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AI Tutor-Based English Learning in Improving High School Students' Speaking Skills

Agussalim Ismail[1*], Ashadi[2]
Universitas Negeri Yogyakarta
Corresponding Author: Agussalim Ismail agussalim.i@yahoo.com

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A B S T R A C T

AI has been inevitable in all fields of education including the learning of speaking in EFL contexts. This research examines artificial intelligence (AI)-based tutors in improving students' English-speaking skills. Using a one-group pretest–posttest design with a mixed-method approach, data was obtained through oral tests, questionnaires, and interviews. The results of the analysis showed a significant increase ($p < 0.05$) from the average pre-test score of 59.10 to post-test 72.09, with the highest increase in the fluency aspect (24.1%). A total of 87% of students gave a positive perception of the use of AI tutors, with an average score of 4.20. Qualitative findings show that Generative AI and Natural Language Processing (NLP) features provide real-time feedback and increase student motivation and confidence. Thus, AI tutors have proven to be effective as an adaptive learning medium that supports the improvement of speaking skills and learning independence of high school students.

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INTRODUCTION

The integration of artificial intelligence in education offers new opportunities, particularly in second language acquisition. AI applications like intelligent assistants and chatbots significantly improve students' speaking proficiency by providing continuous oral interaction and reducing anxiety (Han & Lee, 2024; Qiao & Zhao, 2023). This study examines AI tutor-based English learning's effectiveness in enhancing high school students' speaking skills, often limited in authentic practice. Mobile learning and AI tools present a nuanced approach, addressing diverse learner needs and fostering spontaneity and active participation (Alzahrani & Alotaibi, 2024). These advancements tackle challenges like limited practice and delayed feedback, enhancing engagement and reducing anxiety (Nguyen, 2024). This approach meets the demand for English proficiency globally, offering scalable solutions.

AI creates personalized, adaptive learning experiences, transforming traditional methods (Wiyaka et al., 2024). Research underscores AI's role in enhancing English learners' speaking performance, highlighting its potential for personalized, interactive experiences (Qiao & Zhao, 2023; Rusmiyanto et al., 2023). AI platforms often include speech recognition and instant feedback, crucial for improving pronunciation and fluency (Nguyen, 2024). However, understanding AI's effects in specific contexts, like the Chinese EFL environment, remains limited. This study addresses this by investigating AI applications' impact on Chinese university students' oral proficiency (Zhang, 2025), examining anxiety reduction and self-regulation (Qiao & Zhao, 2023). Further research is needed on AI tools' long-term effects on productivity, motivation, and retention, particularly in higher education and professional training (Nguyen, 2024). This investigation will clarify how AI tutors optimize pedagogical outcomes in linguistic programs (M. Zhang & Li, 2025; X. Zhang, 2025). Additionally, examining AI feedback mechanisms' effectiveness across proficiency levels is vital for refining learning pathways (Nguyen, 2024), including personalized feedback addressing pronunciation and fluency issues for effective skill development (Zhang, 2025).

Examining AI within pedagogical frameworks like communicative language teaching shows how these technologies enhance methodologies. This underscores the need for empirical research on AI tutors' utility in promoting communicative competence and reducing speaking anxiety in high school students (Kemelbekova et al., 2024; Zhang, 2025). AI tools with speech recognition and machine learning offer personalized feedback and real-time assessments, essential for improving pronunciation and speaking (Mohammadkarimi, 2024). This reduces language anxiety and increases communication willingness, creating an engaging learning experience. However, research often overlooks the interaction between fluency gains and long-term retention, especially for advanced learners needing complex linguistic skills (Nguyen, 2024).

This investigation aims to optimize AI tutors for better pedagogical outcomes, especially for high school students (Suh, 2025). It analyzes AI feedback using natural language processing and audio analysis to address oral communication challenges, like prosodic features and pragmatic competence (Xun et al., 2025). The study examines AI-powered agents addressing advanced linguistic components, providing a framework for integrating AI into English instruction (Xun et al., 2025). This approach evaluates AI's impact on speaking proficiency aspects like fluency, coherence, and accuracy among high school students (Lai, 2026). It will also explore students' perceptions of AI-driven instruction, assessing its role in fostering learner autonomy and reducing speaking apprehension (Alwehebi, 2025; Ding & Yusof, 2025).

