



Beyond Human Interaction? Exploring the Role of AI-Speaking Tools in an Immersive English

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Received: May 23, 2026
Revised: May 29, 2026
Accepted: May 30, 2026

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Abstract

This study examined the function of AI-speaking tools in an immersive English learning context via the application of the English Area (ERa) software among Indonesian EFL learners. The study examined the impact of incorporating AI-assisted speaking applications into immersive English interactions on students' speaking performance, perceptions, and communicative experiences. A sequential explanatory mixed-methods design was utilized, comprising Grade XI pupils at UPTD SMAN 1 Kalukku, categorized into experimental and control groups. Quantitative data were gathered using pretest-posttest speaking evaluations assessed with speaking rubrics, whilst qualitative data were acquired through semi-structured interviews, classroom observations, and documentation. Quantitative analysis encompassed descriptive statistics, paired sample t-tests, independent sample t-tests, and Cohen's d effect size assessment, while qualitative data were subjected to thematic analysis. The results indicated that the experimental group utilizing AI-speaking tools shown significantly bigger enhancements in speaking skills than the control group, with posttest mean scores rising from 55.00 to 77.56, in contrast to the control group's increase from 52.53 to 60.11. Students additionally indicated improvements in fluency, pronunciation, vocabulary acquisition, confidence, and readiness to communicate. Notwithstanding technological obstacles like internet connectivity and speech-recognition constraints, users regarded AI-speaking tools favorably as supportive communicative scaffolding rather than substitutes for human engagement. The research emphasizes the significance of incorporating AI-assisted speaking practice into human-centered immersive learning environments to enhance communicative competence in EFL teaching.

Keywords: *AI-assisted language learning; Communicative competence; English immersion; Human-AI interaction; Speaking proficiency*

Introduction

The swift progression of artificial intelligence (AI) has revolutionized the field of language education globally, especially in the area of English as a Foreign Language (EFL) acquisition. AI-driven educational technologies, including conversational chatbots, speech-recognition systems, pronunciation assessment platforms, and adaptive language-learning applications, are progressively incorporated into classroom instruction and autonomous learning practices (Fibriasari et al., 2025; Lan et al., 2025; Wei, 2023). These tools are transforming learner engagement with language by offering instantaneous feedback, customized learning trajectories, and avenues for independent practice outside conventional classroom confines. AI-assisted language learning has gained prominence in various educational settings due to its capacity to mitigate enduring challenges in oral communication development, such as low confidence, restricted exposure to authentic interactions, and inadequate opportunities for speaking practice (Grab, 2025; Hu & Qiu, 2026; Ramos-Saltos et al., 2026).

The significance of speaking proficiency has intensified in the context of globalization and digital communication. English serves as a global lingua franca in education, business, technology, and intercultural communication, necessitating that learners comprehend English passively and engage in active, fluent communication in real-time situations (El-maghub & Alajeeli, 2026; Lin, 2025). In numerous EFL contexts, such as Indonesia, English instruction predominantly emphasizes reading and writing, whereas speaking practice is frequently restricted, tightly regulated, and detached from genuine communicative scenarios (Baharloo & Jahromi, 2024; Kaharuddin et al., 2025; Suryadi & Erlangga, 2024). As a result, numerous students have a theoretical understanding of English syntax and vocabulary yet find it challenging to articulate their thoughts verbally with assurance and fluidity. The discrepancy between curricular objectives and communicative competence underscores the necessity for more immersive and interactive learning environments that facilitate meaningful language use.

Fauzia (2016), Irawati et al. (2025), and Miolo et al. (2017) assert that one growing pedagogical answer to this issue is the deployment of immersive English learning settings, such as English Area (ERa) programs. An English Area denotes a specified location where English serves as the principal medium for interaction in both formal and informal communication activities. In these programs, students are prompted to participate in peer dialogues, presentations, classroom debates, and impromptu communication in English consistently. Students may be mandated to greet peers, pose inquiries, or engage in collaborative activities solely in English during certain school hours. This immersion-focused methodology closely adheres to the tenets of Communicative Language Teaching (CLT), which prioritizes genuine contact as the cornerstone of language learning (Ilqar, 2025; Jones, 2018; Supriyono et al., 2022).

Concurrently, AI-driven speaking tools have arisen as auxiliary resources that can improve oral communication practice. AI-speaking tools denote apps powered by artificial intelligence, aimed at enhancing verbal engagement, correcting pronunciation, recognizing speech, and simulating conversation (Huu, 2025; Mahazan & Ismail, 2025; Nguyen, 2024). Examples encompass ChatGPT for conversational interaction, Google Speech-to-Text for pronunciation assessment, and Duolingo for organized speaking practice and prompt feedback. In contrast to conventional classroom interactions, these technologies offer learners boundless practice chances and non-judgmental settings that may alleviate speaking fear and enhance the motivation to communicate.

An increasing volume of research has explored the pedagogical possibilities of AI-enhanced language acquisition. In a study, researchers investigated the efficacy of AI chatbots in enhancing the conversational fluency of EFL learners through a quasi-experimental design with university students (Karataş et al., 2024; Pham et al., 2024; Qiao & Zhao, 2023; Taeza, 2025). The results indicated that AI-facilitated dialogues improved students' readiness to engage in communication and diminished their apprehension around errors. The study suggested that AI engagement could serve as a low-pressure communicative framework that promotes increased speaking practice among learners. Another study similarly investigated the effect of speech-recognition applications on pronunciation accuracy using an experimental design over eight weeks (Dennis, 2024; Gulzar & Ehsan, 2025). The researchers observed a notable enhancement in pronunciation clarity among subjects who consistently utilized AI pronunciation feedback systems. The findings indicate that automated feedback techniques may expedite spoken language development by facilitating recurrent self-correction.

Conversely, some experts contend that AI technologies are incapable of entirely substituting the intricacies of human contact in language acquisition (Evenddy, 2024; Mananay, 2024; Son et al., 2023). A qualitative study of secondary school students revealed that, although learners valued the accessibility and convenience of AI tools, they favored teacher-mediated interaction for substantive communication and emotional support (AbuSahyon et al., 2023; DEVIKAR et al., 2025; Guan et al., 2025). The research highlighted that interpersonal engagement is crucial for cultivating discourse competence, negotiating meaning, and employing spontaneous communicative techniques. Likewise, a separate mixed-methods study investigating students' perspectives of AI-assisted speaking practice revealed that learners regarded AI as a supplementary rather than a replacement learning partner (Joo, 2024; Kim, 2026). While AI alleviated fear and enhanced independent practice, students contended that genuine interaction with peers and educators was more helpful for cultivating confidence and authentic conversational proficiency.

Investigations into immersive English learning environments have yielded significant discoveries. An action research study on the implementation of English Zone indicated that regular exposure to English interactions markedly enhanced students' oral fluency and confidence (Rohman et al., 2025; Shawaqfeh et al., 2023). The researchers noted that immersion-based programs facilitated the natural internalization of language structures in learners through contextual practice. Similarly, a separate study examining communicative classroom contexts revealed that regular contact in English enhanced students' active vocabulary utilization and diminished communication apprehension (McDonough & Sato, 2019; Omar et al., 2020; Phoeun & Sengsri, 2021). These findings collectively indicate that immersive environments offer crucial chances for significant language use that are frequently lacking in traditional EFL classrooms.

Collectively, prior research suggests that both immersive English environments and AI-speaking tools enhance speaking growth. Current studies consistently demonstrate that AI technologies enhance pronunciation, fluency, student confidence, and motivation, whereas immersion-based programs promote genuine communicative engagement and interactional competency. Moreover, research indicates that AI tools are most efficacious when serving as supportive scaffolding mechanisms rather than substitutes for human communication. The literature underscores the synergistic relationship between technological support and communicative contact in EFL learning.

