



Enhancing EFL Speaking through AI voice interaction: A qualitative case study of a learner with Stargardt disease.

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ABSTRACT

Artificial Intelligence voice assistants have emerged as valuable tools for supporting English as a Foreign Language (EFL) Learning by providing accessible, personalized, and low anxiety opportunities for speaking practice. However, limited research has examined their roles as assistive technologies for learners with visual impairments. This qualitative instrumental case study explored how Gemini's voice assistant supported the speaking development, confidence, and autonomy of an adult EFL learner diagnosed with Stargardt disease. Data were collected through a semi-structured interview and analyzed using thematic analysis. Five themes emerged: accessibility as linguistic empowerment, AI mediated speaking practice, autonomy and metacognitive regulation, reduced speaking anxiety, and perceived limitations of AI-assisted learning. The findings indicate that AI voice assistant functioned both, as a language learning partner and as an accessibility tool, enabling authentic oral practice while reducing dependence on text-based interfaces. The participant reported greater confidence, increased willingness to communicate, and improved autonomy through regular voice interaction. Despite limitations, including the lack of personalized process tracking and the inability to replace authentic human interaction, the study highlighted the potential of AI voice technology to foster inclusive language learning and support speaking development for learners with visual impairments.

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Introduction

Developing speaking skills is one of the most important yet challenging goals in English as a Foreign Language education since many learners struggle to express themselves fluently and confidently, even after years of study. Most EFL learners experience speaking anxiety which is related to the fear of negative evaluation (Aydin, 2008), making mistakes and peer evaluation. This anxiety limits their willingness to communicate effectively in English. In addition, learners face an extra challenge: limited exposure to L2 outside of the classroom, which reduces opportunities for authentic practice and hinders development of communicative competence. As a result of all this background issues, improving oral proficiency and build learners' confidence have become a central common concern among EFL teachers.

In recent years, the rapid advancement of Artificial Intelligence (AI) technologies has opened new possibilities for enhancing language learning experiences. Among the most popular there are ChatGPT, Gemini, Perplexity, Stimuler and various others. Each one is integrated with a voice assistant feature which has gained attention for their potential to provide interactive, personalized and low-anxiety speaking practice environments.

Previous research indicates that AI chatbots and its voice assistant show promise for enhancing EFL learners' speaking skills and confidence. For instance, Qodirqulova (2025) study reports improvements in fluency, pronunciation accuracy, and increased learner willingness to communicate after chatbot interventions. Moreover, in the study conducted by Maysuroh et.al (2025) learners perceive chatbots as low-anxiety, accessible speaking partners that support motivation and autonomy. However, Belda and Calvo (2022) note limitations such as lack of contextual awareness in some chatbots and the need for pedagogical scaffolding.

While existing studies have examined AI chatbots in classroom contexts, less attention has been given to how AI voice interaction may function as an assistive tool for learners with visual impairments. For individuals experiencing degenerative visual conditions such as Stargardt disease; a genetic disorder that progressively affects central vision, voice-based technologies may represent not only a language learning resource but also an accessible communicative support system. In such cases, AI voice assistants may reduce barriers associated with text-based interaction and create opportunities for autonomous oral practice.

Therefore, this study adopts a qualitative case study design to explore how AI voice interaction supports speaking development and confidence in an adult EFL learner diagnosed with Stargardt disease. By focusing on a single information-rich case, this research seeks to provide an in-depth understanding of how AI voice technology functions as a mediational and assistive tool in real-life language learning practices. To address the purpose of this study, the following research questions were formulated:

RQ1: How does the Gemini AI voice assistant support the speaking development of an adult EFL learner with Stargardt disease?

RQ2: How does the learner perceive the role of AI voice interaction in enhancing her speaking confidence and autonomy?

Literature Review

Speaking is broadly recognized as one of the most challenging skills for English students to master, especially in contexts where it is taught as a foreign language (Bygate, 2018). Learners tend to struggle with fluency, vocabulary, pronunciation, and grammatical accuracy. (Goh & Burns, 2002). This can be attributed to the fact that learners often face limited exposure of the target language (Huang, 2024). Moreover, students frequently lack meaningful opportunities to

use English in authentic communicative situations, which hinders their ability to develop oral proficiency (Richards, 2008). Additionally, psychological factors such as anxiety and low-self-confidence can significantly affect learners' willingness to speak during classes (Tuan & Mai, 2015). This study adopts the lens of AI Chatbots with Voice Assistants, which empowers learners towards independent learning, offering tools that caters to individual learning paces (Huang, 2024). As several studies have demonstrated that the use of Artificial Intelligence addresses the psychological barrier to speaking by offering a safe and engaging learning environment (Busso & Sanchez 2024), reducing speaking anxiety, and creating a feeling of satisfaction and confidence (Celik et.al 2025).