This study employs a mixed-methods approach to evaluate AI-powered conversation bots' benefits, assessing L2 speaking skills improvement and reduced language anxiety (Ding & Yusof, 2025). It builds on findings that AI tools create judgment-free environments, boosting learners' motivation and self-regulated learning (Ding & Yusof, 2025; Shen et al., 2025). The study provides empirical evidence on AI tutors' effectiveness in diverse contexts, exploring their integration in educational settings (Suh, 2025). It examines AI platforms' ability to offer feedback and personalized learning for high school students' oral communication challenges (Alenezi et al., 2025). The research evaluates AI tools' impact on students' speaking proficiency, enjoyment, anxiety, and engagement (Yan & Singh, 2026), addressing gaps in long-term language skills retention and motivation (Nguyen, 2024).

AI in English learning has transformative potential for education quality. Through data analysis, AI identifies learning needs, offers real-time feedback, and adjusts content to individual abilities (Zhou et al., 2025; Ulfa, 2023), however, AI cannot fully replace teachers' emotional intelligence and cultural sensitivity. Thus, AI should complement traditional pedagogy, creating synergy between technology and humanistic language education.

LITERATURE REVIEW

Application of AI in English Language Learning

Integrating Artificial Intelligence (AI) into language instruction has transformed pedagogical methods, enhancing English language acquisition, especially speaking proficiency (Ding & Yusof, 2025). Research shows AI-assisted tools improve vocabulary and speaking skills (Wei, 2023). These tools use algorithms for personalized feedback, targeting practice and individual needs (Qassrawi et al., 2024). Personalization reduces speech anxiety and boosts confidence, with AI chatbots providing a low-stress practice environment (Nguyen, 2024). AI platforms improve public speaking by analyzing pronunciation, intonation, and rhythm, crucial for oral communication (Al-Shallakh, 2024; Xun et al., 2025). They offer real-time error correction and adaptive learning to match proficiency (Nguyen, 2024).

AI applications, including chatbots and speech recognition, provide immediate feedback, promoting independent practice and reducing anxiety (Nguyen, 2024). For example, AI tools enhance speaking skills and motivation in EFL learners (Wang & Wen, 2025). AI boosts learner motivation by adapting to abilities and offering supportive practice environments (Karim et al., 2023; Nguyen, 2024). AI-powered speech evaluation systems improve EFL learners' speaking abilities with constructive feedback (Du et al., 2025). This technology assesses fluency and pronunciation, offering insights for communication improvement (Acuña & Durão, 2024). AI provides personalized tools like chatbots and pronunciation apps, adapting content to student progress (Acuña & Durão, 2024). These advancements allow tailored content and real-time feedback, fostering effective learning for prospective teachers (Acuña & Durão, 2024).

AI and Speaking Skills Development

AI-powered speech recognition technology significantly enhances English pronunciation and speaking skills (Dennis, 2024). These tools provide immediate feedback on phonetic accuracy and intonation, beneficial for learners without native-speaking educators, addressing a critical gap in language education. AI systems identify specific deficiencies in grammar, vocabulary, and pronunciation, enabling customized activities (Dhanapal et al., 2024). Gamification in AI platforms enhances engagement by offering progress tracking and rewards (Ulfa, 2023). The interactive nature of AI-driven systems, including virtual agents, creates immersive environments simulating real-world scenarios, refining oral communication skills (Kianinezhad, 2023; Mohammadkarimi, 2024).

AI provides real-time feedback on pronunciation, grammar, vocabulary, and writing skills (Rukiati et al., 2023). AI tools improve speaking fluency and pronunciation with personalized feedback through speech recognition, chatbots, and mobile apps (Nguyen, 2024). These applications offer interactive conversation practice, refining language skills dynamically (Rukiati et al., 2023). AI platforms integrate virtual language assistants or chatbots for simulated conversations, providing feedback on speech skills using natural language processing (Sharifuddin & Hashim, 2024). This allows practice in a low-stakes environment, with immediate evaluations refining articulation and speech patterns (CHISEGA-NEGRILĂ, 2023). Recent advancements use graph neural networks for processing speech patterns, providing detailed feedback on phonetic precision (Backhaus et al., 2023).