Notwithstanding these discoveries, some significant gaps persist unaddressed. Most prior research has analyzed AI-speaking tools or immersive English programs in

isolation, rather than exploring their combined application within a unified educational framework. Secondly, numerous research predominantly concentrate on higher education contexts, resulting in scant evidence about secondary school learners in EFL environments within developing countries. Third, current research frequently emphasizes quantitative results, such as enhancements in test scores, while neglecting the lived experiences, perspectives, and obstacles faced by learners in AI-mediated speaking practice. Few studies critically analyze the fundamental contradiction in modern AI-assisted language learning: whether AI-facilitated communication can authentically replace or merely augment human contact in the development of speaking skills. Addressing this issue is conceptually and pedagogically significant, as speaking is the most interaction-dependent language ability, necessitating spontaneous meaning negotiation, emotional reactivity, and real-time communicative adaptation.

This study seeks to investigate the function of AI-speaking tools in an immersive English learning context by implementing the English Area (ERa) program among Indonesian EFL learners. This study specifically examines three research questions: (1) Does participation in the ERa program, augmented with AI-speaking tools, significantly enhance students' speaking skills? What is the students' perception of AI-speaking aids in facilitating their speaking practice? What problems and opportunities arise from the integration of AI-speaking tools into an immersive English learning environment? This study posits that students engaged in AI-integrated ERa activities will exhibit markedly superior enhancement in speaking performance compared to those involved solely in traditional ERa activities.

The study used an explanatory sequential mixed-methods design that integrates both quantitative and qualitative methodologies to address these problems. The quantitative phase employs a quasi-experimental pretest-posttest approach to assess enhancements in speaking performance between the experimental and control groups. Qualitative interviews and classroom observations are subsequently conducted to elucidate learners' experiences, perspectives, and interaction patterns during AI-supported immersion activities. This design aims to assess the efficacy of AI-speaking tools and to explore how learners navigate the interplay between technological support and genuine human interaction.

This research provides multiple substantial contributions to the domain of AI-assisted language acquisition and English as a Foreign Language instruction. It conceptually advances existing dialogues by framing AI not as a substitute for educators or colleagues, but as a communicative framework within immersive language contexts. It offers empirical findings from Indonesian secondary school, a context that is underrepresented in AI-mediated speech research. The study provides insights for educators, curriculum developers, and politicians aiming to include AI technologies into communicative language training while preserving the critical importance of human connection in speaking growth. The study ultimately contributes to broader discussions regarding the potential interplay between artificial intelligence and genuine communication in language education.

Research Methods

1. Research Design

This study utilized an explanatory sequential mixed-methods design, combining quantitative and qualitative methodologies, to examine the function of AI-speaking tools in an immersive English learning environment. The mixed-methods approach was used to offer a thorough knowledge of both quantifiable speaking enhancement and students'

experiential realities during the intervention. Quantitative data were initially gathered using a quasi-experimental two-group pretest-posttest methodology, contrasting an experimental group (ERa integrated with AI-speaking tools) with a control group (ERa without AI integration). Qualitative interviews and classroom observations were subsequently done to elucidate, expand upon, and contextualize the quantitative findings related to speaking performance, learner perspectives, and interactional experiences.

2. Research Setting and Participants

This research was performed at UPTD SMAN 1 Kalukku, a public senior high school in West Sulawesi, Indonesia, where the English Area (ERa) program had been established to promote immersive English communication among students. The participants comprised Grade XI students, allocated into an experimental group and a control group, each including roughly 18 pupils. Participants exhibited diverse levels of English proficiency and had access to cellphones and internet connectivity, facilitating the utilization of AI-speaking tools. The sample was chosen by simple sampling methods predicated on accessibility, willingness to participate, and students' familiarity with fundamental AI-assisted applications.

Table 1 Research Setting and Participants

Component	Description
Research Site	The study was conducted at UPTD SMAN 1 Kalukku, a public senior high school located in West Sulawesi, Indonesia. The school has implemented the English Area (ERa) program as part of its effort to promote immersive English communication among students.
Learning Environment	The school environment supports communicative English learning through classroom interaction, peer discussion, presentations, and English-only communication practices during designated ERa sessions.
Research Participants	The participants consisted of Grade XI students enrolled in the researcher's English classes during the 2025/2026 academic year.
Experimental Group	One class was assigned as the experimental group and participated in the ERa program integrated with AI-speaking tools such as ChatGPT, Google Speech-to-Text, Google Translate speaker features, and Duolingo.
Control Group	One class was assigned as the control group and participated in the conventional ERa program without AI-speaking tool integration.
Total Participants	Approximately 36 students participated in the study, with around 18 students in each group.
Participant Characteristics	Participants demonstrated varying levels of English-speaking proficiency, ranging from low to intermediate levels. Most students possessed basic digital literacy and familiarity with smartphone applications.
Technology Access	All participants had access to smartphones and internet connectivity, enabling the use of AI-speaking tools both inside and outside classroom activities.
Prior AI Familiarity	Students were generally familiar with common AI-assisted applications such as Google Translate, ChatGPT, Duolingo, and speech-recognition tools before the intervention began.

Sampling Technique	The study employed simple sampling techniques based on accessibility and classroom availability. Participants were selected from intact classroom groups already assigned within the school schedule.
Inclusion Criteria	Students were included if they actively participated in the ERa program, possessed smartphone and internet access, and agreed to participate voluntarily in the research activities.
Research Duration	The study was conducted over approximately two months during the implementation of the ERa program.
Ethical Participation	Participation was voluntary, and informed consent was obtained from students and school authorities before data collection procedures were conducted.

3. Instruments and Data Collection Procedures

Data were gathered utilizing quantitative and qualitative measures to get extensive evidence concerning students' speaking development and learning experiences. The quantitative instrument comprised pretest and posttest speaking evaluations assessed with a rubric derived from Brown (2007) and IELTS speaking criteria, encompassing fluency, pronunciation, grammar, vocabulary, and understanding. Qualitative instruments comprised semi-structured interviews, observational checklists, and document analysis. The interviews examined students' impressions of AI communication tools, their speaking experiences, the development of their confidence, and the problems they encountered in learning. Observations recorded participation, frequency of English usage, interaction patterns, and engagement with AI. Data collection occurred in a systematic manner, encompassing pretesting, intervention implementation, posttesting, interviews, classroom observations, and the synthesis of findings for interpretive analysis.

4. Data Analysis Techniques

Quantitative data were examined utilizing descriptive and inferential statistics via SPSS. Descriptive statistics encompassed the mean, standard deviation, minimum, and maximum scores to encapsulate students' speaking performance. Assumption testing included the Shapiro-Wilk normality test and Levene's test for homogeneity of variance. Inferential analysis utilized Paired Sample T-Tests and Independent Sample T-Tests at a significance level of $p < .05$ to ascertain within-group and between-group differences. The effect size magnitude was assessed using Cohen's d . Qualitative data were examined using thematic analysis (Braun & Clarke, 2006), encompassing familiarization, coding, theme formulation, theme review, interpretation, and reporting.

5. Ethical Considerations

This study complied with recognized ethical research standards during the inquiry procedure. Informed consent was secured from kids, parents, and school officials before data collection commenced. Participation was completely optional, and participants maintained the freedom to withdraw at any point without consequence. Confidentiality and anonymity were preserved by the utilization of coded participant identities and secure data storage protocols. All student data were utilized solely for academic research objectives and managed with due diligence to safeguard participants' privacy and welfare.