Artificial intelligence and voice assistants

The integration of artificial intelligence (AI) and voice technologies has significantly reshaped language education, offering learners more interactive and personalized learning experiences. Busso and Sanchez (2024) argue that AI tools foster communicative competence by simulating authentic interactional contexts, allowing learners to engage in real-time dialogue. Similarly, Zhou (2023) emphasizes that AI-driven voice assistants facilitate oral practice and constructive communication, helping learners enhance fluency and spontaneity. Research by Kanoksilapatham and Takrudkaew (2025) highlights the pedagogical importance of integrating ChatGPT to promote communication skills, noting that effective use depends on careful instructional design. In line with this, Pondelíková and Luprichová (2025) found that AI chatbots support specialized communication, particularly in academic and professional English contexts. However, Poaquiza and Estefanía (2024) caution that while AI-based voice chatbots can improve pronunciation and interactional accuracy, they must be complemented with human feedback to ensure authentic learning outcomes. Collectively, these studies underscore the transformative role of AI and voice technologies in language learning. Yet, despite their proven utility, limited

research has examined how adult EFL learners emotionally experience and adapt to AI-mediated oral communication, indicating a need for more context-specific exploration.

EFL and speaking development

Recent research confirms that AI-based applications, particularly ChatGPT, have emerged as promising tools to enhance EFL learners' speaking abilities. Celik et al. (2025) report that ChatGPT functions as an effective virtual speaking tutor, significantly increasing learners' self-efficacy and motivation to speak. Similarly, Yildiz (2024) demonstrates that consistent ChatGPT use fosters greater linguistic confidence and autonomy, especially when integrated into blended learning environments. Nuñez et al. (2025) also observed measurable improvement in learners' pronunciation, fluency, and coherence when using ChatGPT's voice function, emphasizing its potential for individualized oral feedback. Complementing these findings, Huang (2024) shows that AI voice prompts can provide detailed, real-time speaking feedback that teachers often cannot deliver due to time constraints. Nonetheless, Kanoksilapatham and Takrudkaew (2025) warn that successful implementation requires structured pedagogical frameworks to prevent overreliance on automated responses. Collectively, these studies illustrate AI's growing capacity to promote speaking development in EFL contexts, yet they primarily focus on linguistic gains rather than learners' affective responses—particularly how AI interactions influence speaking anxiety and confidence in authentic communication.

Speaking anxiety

Speaking anxiety remains a major obstacle in EFL classrooms, often inhibiting learners from expressing themselves confidently. Salsabil et al. (2025) found that AI voice chat interactions with ChatGPT transformed silent learners into more confident speakers by providing

a low-stress environment for oral practice. This finding aligns with Celik et al. (2025), who observed that virtual speaking sessions increased self-efficacy and reduced fear of negative evaluation. Likewise, Yildiz (2024) noted that learners using ChatGPT reported less anxiety and greater engagement in oral communication. Conversely, Poaquiza and Estefanía (2024) suggested that while AI voice chatbots lower initial anxiety, the absence of human social cues can sometimes limit emotional connection and authentic interaction. Nuñez et al. (2025) similarly indicated that although students became more fluent, some still doubted the authenticity of AI feedback. Overall, these studies converge on the notion that AI voice tools have the potential to mitigate speaking anxiety; however, the emotional and psychological dimensions of learners' interaction with AI remain underexplored. This gap underscores the need for qualitative inquiry into how EFL learners perceive and emotionally experience AI-assisted speaking practice.