AI Tutor and Learning Effectiveness

AI tutors enhance language learning by providing immediate, personalized feedback for error correction and skill development (Chen, 2024). They analyze learner data to tailor materials, boosting engagement and motivation (CHISEGA-NEGRILĂ, 2023). Adaptive feedback enables efficient error rectification, often surpassing traditional methods (Anh, 2025). AI systems simulate conversations and provide immersive input, crucial for fluency and communication skills (Qiao & Zhao, 2023). By discerning complex learning patterns, AI offers insights into pedagogical effectiveness and student progress (Chen, 2024), recommending exercises for comprehensive knowledge (Ai-jun, 2024). Personalization through narrative fragment generation and question creation makes content interactive (Suh, 2025). AI generates diverse materials for various goals and proficiency levels. automating content and instruction, reducing educators' cognitive load.

AI addresses language learning challenges by offering flexible, interactive environments (Király, 2024), ensuring curricula remain relevant and responsive (Chen, 2024; PAN, 2024). Adaptive instruction creates engaging environments by catering to learning styles and paces (CHISEGA-NEGRILĂ, 2023). AI's flexibility in tailoring content sequences to proficiency levels highlights its potential for personalized learning (Praveena & Anupama, 2025). Platforms use algorithms to analyze interactions and performance data, optimizing content delivery in real-time (Naterkumar & Hashim, 2025).

Research on AI tutor-based English learning's effectiveness in enhancing high school students' speaking skills is limited, highlighting the need to study AI tools' impact on adolescents' oral proficiency. Current studies focus on university and adult learners, neglecting younger students. This calls for research on primary and high school students to help educators support these learners with AI (Huynh, 2024). There is a lack of research on AI tools' contribution to integrated language skills in classrooms (Korkut, 2025), limiting understanding of AI's role in comprehensive language development. Additionally, AI's potential to address equity and access challenges for rural and low-income learners, particularly regarding device availability and broadband quality, needs investigation (Althobaiti, 2025). While AI offers personalized learning, concerns persist about its long-term impact on learner autonomy and critical thinking, especially for high school students who may rely too much on AI instead of developing independent problem-solving skills (Huynh, 2024).

This study examines the effectiveness of AI tutor-based English learning platforms in enhancing the speaking proficiency of high school students. It delineates the specific pedagogical approaches and technological affordances that optimize learning outcomes within this demographic. Additionally, the research aims to explore the impact of AI tool integration on student engagement and motivation, as well as the challenges encountered by both educators and students during implementation. This investigation seeks to contribute to a more nuanced understanding of AI's role in ESL instruction (Saleem et al., 2025).

METHODOLOGY

This study employs an explanatory sequential mixed-method design, prioritizing quantitative data, followed by qualitative support (Creswell & Plano Clark, 2018). Quantitative data is initially collected and analyzed, with a subsequent qualitative phase refining statistical finding. The quantitative component uses a pre-experimental one-group pretest-posttest design to evaluate an AI tutor intervention, comparing students' speaking proficiency before and after treatment. This design assesses performance shifts within a single group without a control group (Bierer et al., 2025; Thyer, 2012). A qualitative phase with semi-structured interviews and observations explores students' perceptions of AI tutors (Fathi et al., 2024; Fattah et al., 2023; Yan & Singh, 2026). Integrating these phases provides robust interpretation of AI-mediated instruction's impact on language learning outcomes.

This mixed-methods approach combines measurable evidence with insights into AI's role in ESL education (Konyrova, 2024; Saleem et al., 2025). It explores AI's impact on learning outcomes and experiences (Chea & Xiao, 2024). Data triangulation enhances findings' validity, offering a robust understanding of AI technology, pedagogical practices, and learner outcomes (Konyrova, 2024; Rad, 2025). Integrating quantitative and qualitative data addresses educational interventions' complexities by highlighting statistical patterns and contextual factors (Li & Yan, 2026; Rad, 2025; Shen, 2025). The research included all grade XI students in English language learning, using saturated sampling to represent the population (Mahendra et al., 2023; Azzahra et al., 2025). Instruments included speaking tests, questionnaires, interviews, and observations. Speaking tests assess fluency, pronunciation, grammar, and vocabulary (Sidabutar & Manihuruk, 2022), while questionnaires and interviews examine students' motivations and perceptions of AI tutors. All instruments were tested for content and construct validity and reliability.