Results and Discussion

Result

1. Quantitative Results

The quantitative results indicated a notable enhancement in students' speaking performance after the integration of the ERA program with AI-speaking tools. Descriptive statistics in Table 2 and Figure 1 indicated that the experimental group experienced a significant enhancement in mean speaking scores from pretest to posttest relative to the control group. The experimental group's mean score rose from 55.00 to 77.56, whereas the control group experienced a more moderate gain from 52.53 to 60.11. Furthermore, the standard deviation in the experimental group diminished post-intervention, signifying more uniform learning results, whereas the control group exhibited heightened score variability. The minimum and maximum scores indicated a more robust and consistent enhancement in performance among students engaged in AI-assisted speaking exercises.

Before doing inferential analysis, assumption testing was performed to confirm the appropriateness of parametric statistical methods. The results of the Shapiro-Wilk normality test presented in Table 3 demonstrated that the posttest data had a normal distribution, since the significance values surpassed the .05 level. Moreover, Levene's Test of homogeneity presented in Table 4 validated equal variance among groups, hence endorsing the application of Independent Sample T-Test analysis.

Within-group improvement examination utilizing Paired Sample T-Tests revealed statistically substantial enhancements in speaking abilities for both groups (Table 5 and Figure 2). Nonetheless, the experimental group had a significantly greater mean gain compared to the control group, signifying a more pronounced intervention effect. The results of the Independent Sample T-Test, as shown in Table 5 and Figure 3, indicated a statistically significant difference in the posttest scores of the two groups ($p < .05$), thereby affirming the superiority of the AI-integrated ERA software.

Ultimately, the effect size study employing Cohen's d , as presented in Table 6 and Figure 4, revealed a substantial intervention impact, signifying that AI-speaking tools facilitated not only statistically significant improvements but also considerable practical advancements in students' speaking skill.

Table 2. Quantitative Result - Descriptive Statistics of Speaking Scores

Group	Mean	SD	Minimum	Maximum
Experimental Pretest	55	12.35	35	75
Experimental Posttest	77.56	11.26	60	95
Control Pretest	52.53	8.99	38	70
Control Posttest	60.11	14.61	40	82

Table 3. Quantitative Result - Assumption Tests

Test	Statistic	Sig.	Interpretation
Shapiro-Wilk Experimental Posttest	0.964	0.064	Normal
Shapiro-Wilk Control Posttest	0.952	0.156	Normal
Levene's Test	2.045	0.157	Homogeneous

Table 4. Quantitative Result - Paired T-Test

Group	Mean Difference	t-value	Sig.	Interpretation
Experimental	-22.556	-18.191	< .001	Significant Improvement
Control	-8	-4.197	< .001	Significant Improvement

Table 5. Quantitative Result - Independent T-Test

Comparison	Mean Difference	t-value	Sig.	95% CI
Experimental vs Control Posttest	17.45	4.052	< .001	8.707 - 26.193

Table 6. Quantitative Result - Effect Size

Variable	Cohen's d	Magnitude
AI-Speaking Tool Intervention	1.85	Large Effect

Figure 1 Comparative Mean Score Improvement Across Groups

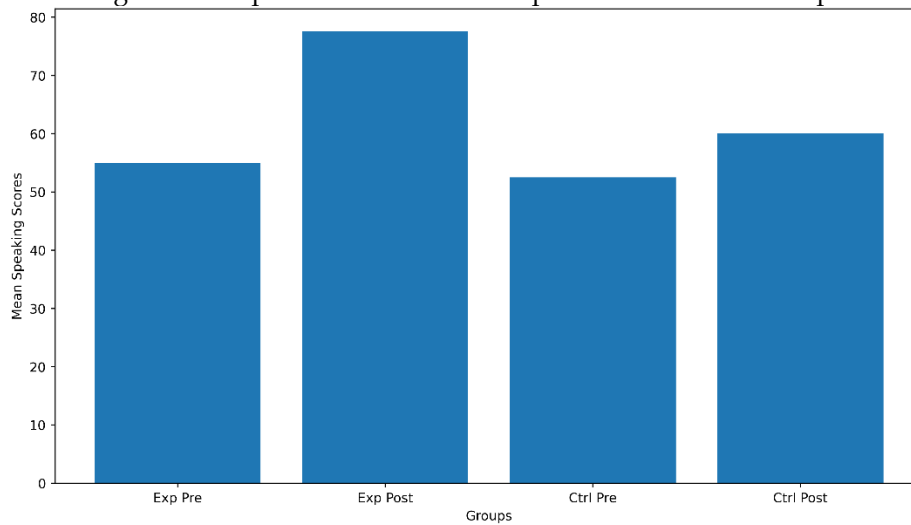


Figure 1 illustrates the relative enhancement in speaking scores between the experimental and control groups during the pretest and posttest phases. The experimental group utilizing AI-speaking tools demonstrated significantly superior posttest results compared to the control group, indicating the efficacy of merging immersive English interaction with AI-facilitated speaking practice. The figure emphasizes both the extent of speaking enhancement and the accelerated progress of oral communication within the AI-assisted learning environment. The findings suggest that AI-speaking tools serve as communicative scaffolding that improve students' fluency, pronunciation, vocabulary usage, and confidence in English-speaking tasks.

Figure 2. Speaking Improvement Trends Within Groups

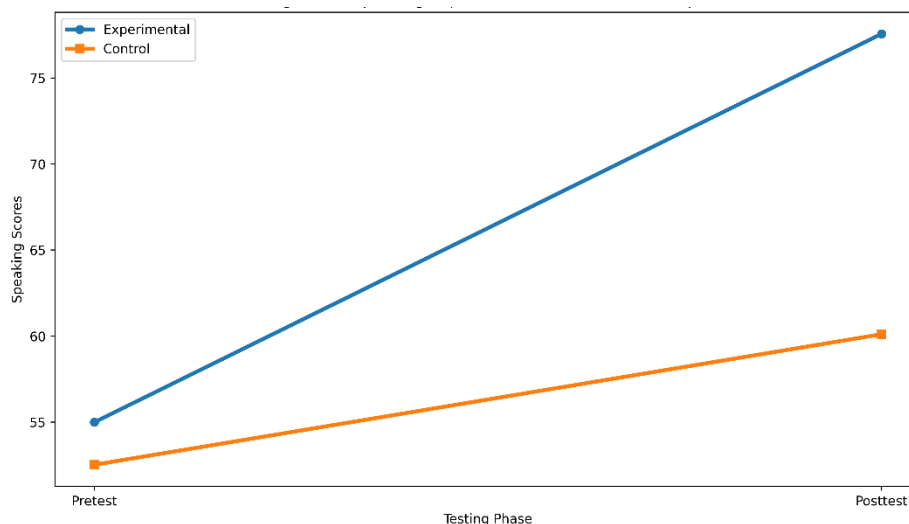


Figure 2 depicts the advancement in speaking performance in each group from pretest to posttest. Both groups exhibited quantifiable enhancement following their involvement in the ERa program; yet, the experimental group displayed a markedly higher improvement trajectory compared to the control group. This trend indicates that the incorporation of AI-speaking tools enhanced the efficacy of immersive English engagement by offering learners supplementary opportunities for independent speaking practice and instant feedback. The visual pattern indicates that AI-assisted speaking exercises fostered more continuity and maintained language engagement, allowing students to enhance their communicative competence beyond traditional classroom interactions.