AI voice assistant and accessibility for learners with visual impairment

AI-driven voice technology has become increasingly significant in supporting learners with visual impairments by improving accessibility, autonomy, and engagement with educational content. Assistive systems that integrate natural language processing, voice assistants, and speech-to-text/text-to-speech features enable real-time interaction with digital environments that traditional screen readers alone cannot provide (Al-Eidarus et al., 2024; SciVerse, 2025; Sustainable AI Solutions, 2025). Studies show that Pa, thereby enhancing learning participation and reducing reliance on human assistance (SciVerse, 2025; Sustainable AI Solutions, 2025). These technologies facilitate autonomous learning by converting complex text or environmental cues into accessible audio formats, which not only increases access to information but also supports learners' confidence and independence (SciVerse, 2025). Moreover, emerging research underscores that AI-based assistive tools can provide personalized interaction via adaptive

speech modulation and real-time feedback, which may improve academic engagement and participation among visually impaired students (SciVerse, 2025). However, challenges such as usability issues, contextual understanding limitations, and ethical considerations remain, pointing to ongoing development needs in inclusive AI design practices (Karamolegkou et al., 2025; SciVerse, 2025). These insights highlight the transformative yet complex role of AI voice technology in accessible education for learners with visual disabilities.

Methods

Research design

This study adopts a qualitative instrumental case study design to explore how AI voice interaction functions as an assistive tool for enhancing EFL speaking skills and confidence. A case study approach is appropriate because it allows for an in depth examination of a contemporary phenomenon within its real life context. Rather than seeking generalizable findings, this design aims to generate a rich, contextualized understanding of one information rich case.

The study focuses on a single adult learner diagnosed with Stargardt disease, a degenerative retinal condition that affects central vision. By examining her experiences with AI voice interaction, the study seeks to understand how voice-based technologies mediate speaking development, autonomy, and confidence in the context of visual impairment.

Participant

The participant is a 34-year-old Ecuadorian adult originally from Manta, Ecuador, who is currently residing in Manhattan, Kansas, United States. She was diagnosed with Stargardt disease at the age of 20 and currently retains approximately 50% of her vision. Due to the

progressive nature of the condition, she relies increasingly on auditory-based technologies in her daily life.

She is an English as a Foreign Language (EFL) learner who actively uses AI voice assistants, particularly Gemini, to practice and improve her English-speaking skills. The participant was selected through purposive sampling as an information-rich case because of her sustained engagement with AI voice interaction and her lived experience navigating language learning with a visual impairment.

To protect confidentiality, a pseudonym will be used in reporting the findings, and identifying personal details will be omitted.

Instrument and materials

The primary data collection instrument was a semi-structured interview protocol designed to explore the participant's experiences using AI voice interaction for speaking development. The semi-structured format allowed flexibility to probe deeper into emerging themes while maintaining alignment with the research questions.

The interview included open-ended questions related to: (a) frequency and contexts of AI voice use, (b) perceived impact on fluency and pronunciation, (c) emotional responses and speaking confidence, (d) the role of voice interaction in accessibility and autonomy.

The interview lasted approximately 20 minutes and was conducted in Spanish to ensure comfort and depth of expression. With informed consent, the interview was recorded and later transcribed for thematic analysis.

Data collection procedures

The participant was contacted through academic referral and voluntarily agreed to participate in the study. The interview was conducted individually via WhatsApp due to geographical distance (the participant resides in Manhattan, Kansas). The session lasted approximately 20 minutes and was recorded with permission.

Following the interview, the recording was transcribed verbatim. The transcript was reviewed multiple times to ensure accuracy and to facilitate thematic coding.

Ethical considerations

Ethical approval procedures were followed in accordance with institutional research guidelines. The participant was fully informed of the voluntary nature of the study and her right to withdraw at any time without consequences.

Confidentiality was ensured through the use of a pseudonym and the removal of identifying details. Given the inclusion of a medical condition (Stargardt disease), special care was taken to present information respectfully and in a non-stigmatizing manner.

All digital files, including audio recordings and transcripts, are stored on a password-protected device accessible only to the researcher. The study poses minimal risk; however, the participant was informed that she could decline to answer any question that caused discomfort.

Findings

The analysis of the interview transcript revealed five central themes regarding the use of an AI voice assistant (Gemini) for English learning. These themes reflect (1) accessibility, (2) AI-mediated informal speaking practice, (3) autonomy and metacognitive regulation, (4) reduced

anxiety in AI interaction, and (5) perceived limitations of AI- mediated learning. Table 1 summarizes the thematic interpretation derived from the participant’s responses.

Table 1.