Meanwhile, qualitative data were analyzed using thematic analysis to identify recurring patterns and themes, which were then integrated with the quantitative results to provide corroboration and deeper contextual insights. Triangulation was achieved through the convergence of multiple data sources (pre- and post-tests, semi-structured interviews, and classroom observations) and methods, thereby enhancing the validity, reliability, and credibility of the research findings.(Chea & Xiao, 2024; Shen, 2025) The qualitative data were gathered through focus group interviews and field notes, with randomly selected participants from both control and experimental groups providing insights into their learning experiences (Songsiengchai et al., 2023).

RESEARCH RESULT

Description of AI English Tutor (Google AI Studio)

Figure 1. AI English Speaking Tutor

The AI English Tutor application is a cloud-based AI conversation partner system developed in Google AI Studio, designed to assist English learners in enhancing their speaking skills through adaptive conversational interactions. This system operates across multiple platforms, including Windows, macOS, and Android, without requiring additional installations and is accessible via a modern browser and Internet connection. By leveraging natural language processing (NLP) and generative AI technology, the application can comprehend conversational context, provide automatic corrections, and adjust the difficulty level according to the user's proficiency. Users can practice grammar, tenses, and speaking fluency in real-time through both text and voice, as demonstrated by the AI conversational interface shown in the accompanying screenshot. The benefits of this system are summarized in the following table:

Table 1. Gemini English Tutor Description

Technical/Academic Aspects	Explanation
Platform	Google AI Studio (cloud-based)
Basic Technology	Generative AI + NLP
Key Features	Automatic grammar correction, tenses training, adaptive conversation
Interaction	Text and voice (speech recognition & text generation)
Research Function	Experimental media for improving speaking skills
Pros	Real-time feedback, personalized learning, cross-operating systems

In the context of research, AI English Tutor was used as an AI-based learning medium to measure the improvement of English-speaking skills through comparison of Pre-Test and Post-test results. The system not only served as an interactive virtual tutor, but also as a qualitative data collection tool to analyse patterns of errors and student development. Based on the results of initial observations, interaction with AI showed a significant improvement in aspects

of student fluency, pronunciation, grammar, and vocabulary on the comparison of pre-test and post-test result were as follows:

Table 2. The Comparison of Pre-test and Post-test Results

Assessment Aspects	Pre-Test Average Score	Post-Test Average Score
Fluency	58	72
Pronunciation	60	73.5
Grammar	57.5	71
Vocabulary	59	72

Data analysis revealed a consistent enhancement across all evaluated linguistic dimensions–fluency, pronunciation, grammar, and vocabulary–following the instructional intervention. Notably, the increase in mean scores for each of these dimensions indicated the efficacy of the implemented intervention in augmenting learners' language proficiency. This improvement was evident in the comparison between pre-test mean scores, which ranged from 57.5 to 60, and post-test mean scores, which significantly increased to a range of 71 to 73.5. This comparison demonstrated substantial development in all aspects of language ability, supporting the premise that the implemented instructional method was positively correlated with improvements in linguistic competence.

The most significant mean score increase was observed in pronunciation, followed by fluency and vocabulary, suggesting that the intervention had the most pronounced impact on these areas. Quantitatively, the largest difference between pre-test and post-test scores was found in pronunciation (13.5 points), followed by fluency (14 points) and vocabulary (13 points). These findings suggest that the intervention was particularly effective in enhancing speaking-related skills, as evidenced by the significantly higher post-test scores compared to the pre-test results.

Overall, this comprehensive improvement confirmed that the instructional intervention successfully facilitated the holistic development of learners' language abilities, thereby better preparing them for more effective language use. Furthermore, these findings were consistent with previous studies reporting the positive impact of instructional interventions on improving students' speaking performance across multiple linguistic dimensions.

Based on the results of the Post-Test, there was a significant improvement in all aspects of the assessment, with an average of 71–74. The highest improvements occurred in fluency and vocabulary, signalling the effectiveness of interactive speaking exercises with AI.

Table 3. Comparative Analysis of Pre-Test and Post-Test Scores of Speaking Skills

Assessment Aspects	Pre-Test	Post-Test	Gap (Δ)	Percentage Increase (%)
Fluency	58	72	14	24.1%
Pronunciation	60	73.5	13.5	22.5%
Grammar	57.5	71	13.5	23.5%
Vocabulary	59	72	13	22.0%

When compared to the Pre-Test results, all aspects have increased by more than 13 points, which is equivalent to a relative increase of about 22–24%. Statistically, if tested with the Paired Sample t-Test and the results are significant ($p < 0.05$), it can be concluded that AI Tutor-based learning is effective in improving students' speaking skills.