Figure 3. Performance Gap Dynamics Between Groups

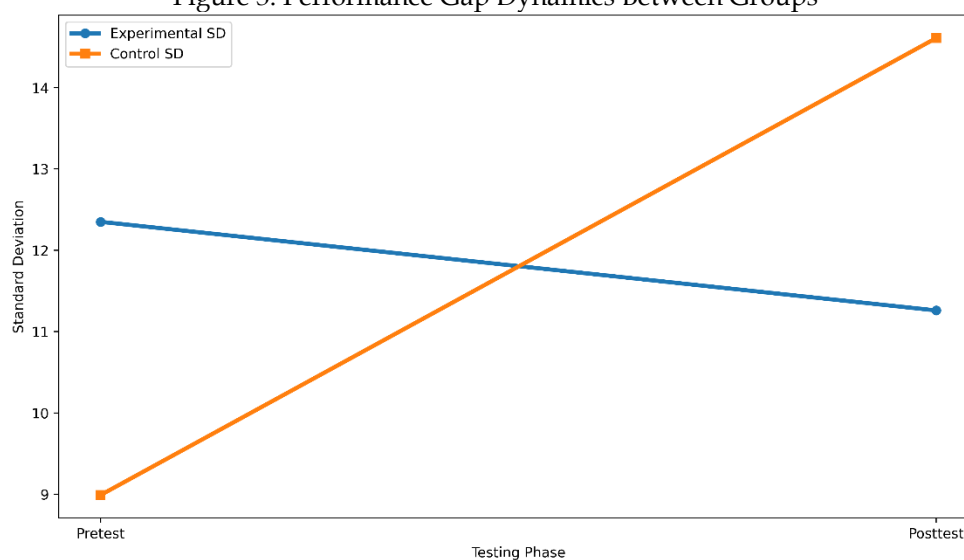


Figure 3 illustrates the fluctuations in score variability between the experimental and control groups via standard deviation analyses. The experimental group exhibited a decrease in standard deviation post-intervention, signifying that students' speaking performance grew increasingly uniform over time. In contrast, the control group had heightened variability, indicating an expansion of performance disparities among learners. This pattern suggests that AI-speaking technologies could facilitate more equal language acquisition by aiding underperforming students through personalized, low-

stress, and repetitive speaking practice opportunities. The results indicate that AI-assisted speaking environments enhance overall performance and diminish inequalities in the development of communicative competence.

Figure 4. Magnitude of AI Intervention Effect

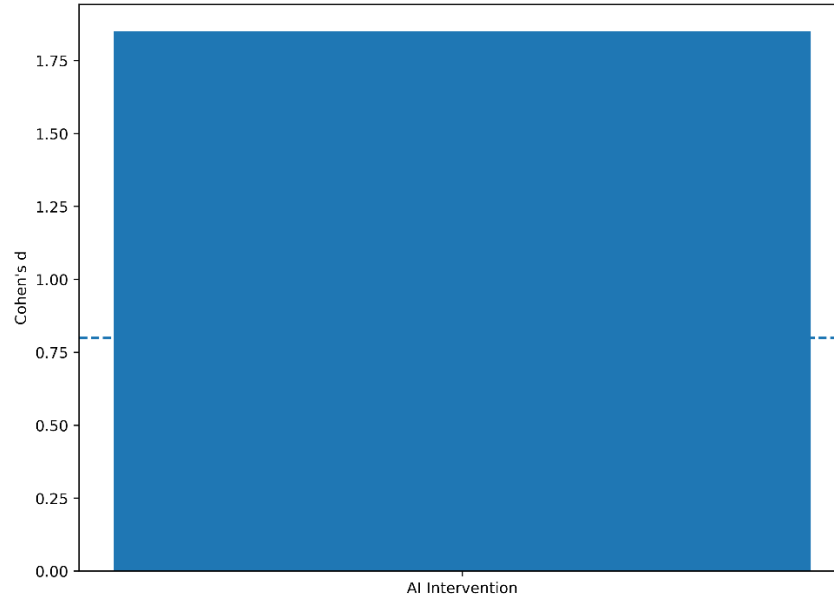


Figure 4 depicts the extent of the intervention effect as determined by Cohen's *d* analysis. The effect size derived from the AI-speaking tool intervention categorizes as "large effect," indicating that the enhancement in speaking performance was both statistically significant and practically substantial. This outcome demonstrates that the incorporation of AI-speaking technologies in immersive English learning settings significantly improved students' oral communication abilities. The substantial effect size further substantiates that AI-assisted speaking practice can function as a significant pedagogical innovation in EFL instruction, especially for enhancing fluency, pronunciation, learner confidence, and sustained involvement in real communication activities.

2. Qualitative Results

The qualitative findings identified four principal themes concerning students' experiences with the ERA curriculum and AI-speaking tools. Theme 1 concentrated on students' perceptions of the ERA program. As indicated in Table 7, the majority of participants conveyed favorable opinions towards immersive English engagement, characterizing the ERA setting as inspiring, engaging, and advantageous for enhancing communication practice. Students saw the training as significantly pertinent to their oral communication enhancement due to its promotion of sustained English usage in genuine contexts. A multitude of participants indicated enhanced confidence in their interactions in English with classmates and educators. Several students, however, highlighted deficiencies including inconsistent involvement, inadequate language preparation, and intermittent nervousness during spontaneous engagement exercises.

Theme 2 examined students' experiences using AI communication tools. Figure 5 depicts the most often utilized AI applications, such as ChatGPT, Google Speech-to-Text, Google Translate's speaker functionalities, and Duolingo. Participants typically expressed significant confidence in utilizing AI technologies owing to its accessibility,

immediacy, and non-judgmental feedback environment. Students valued the chance to engage in repetitive speaking practice without the apprehension of humiliation. Nonetheless, the majority of participants saw teacher feedback as more comprehensive, engaging, and emotionally helpful than AI-generated responses, suggesting that AI served largely as an auxiliary learning framework rather than a substitute for human connection.

Theme 3 analyzed the advancement of speaking skills. Table 8 indicates that students observed significant enhancement in fluency, vocabulary utilization, pronunciation precision, and self-assurance. Numerous participants articulated the use of their speaking skills in practical scenarios, including internet communication, peer interactions, and public speaking engagements. Ultimately, Theme 4 emphasized the obstacles and opportunities related to AI-assisted speaking practice. Figure 6 illustrates that issues with internet connectivity, mistakes in ASR identification, and limited access to premium application features were the most commonly mentioned obstacles. Students proposed enhancements such as more interactive AI conversational features, gamified exercises, and improved school internet infrastructure to facilitate sustainable AI-assisted language learning.

