE LEARNING

Artificial Intelligence (AI) is redefining the process of knowledge acquisition, providing learners with enhanced access to diverse educational resources through digital tools(Alkaissi& McFarlane, 2023). However, the growing proliferation of misinformation and disinformationfacilitated by AIhas made it imperative for users to adopt a more critical and cautious approach toward the use of these technologies(Hwang et al., 2023). The ease with which AI can generate misleading content raises complex questions regarding the reliability of information, particularly within the context of education(Baskara, 2023).Students encounter various challenges when using AI tools. For instance, tools like ChatGPT can sometimes misattribute ideas or generate realistic-sounding content that bears no direct relation to the real world. These issues stem from the limitations inherent in AI's training data, transformer architecture, and human feedback-based learning (reinforcement learning).

Although the convenience offered by AI provides numerous benefits, an excessive reliance on it can hinder students' independent learning skills. Furthermore, AI and NLP-based systems are not free from bias, which can impact the quality and accuracy of the generated content. In

the context of language education, this bias can have a negative effect on students' learning and development.In these situations, moral questions also emerge, such as: Should large language models like ChatGPT be acknowledged as co-authors in scholarly writing, or is using them to rephrase material considered plagiarism?

Similarly, AI tools also present challenges for teachers. Integrating AI successfully into language instruction while preventing its misuse is a difficult task. Teachers need additional training and support to use these technologies effectively. Although AI-based plagiarism detectors are being developed, solving these problems remains difficult. Therefore, it is necessary to create a clear plan and consensus to ensure the ethical and educational use of AI.In this context, the role of teachers becomes crucial, as they provide guidance to students on how to use AI responsibly and effectively.

In conclusion, the shift from the initial phases of CALL/TELL towards AI-assisted language learning signifies a pivotal change. The incorporation of AI has made second and foreign language acquisition more individualized, flexible, and technologically advanced. Going forward, AI-driven innovations will continue to reshape language pedagogy and expand opportunities for tailored learning.

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