Perceived impact of AI voice assistant on English Learning (Case study)

Interview extract	Emerging theme	Analytical interpretation
<i>“Gemini has become my eyes... it reads labels and translates for me.”</i>	Accessibility as linguistic empowerment	The assistant functions as an assistive technology that reduces physical barriers and enables authentic language exposure in real life contexts.
<i>“I practice speaking while cooking or washing dishes.”</i>	AI-mediated speaking practice	The participant integrates English practice into daily routines, suggesting contextualized and spontaneous language use.
<i>“If I want correction, I must ask for it explicitly.”</i>	Intentional feedback and metacognitive awareness	The participant demonstrates strategic use of commands to obtain corrective feedback, reflecting emerging metacognitive control.
<i>“I feel more relaxed because I am not judged.”</i>	Reduced anxiety in AI interaction	The absence of social judgement lowers affective barriers, facilitating oral production.
<i>“It does not replace real social interaction.”</i>	Limitations of AI-mediated learning	The participant recognizes the irreplaceable value of human interaction in language acquisition.

<i>“It does not keep a personalized record of my progress.”</i>	Lack of personalization	The tool lacks longitudinal memory of learner progress, limiting adaptive scaffolding.
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Accessibility as linguistic empowerment

A salient theme emerging from the participant’s narrative is the role of the voice assistant as an accessibility tool. The participant explicitly described Gemini as having “become my eyes,” emphasizing its function in compensating for her visual condition. Beyond facilitating basic tasks such as reading and translating supermarket labels, the assistant enabled authentic, real-world engagement with English.

This suggests that the AI voice assistant operates as a mediational artifact that reduces physical and linguistic barriers simultaneously. Rather than merely serving as a digital dictionary, the tool expands the learner’s capacity to interact independently with her environment. In this sense, accessibility transcends accommodations and becomes a form of linguistic empowerment. The participant’s experience highlights the inclusive potential of AI voice technologies in language education, particularly for learners with disabilities.

AI mediated speaking practice

Another prominent theme is integration of English speaking practice into daily routines. The participant reported engaging in spontaneous conversations with the voice assistant while performing household tasks such as cooking or washing the dishes. This pattern of use reflects contextualized and informal language practice embedded within everyday life.

Importantly, the participant does not restrict English learning to informal instructional settings. Instead, she extends speaking practice beyond the classroom through continuous

interaction with the assistant. This suggests that AI voice tools may function as accessible interlocutors, providing opportunities for rehearsal and output production in low stakes environments.

The data further indicate that the participant actively requests corrective feedback, particularly for pronunciation. Her explicit commands (asking the assistant to correct a paragraph after oral production) demonstrate intentional engagement with linguistic form. Thus, the AI serves as a practice partner that supports ongoing oral development.

Autonomy and metacognitive regulation

The participant's responses strongly reflect autonomous and self-regulated learning behaviors. She organizes her practice daily, allocates specific time for interactions (15-30 minutes), and aligns her AI assisted practice with classroom content. For example, she uploads images of academic materials and requests vocabulary extraction, explanations and pronunciation guidance.

Moreover, the participant shows awareness of how to strategically interact with the tool. She recognizes that corrective feedback must be explicitly requested, indicating emerging metacognitive understanding of how system functions. This strategic use of commands suggests that autonomy is not merely behavioral (practicing independently) but also cognitive (knowing how to optimize the tool's responses).

However, the participant also acknowledges that AI interaction does not fully replace authentic human communication. While the assistant strengthens her independence, she identifies real social interaction as an irreplaceable component of language development. This demonstrates critical awareness of both the affordances and boundaries of IA mediated learning.

Reduced anxiety and emotional safety

The affective dimension of learning emerges as a significant theme. The participant reported feeling “more relaxed” when speaking with the assistant because she does not feel judged. In contrast, interacting with native speakers may trigger nervousness or mental blocks.

This perception suggests that AI mediated communication can function as low-anxiety rehearsal space. The absence of social evaluation reduces affective barriers and encourages oral production. In this case, the assistant acts as an emotionally neutral interlocutor, enabling risk taking in language use. The participant’s experience indicates that voice-based AI tools may contribute to lowering emotional constraints associated with speaking practice particularly for adult learners navigating immersion contexts.

Perceived limitations of AI mediated learning.

Despite predominantly positive perceptions, the participant identified notable limitations. The most significant concern involves the lack of personalized memory and progress tracking. She observed that the assistant sometimes repeats previously learned vocabulary and does not maintain a consistent record of her linguistic development.