Table 7. Students' Perceptions of the ERa Program

Perception Aspect	Frequency (n=10)	Interpretation
Positive Immersive Interaction	10	Very Positive
Communication Relevance	9	Highly Relevant
Confidence Development	8	Strong Impact
Vocabulary Expansion	8	Moderate-Strong
Participation Challenges	7	Common Challenge

Table 8. Students' Speaking Skill Area

Speaking Skill Area	Frequency (n=10)	Interpretation
Fluency Improvement	8	Strong Improvement
Vocabulary Expansion	8	Strong Improvement
Pronunciation Development	7	Moderate-Strong
Confidence Increase	8	Strong Improvement
Real-World Communication Transfer	10	Universal Transfer

Figure 4.5. Students' AI Tool Usage Patterns

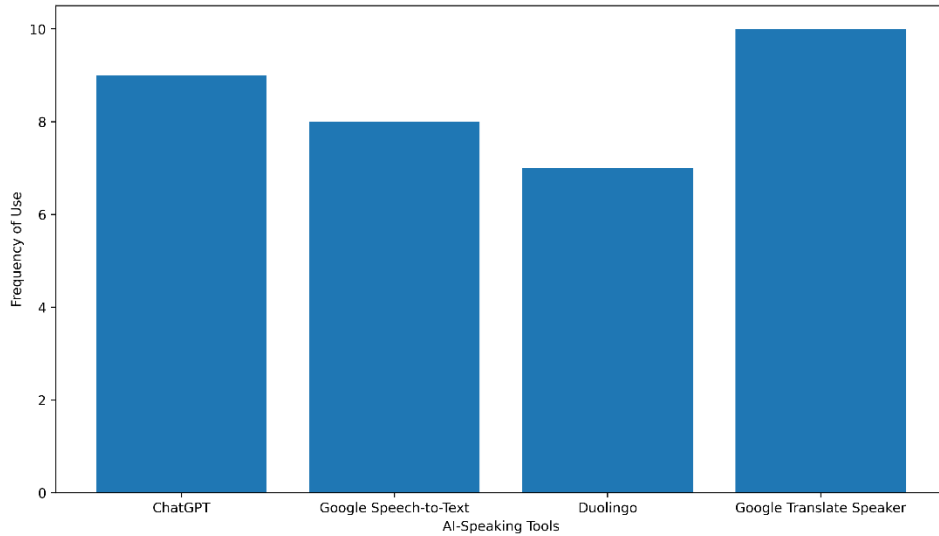


Figure 4.5 depicts the frequency and patterns of utilization of AI-speaking tools among participants during the intervention period. The speaker features of Google Translate and ChatGPT have become the most commonly used tools owing to their accessibility, prompt feedback systems, and conversational assistance capabilities. Students indicated utilizing these resources for practicing pronunciation, vocabulary, and speaking fluency both during and outside of classroom sessions. Duolingo and Google Speech-to-Text were extensively utilized for organized speaking activities and pronunciation assessment. The visual distribution indicates that students effectively incorporated various AI tools into their autonomous language-learning practices, showcasing significant technical engagement and favorable acceptance of AI-assisted speaking exercises.

Table 4.8. Areas of Perceived Speaking Improvement

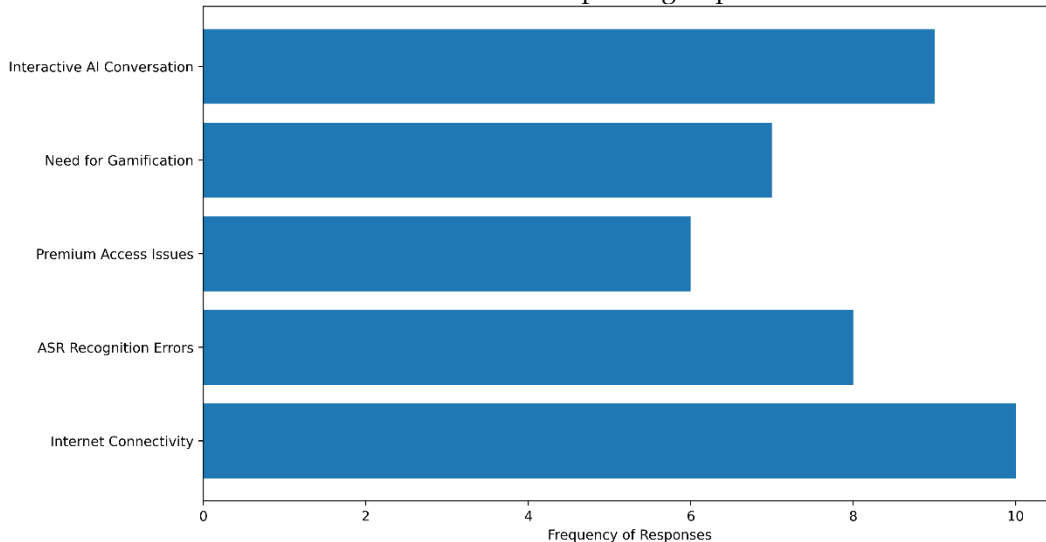


Table 4.8 encapsulates students' self-reported domains of speaking enhancement subsequent to their involvement in the ERa program augmented with AI-speaking technologies. Fluency development, vocabulary expansion, pronunciation enhancement, and confidence augmentation were regularly recognized as the most substantial advancements. All participants notably indicated that they used their speaking skills to real-world communication scenarios, such as peer discussions, internet

interactions, and classroom presentations. These findings indicate that AI-assisted immersive learning environments enhance not only quantifiable speaking proficiency but also genuine communicative applicability outside formal educational contexts. The findings indicate that students regarded AI-speaking tools as beneficial aids for ongoing oral communication practice.

Discussion

This study examined the function of AI-speaking tools in an immersive English learning context via the application of the English Area (ERa) software among Indonesian EFL learners. The findings demonstrate that the incorporation of AI-speaking tools into an immersive English-speaking environment significantly improved students' speaking skills, especially in fluency, pronunciation, vocabulary utilization, confidence, and communicative engagement. Students had significantly favorable impressions of AI-assisted speaking practice; yet, the majority of participants still regarded human connection as the most relevant mode of communication in language acquisition. Concurrently, other technological and infrastructural obstacles arose, especially concerning internet connectivity and speech recognition deficiencies.

The findings indicate that AI-speaking tools served as communication scaffolding mechanisms, rather than direct replacements for human engagement, while also showing meaningful enhancement in speaking competence. The initial research inquiry into the efficacy of AI-speaking tools in the ERa program was unequivocally substantiated. Students engaged in AI-assisted speaking exercises exhibited enhanced communication skills compared to those just involved in traditional immersion sessions. This enhancement was evidenced not just by elevated speaking scores but also by less fear, increased speaking frequency, and a greater desire to engage in spontaneous communication. The second research question about students' perceptions was affirmed, as participants uniformly characterized AI technologies as approachable, motivating, and conducive to independent practice. Nonetheless, the third research question indicated that significant obstacles persisted, particularly concerning digital infrastructure, disparate technical access, and constraints in AI-generated conversational responsiveness.

The results can be analyzed through many theoretical frameworks. The findings are closely aligned with Communicative Language Teaching (CLT), which prioritizes meaningful contact and authentic conversation as the basis for language acquisition (Karakaya et al., 2025; Xiao et al., 2023). The ERa program established immersive communicative environments where students were consistently exposed to genuine English interactions. AI-driven speaking tools have expanded these opportunities beyond the confines of the classroom by facilitating personalized and repetitive speaking practice. This combination likely heightened communication exposure and strengthened oral production practices. According to Krashen's Input Hypothesis and Long's Interaction Hypothesis, students gained advantages from enhanced comprehensible input as well as from opportunities to negotiate meaning through repeated interactions with peers and AI systems (Aldamen et al., 2025; Koç & Savaş, 2024; Lege et al., 2024). AI systems offered instantaneous pronunciation feedback and conversational simulation, enabling students to participate in low-risk communicative experiments devoid of social judgment apprehension.

The results further corroborate the Technology Acceptance Model (TAM), namely in relation to perceived utility and simplicity of use (Vančová, 2023; Weng et al., 2024).

Students willingly utilized AI-speaking technologies beyond formal instructional periods, demonstrating significant technical adoption and intrinsic motivation. AI programs like ChatGPT, Google Speech-to-Text, and Duolingo seem to alleviate psychological hurdles typically linked to speaking fear by providing non-threatening speaking settings. This approach may elucidate why students exhibited enhanced confidence development and heightened communicative participation during ERA activities (Ding & Yusof, 2025; Kaplan-Rakowski & Gruber, 2023). The findings indicate that AI tools may facilitate more fair learning outcomes by reducing performance disparities among students. Students with lower performance seemed to gain advantages from recurrent, personalized, and self-directed speaking chances that traditional classroom interactions frequently fail to offer consistently.

These findings align broadly with prior studies on AI-assisted language acquisition. Numerous research indicate that AI chatbots and speech-recognition systems enhance pronunciation accuracy, learner confidence, and speaking fluency by providing instant feedback and facilitating repeated interaction opportunities (Gulzar & Ehsan, 2025; Nguyen, 2024). Previous studies on immersive English settings have shown that regular communicative exposure enhances oral fluency and the willingness to communicate (Ayedoun et al., 2018; Gu, 2025; Zhang, 2024). This study enhances previous findings by showing that AI-assisted speaking practice is significantly more effective when integrated within a structured immersive English setting rather than applied as a standalone technology intervention.

Nonetheless, the findings also contradict excessively optimistic notions about AI supplanting human communication in language acquisition. Although participants held AI technologies in high regard, the majority of children favored teacher-mediated and peer-based interactions for genuine communication growth. This partially contradicts more technologically deterministic studies indicating that conversational AI may autonomously promote oral skill growth comparable to human contact (Song et al., 2026; Timpe-Laughlin et al., 2025). A potential explanation resides in contextual disparities. In contrast to entirely online or higher education environments, secondary school students in this study exhibited a significant reliance on emotional support, social engagement, and instructional direction from teachers. Human connection facilitated spontaneous negotiation of meaning, emotional reactivity, and contextual adaptability that AI systems could not entirely emulate. Moreover, the immersive educational setting may have heightened students' consciousness of the social aspects of communication, emphasizing the indispensable nature of genuine interpersonal connection.

The research presents numerous significant theoretical implications. It conceptually enhances current conversations by framing AI-speaking technologies as communicative scaffolds instead of independent teaching substitutes. This distinction is crucial as much current discourse around AI in education frequently portrays technology as a replacement for human instructional methods. The current findings indicate that speaking is fundamentally reliant on interaction and is socially created. AI is most effective when operating within human-centered communication systems that maintain genuine interpersonal interactions while enhancing opportunity for personalized practice. Moreover, the work enhances ongoing dialogues around AI-facilitated fair education by illustrating how AI-driven repetition and low-anxiety practice might mitigate performance gaps among learners.

The findings have substantial consequences for educators, educational institutions, and policymakers. English educators must intentionally include AI-speaking technologies into communicative instruction instead of regarding them as standalone

technical adjuncts. Structured speaking challenges that integrate peer engagement with AI-assisted practice may optimize speaking development while preserving authentic communication. Educational institutions and governments must acknowledge that effective AI integration is significantly contingent upon the quality of digital infrastructure. Reliable internet connectivity, institutional software assistance, and educator training are critical factors for sustainable deployment. Furthermore, students ought to be motivated to utilize AI tools independently beyond classroom hours to enhance speaking exposure and reinforce self-directed language learning practices.

Notwithstanding these advances, the study exhibits several shortcomings. The quasi-experimental methodology restricts causal certainty due to the lack of complete random assignment of participants across larger groups. Secondly, the sample size was rather limited and confined to a single Indonesian secondary school, hence constraining the generalizability of the findings to diverse educational or cultural contexts. Third, the duration of the intervention may have been inadequate to assess long-term speaking development or persistent AI interaction behaviors. The qualitative findings were partially based on self-reported perceptions, which may be influenced by social desirability bias or subjective interpretation. Ultimately, technological factors such as internet quality and device accessibility were not entirely manageable, potentially affecting students' learning experiences inconsistently.

Subsequent research must rectify these shortcomings by conducting extensive longitudinal investigations across varied educational contexts and participant demographics. Experimental research contrasting various AI-speaking platforms may elucidate which technological attributes most effectively enhance the development of communicative competence. Furthermore, subsequent study may explore the impact of AI-assisted speaking settings on particular aspects of oral communication, including pragmatic competence, interactional techniques, and intercultural communication skills. Subsequent research on AI-avatar interactions, voice-activated conversational bots, and emotionally attuned AI systems may enhance comprehension of how artificial intelligence might facilitate genuine communication while preserving the human aspect of language acquisition.

This study concludes that AI-speaking technologies can substantially enhance immersive English learning environments by broadening possibilities for communicative practice, boosting learner confidence, and fostering more equal speaking growth. Nonetheless, the results further confirm that genuine human interaction is essential for the effective acquisition of oral communication skills. AI serves most successfully as a supportive communicative framework integrated inside socially engaged learning contexts, rather than substituting teachers or peers. This study integrates technological innovation with human-centered pedagogy, contributing to discussions on the future role of artificial intelligence in EFL education and emphasizing the necessity of balancing technological progress with genuine communicative engagement in language learning.

Conclusion

This study examined the function of AI-speaking tools in an immersive English learning context via the application of the English Area (ERa) software among Indonesian EFL learners. The study sought to investigate if the incorporation of AI-assisted speaking applications into communicative English immersion activities could improve students' speaking proficiency, perspectives, and overall learning experiences.

The results indicated that the incorporation of AI-speaking tools markedly enhanced students' speaking performance in comparison to traditional immersive English exercises alone. Participants in the AI-enhanced ERA program shown significant advancements in fluency, pronunciation, vocabulary utilization, confidence, and conversational involvement. The research indicated that students viewed AI-speaking tools favorably because of their accessibility, immediacy, and non-judgmental practice environment, which facilitated repeated speaking practice outside of classroom confines. The findings simultaneously affirmed that students considered human interaction vital for the development of authentic communication, emotional support, and meaningful feedback. Moreover, the study revealed numerous implementation obstacles, such as internet connectivity constraints, flaws in speech recognition, and disparate access to premium AI functionalities.

The work theoretically enhances the comprehension of AI-speaking tools as communicative scaffolds instead of substitutes for human contact in language acquisition. The findings underscore the significance of incorporating AI-assisted speaking practice into human-centered communication settings to optimize oral language development. Educators are urged to integrate immersive English engagement with organized AI-enhanced speaking exercises, while legislators and school administrators must bolster digital infrastructure, ensure equal technology access, and facilitate teacher training in AI-supported instruction.

Future study should investigate longitudinal implementations in diverse educational settings, analyze new conversational AI technologies, and assess the impact of AI-assisted speaking environments on pragmatic competence, intercultural communication, and sustained communicative autonomy. This study illustrates that the optimal future of AI-assisted language acquisition resides not in supplanting human interaction, but in enhancing it through intelligent and supportive technological integration.