This limitation suggests that while the assistant supports immediate feedback and accessibility, it lacks longitudinal scaffolding. The absence of adaptive personalization restricts its ability to function as a fully responsive tutor. Additionally, the participant noted occasional technical disruptions, though she perceived these as common to most digital applications rather than inherent flaws.

These reflections demonstrate a balanced perspective. The participant does not idealize the technology; instead, she situates it as a complementary tool that enhances but does not replace structure, direct instruction and human interaction.

Discussion

The findings of this study suggests that AI voice interaction functioned as both a linguistic and assistive mediational tool in the participant's EFL speaking development. The results indicate improvements in oral fluency, pronunciation awareness, confidence, and autonomous practice, supporting prior research that highlights the potential of AI mediated interaction in language learning (Qodirqulova, 2025; Maysuroh et al., 2025). However, this case extends existing literature by demonstrating how AI voice technology may also operate as an accessibility resource for learners with visual impairments.

One of the most significant finding relates to reduced speaking anxiety and increased confidence during AI mediated interaction. The participants described the AI voice assistant as a nonjudgmental conversational partner, which encouraged to practice her speaking more frequently without the fear of negative evaluation. This aligns with Krashen's affective filter theory (1982), which states that emotional variables such as anxiety, self-doubt, and fear can inhibit language acquisition. In this case, The AI voice assistant appeared to lower the participant's affective filter by creating a safe environment for oral expression. Unlike traditional classroom settings, where peer comparison may heighten anxiety (Aydin,2008). AI voice interaction provided a private and emotionally secure space for practice.

From a sociocultural perspective, the findings also suggest that AI voice interaction functioned as a mediational tool in the learner's development. Drawing on Vygotsky's (1978) theory of mediation, learning occurs through interaction with tools that scaffold cognitive processes. The participant's consistent engagement with voice-based AI supported her ability to rehearse conversations, self-correct pronunciation, and simulate real-life communicative situations. In this sense, the AI assistant operated within her zone of proximal development by offering immediate responses and conversational continuity, enabling gradual refinement of oral skills.

Importantly, this study contributes to discussions on accessibility in technology-enhanced language learning. For the participant, who retains approximately 50% of her vision due to Stargardt disease, voice interaction reduced reliance on visual text-based interfaces. The auditory nature of AI communication supported greater autonomy and independence, aligning with research that identifies voice technology as a key assistive resource for individuals with visual impairments (Al-Eidarus et al., 2024). Thus, AI voice interaction in this case did not merely enhance speaking practice; it also facilitated equitable access to language learning opportunities.

Nevertheless, some limitations identified in the broader literature remain relevant. As noted by Belda and Calvo (2022), AI systems may lack contextual sensitivity or nuanced feedback compared to human instructors. While the participant valued the immediacy of responses, AI interaction did not fully replace authentic human communication. Therefore, AI voice technology should be viewed as a complementary tool rather than a substitute for pedagogical guidance.

Conclusion

This qualitative case study explored how AI voice interaction functions as an assistive tool for enhancing EFL speaking skills and confidence in an adult learner diagnosed with Stargardt disease. The findings demonstrate that AI voice technology provided not only increased opportunities for oral practice but also an emotionally supportive and accessible environment that fostered greater speaking confidence and autonomy. Through consistent engagement with voice based interaction, the participant was able to rehearse conversations, refine pronunciation, and experiment with language in a low anxiety context.

The study contributes to existing literature by highlighting the dual role of AI voice assistants as both pedagogical and assistive tools. While previous research has emphasized the potential of AI chatbots to improve fluency and motivation, this case illustrates how voice

interaction may also reduce accessibility barriers for learners with visual impairments. In this context, AI voice technology supported independent learning by minimizing reliance on visual interfaces and facilitating auditory-based communication. These findings align with theoretical perspectives such as Krashen's Affective Filter Theory, as reduced anxiety appeared to enhance willingness to communicate, and Vygotsky's sociocultural theory, which frames technological tools as mediational resources in cognitive development.

Although limited to a single participant, this case provides meaningful insights into inclusive applications of AI in language education. It suggests that voice-based AI tools can complement traditional instruction by expanding opportunities for autonomous and confidence-building speaking practice. Future research may explore similar cases across diverse learner profiles to further understand the intersection between artificial intelligence, accessibility, and oral language development in EFL contexts.

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