References

- AbuSahyon, A. S. E., Alzyoud, A., AlShorman, O., & Al-Absi, B. (2023). AI-driven Technology and Chatbots as Tools for Enhancing English Language Learning in the Context of Second Language Acquisition: A Review Study [Review of *AI-driven Technology and Chatbots as Tools for Enhancing English Language Learning in the Context of Second Language Acquisition: A Review Study*]. *International Journal of Membrane Science and Technology*, 10(1), 1209–1223. <https://doi.org/10.15379/ijmst.v10i1.2829>
- Aldamen, H., Almashour, M., Al-Deaibes, M., & Alsharefeen, R. (2025). Testing Krashen's input hypothesis with AI: a mixed-methods study on reading input and oral proficiency in EFL. *Frontiers in Education*, 10. <https://doi.org/10.3389/feduc.2025.1614680>
- Ayedoun, E., Hayashi, Y., & Seta, K. (2018). Adding Communicative and Affective Strategies to an Embodied Conversational Agent to Enhance Second Language Learners' Willingness to Communicate. *International Journal of Artificial Intelligence in Education*, 29(1), 29–57. <https://doi.org/10.1007/s40593-018-0171-6>
- Baharloo, A., & Jahromi, S. K. (2024). Studying English teachers' attitudes toward speaking tasks in online classes. *World Journal on Educational Technology Current Issues*, 16(1), 15–24. <https://doi.org/10.18844/wjet.v16i1.9070>

- Dennis, N. K. (2024). Using AI-Powered Speech Recognition Technology to Improve English Pronunciation and Speaking Skills. *IAFOR Journal of Education*, 12(2), 107–126. <https://doi.org/10.22492/ije.12.2.05>
- Devikar, S., Hinge, M., & Shevkari, S. (2025). Human vs. Machine: A Review of AI's Impact on Language Learning Interaction or replacing human interaction. *International Journal For Multidisciplinary Research*, 7(3). <https://doi.org/10.36948/ijfmr.2025.v07i03.49459>
- Ding, D., & Yusof, A. M. (2025). Investigating the role of AI-powered conversation bots in enhancing L2 speaking skills and reducing speaking anxiety: a mixed methods study. *Humanities and Social Sciences Communications*, 12(1). <https://doi.org/10.1057/s41599-025-05550-z>
- El-maghub, S. K., & Alajeeli, N. A. (2026). The Role of Voice Recording in Enhancing English Pronunciation: A Case Study of Libyan EFL Learners. *Al-Qurtas*, 9(28). <https://doi.org/10.66045/alqurtas.v9i28.1858>
- Evenddy, S. S. (2024). Investigating AI's Automated Feedback in English Language Learning. *FLIP Foreign Language Instruction Probe*, 3(1), 76–87. <https://doi.org/10.54213/flip.v3i1.401>
- Fauzia, F. (2016). Building Sustainability Quality of English Education Department by Creating English Area. *Journal of Education and Learning (EduLearn)*, 10(3), 275–280. <https://doi.org/10.11591/edulearn.v10i3.3953>
- Fibriasari, H., Soraya, T. R., Maulana, B., & Hutahaean, H. D. (2025). Artificial Intelligence Technology as a Communication Aid for Persons with Disabilities in Understanding Foreign Language Learning. *TEM Journal*, 2082–2089. <https://doi.org/10.18421/tem143-15>
- Grab, M. Ö. (2025). Strategies for Integrating Artificial Intelligence (AI) to Improve and Assess English Oral Communication Skills. *International Journal of Research in Education and Science*, 11(3), 533–552. <https://doi.org/10.46328/ijres.1312>
- Gu, L. (2025). Beyond the classroom - exploring the impact of virtual reality exposure on foreign language anxiety with the mediating role of ESL Chinese learners' communicative confidence and fluency. *Humanities and Social Sciences Communications*, 12(1). <https://doi.org/10.1057/s41599-025-05030-4>
- Guan, L., Lee, J. C., Zhang, Y., & Gu, M. (2025). Investigating the tripartite interaction among teachers, students, and generative AI in EFL education: A mixed-methods study. *Computers and Education Artificial Intelligence*, 8, 100384–100384. <https://doi.org/10.1016/j.caeai.2025.100384>
- Gulzar, R., & Ehsan, M. (2025). Adopting AI-Based Speech Recognition for Enhancing Pronunciation Accuracy and Learner Confidence. *Journal of Critical Inquiry*, 23, 58–73. <https://doi.org/10.52015/numlji.v23iii.316>
- Gulzar, R., & Ehsan, M. (2025). Adopting AI-Based Speech Recognition for Enhancing Pronunciation Accuracy and Learner Confidence. *Journal of Critical Inquiry*, 23, 58–73. <https://doi.org/10.52015/numlji.v23iii.316>
- Hu, X., & Qiu, R. (2026). Artificial Intelligence in English Speaking Instruction: Learner Impacts and Teacher Role Reconstruction. *Communications in Humanities Research*, 102(1), 265–274. <https://doi.org/10.54254/2753-7064/2026.ht31925>
- Huu, H. N. (2025). AI for English speaking practice: A study of effectiveness and engagement among Vietnamese university learners. *Australasian Journal of Educational Technology*. <https://doi.org/10.14742/ajet.10050>

- Ilqar, F. J. (2025). A Comprehensive Examination of Full English Immersion in Language Education. *Porta Uniuersorum*, 1(3), 87–92. <https://doi.org/10.69760/portuni.010307>
- Irawati, L., Ferdiyanto, F., & Islam, R. (2025). Enhancing Students' Speaking Skills through English Area Program at Islamic Boarding Schools. *ETDC Indonesian Journal of Research and Educational Review*, 4(3), 588–598. <https://doi.org/10.51574/ijrer.v4i3.3191>
- Jones, A. G. (2018). Immersion versus Engagement Strategies: Examining the Effects on Conversational Competence amongst Korean Students in an Intensive English Program. *Journal of Language Teaching and Research*, 9(4), 665–665. <https://doi.org/10.17507/jltr.0904.01>
- Joo, S. H. (2024). Generative AI as Writing or Speaking Partners in L2 Learning: Implications for Learning-Oriented Assessments. *Studies in Applied Linguistics and TESOL*, 24(1). <https://doi.org/10.52214/salt.v24i1.12865>
- Kaharuddin, Arafah, B., Ahmad, D., Nurfitri, R. Y., Taqdir, T., Mardiana, M., & Rasyid, M. N. A. (2025). Effect of Interactive and Collaborative Strategies on Indonesian EFL Learners' Oral English Proficiency Improvement. *Journal of Language Teaching and Research*, 16(5), 1628–1639. <https://doi.org/10.17507/jltr.1605.20>
- Kaplan-Rakowski, R., & Gruber, A. (2023). The impact of high-immersion virtual reality on foreign language anxiety. *Smart Learning Environments*, 10(1). <https://doi.org/10.1186/s40561-023-00263-9>
- Karakaya, K., Alpat, M. F., Uçar, H., Karakaya, Ö., & Bozkurt, A. (2025). Preparing teachers for the algorithmic educational landscape: A critical mapping of generative AI integration in language teacher education. *Technology in Language Teaching & Learning*, 7(2), 102841–102841. <https://doi.org/10.29140/ttl.v7n2.102841>
- Karataş, F., Abedi, F. Y., Gonyel, F. O., Karadeniz, D., & Kuzgun, Y. (2024). Incorporating AI in foreign language education: An investigation into ChatGPT's effect on foreign language learners. *Education and Information Technologies*, 29(15), 19343–19366. <https://doi.org/10.1007/s10639-024-12574-6>
- Kim, H.-S. (2026). Oral Communication Skills and Literacy Gains Through AI Conversational Practice Across Proficiency Levels. *STEM Journal*, 27(1), 16–37. <https://doi.org/10.16875/stem.2026.27.1.16>
- Koç, F., & Savaş, P. (2024). The use of artificially intelligent chatbots in English language learning: A systematic meta-synthesis study of articles published between 2010 and 2024. *ReCALL*, 1–18. <https://doi.org/10.1017/s0958344024000168>
- Lan, D., Khuong, V. V., & Nguyen, T. H. T. (2025). Employing Artificial Intelligence for Foreign Language Education. *Journal of Education Linguistics Literature and Art*, 3(1), 1–7. <https://doi.org/10.62568/ella.v3i1.397>
- Lege, R., Bonner, E., & Aikawa, T. (2024). Pecha, a language practice peer: Guiding language learning interactions through large language models. *Technology in Language Teaching & Learning*, 6(3), 1716–1716. <https://doi.org/10.29140/ttl.v6n3.1716>
- Lin, Q. (2025). English Language Teaching Goals: Embracing Global Varieties for Effective Communication. *Journal of Contemporary Educational Research*, 9(5), 320–325. <https://doi.org/10.26689/jcer.v9i5.10563>
- Mahazan, M. H., & Ismail, H. H. (2025). Artificial Intelligence Tools as Catalysts of Improved Spoken English: A Systematic Review of the Current Applications and

- Challenges. *International Journal of Learning Teaching and Educational Research*, 24(12), 675–701. <https://doi.org/10.26803/ijlter.24.12.29>
- Mananay, J. A. (2024). Integrating Artificial Intelligence (AI) in Language Teaching: Effectiveness, Challenges, and Strategies. *International Journal of Learning Teaching and Educational Research*, 23(9), 361–382. <https://doi.org/10.26803/ijlter.23.9.19>
- McDonough, K., & Sato, M. (2019). Promoting EFL students' accuracy and fluency through interactive practice activities. *Studies in Second Language Learning and Teaching*, 9(2), 379–395. <https://doi.org/10.14746/ssllt.2019.9.2.6>
- Miolo, S. T., Emzir, E., & Rasyid, Y. (2017). English Speaking Learning through The "English Area" Program in Smk Negeri I Gorontalo. *JETL (Journal Of Education Teaching and Learning)*, 2(2), 133–133. <https://doi.org/10.26737/jetl.v2i2.276>
- Nguyen, H. A. (2024). Harnessing AI-Based Tools for Enhancing English Speaking Proficiency: Impacts, Challenges, and Long-Term Engagement. *International Journal of AI in Language Education.*, 1(2), 18–29. <https://doi.org/10.54855/ijaile.24122>
- Nguyen, H. A. (2024). Harnessing AI-Based Tools for Enhancing English Speaking Proficiency: Impacts, Challenges, and Long-Term Engagement. *International Journal of AI in Language Education.*, 1(2), 18–29. <https://doi.org/10.54855/ijaile.24122>
- Omar, S. F., Nawli, H. S. A., Shahdan, T. S. T., Mee, R. W. M., Pek, L. S., & Yob, F. S. C. (2020). Interactive language learning activities for learners' communicative ability. *International Journal of Evaluation and Research in Education (IJERE)*, 9(4), 1010–1010. <https://doi.org/10.11591/ijere.v9i4.20605>
- Pham, T. T. T., Nguyen, L. A. D., Dang, H. M., & Le, T. T. P. (2024). Exploring Tertiary Vietnamese EFL Students' Engagement in Vocabulary Learning through the Use of an AI Tool. *Proceedings of the AsiaCALL International Conference*, 4, 129–149. <https://doi.org/10.54855/paic.23410>
- Phoenu, M., & Sengsri, S. (2021). The Effect of a Flipped Classroom with Communicative Language Teaching Approach on Undergraduate Students' English Speaking Ability. *International Journal of Instruction*, 14(3), 1025–1042. <https://doi.org/10.29333/iji.2021.14360a>
- Qiao, H., & Zhao, A. (2023). Artificial intelligence-based language learning: illuminating the impact on speaking skills and self-regulation in Chinese EFL context. *Frontiers in Psychology*, 14. <https://doi.org/10.3389/fpsyg.2023.1255594>
- Ramos-Saltos, L. A., Vélez-Olvera, E. R., Piña-Roldán, V. A., & Pereira-Loor, J. M. (2026). AI-Enhanced Speaking Practice in Upper-Secondary EFL Classroom: A Systematic Review of Recent Evidence. *Revista Científica Ciencia y Método*, 4(1), 516–532. <https://doi.org/10.55813/gaea/rcym/v4/n1/168>
- Rohman, D. N., Entusiastik, E., & Wulandari, S. (2025). EFL Students' Experience in a Language Immersion Program: A Diary Study. *IDEAS Journal on English Language Teaching and Learning Linguistics and Literature*, 13(1), 402–417. <https://doi.org/10.24256/ideas.v13i1.6154>
- Shawaqfeh, A. T., Jameel, A. S., Al-adwan, L. A. Y., & Khasawneh, M. A. S. (2023). Interaction as a Mechanism to Enhance English Language Proficiency in the Classroom. *Journal of Language Teaching and Research*, 15(1), 229–234. <https://doi.org/10.17507/jltr.1501.25>
- Son, J., Ružić, N. K., & Philpott, A. (2023). Artificial intelligence technologies and applications for language learning and teaching. *Journal of China Computer-Assisted Language Learning*, 5(1), 94–112. <https://doi.org/10.1515/jccall-2023-0015>

- Song, Q., Rong, Z., Islam, M., & Lambri, A. B. (2026). Mediating oral communication with ChatGPT: a sociocultural and technology acceptance perspective in ESL classrooms. *Language Teaching Research*. <https://doi.org/10.1177/13621688261418099>
- Supriyono, Y., Saputra, Y., & Dewi, N. S. N. (2022). English Immersion Program in EFL Setting: A Modified Model, Implementation, and Effectiveness. *JEELS (Journal of English Education and Linguistics Studies)*, 7(1), 137–160. <https://doi.org/10.30762/jeels.v7i1.209>
- Suryadi, S., & Erlangga, F. (2024). Enhancing English Speaking Skills through Learning Media and Discourse Marker Mastery: A Quasi-Experimental Study. *Voices of English Language Education Society*, 8(1), 271–281. <https://doi.org/10.29408/veles.v8i1.25314>
- Taeza, J. (2025). The role of AI-powered chatbots in enhancing second language acquisition: An empirical investigation of conversational AI assistants. *Edelweiss Applied Science and Technology*, 9(3), 2616–2629. <https://doi.org/10.55214/25768484.v9i3.5853>
- Timpe-Laughlin, V., Divekar, R. R., Sydorenko, T., Dombi, J., & Oh, S. (2025). Intent-Based Versus GPT -Based Conversational Agents: Benefits and Challenges for Practicing and Assessing Oral Interaction. *TESOL Quarterly*, 59. <https://doi.org/10.1002/tesq.3409>
- Vančová, H. (2023). AI and AI-powered tools for pronunciation training. *Journal of Language and Cultural Education*, 11(3), 12–24. <https://doi.org/10.2478/jolace-2023-0022>
- Wei, L. (2023). Artificial intelligence in language instruction: impact on English learning achievement, L2 motivation, and self-regulated learning. *Frontiers in Psychology*, 14. <https://doi.org/10.3389/fpsyg.2023.1261955>
- Weng, J., Noordin, N., & Ahmad, N. K. (2024). Exploring the Acceptance of Mobile-Assisted Peer Feedback in English Speaking among Chinese EFL Students. *International Journal of Learning Teaching and Educational Research*, 23(9), 325–342. <https://doi.org/10.26803/ijlter.23.9.17>
- Xiao, F., Zhao, P., Sha, H., Dandan, Y., & Warschauer, M. (2023). Conversational agents in language learning. *Journal of China Computer-Assisted Language Learning*, 4(2), 300–325. <https://doi.org/10.1515/jccall-2022-0032>
- Zhang, M. (2024). Enhancing self-regulation and learner engagement in L2 speaking: exploring the potential of intelligent personal assistants within a learning-oriented feedback framework. *BMC Psychology*, 12(1). <https://doi.org/10.1186/s40359-024-01917-0>