Empirically, Post-Test > Pre-Test in all aspects, which indicates an improvement in participants' speaking competence. When statistically tested with a paired t-test and the results were significant ($p < 0.05$), it can be concluded that learning interventions are effective in improving students' speaking skills.

A comparison of the results of pre-test and post-test AI-based learning tutors can also be seen in the following diagram:

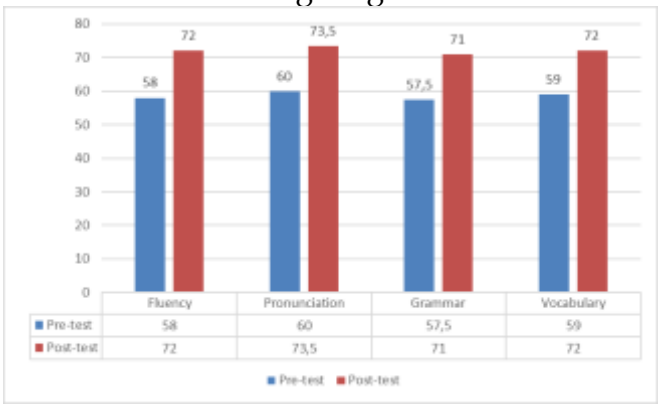

Figure 2. Comparison of Pre-test and Post-test Scores in Speaking Skills

The analysis of the presented data suggests a consistent enhancement in all aspects of speaking skills following the implementation of the instructional treatment. The mean scores for fluency increased from 58 to 72, pronunciation from 60 to 73.5, grammar from 57.5 to 71, and vocabulary from 59 to 72. The relatively uniform improvement, ranging from approximately 13 to 14 points in each aspect, indicates that the intervention had a comprehensive impact rather than focusing on a single component of speaking ability. Furthermore, the highest post-test score in pronunciation suggests that the instructional approach may have emphasized phonological accuracy or employed effective strategies to enhance learners' pronunciation.

Overall, this pattern of improvement reflects substantial development in students' communicative competence, encompassing fluency, structural accuracy, lexical mastery, and clarity of articulation. However, this interpretation remains descriptive in nature; therefore, further statistical analysis is required to determine the significance of the observed improvements and to account for additional factors, such as sample size and data variability, to strengthen the validity of the findings.

Analysis of Students' Perceptions of the Use of AI Tutors in English Learning

Our data indicated a predominantly positive trend in students' perceptions of utilizing AI tutors for English learning, with the majority expressing agreement, while only a small proportion remained neutral or expressed disagreement.

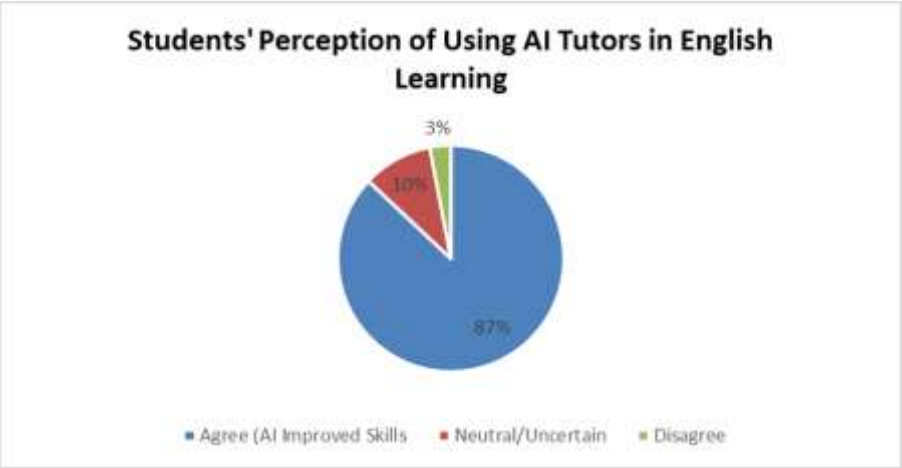

Figure 3. Graph Showing Students' Perceptions of the Use of AI Tutors in English Language Learning

The data illustrated in the chart reveals that students' perceptions of employing AI tutors in English language learning are predominantly favourable. Specifically, 87% of respondents concur that AI enhances their language skills, 10% express neutrality or uncertainty, and a mere 3% express disagreement. This distribution indicates a strong level of acceptance and perceived utility of AI-assisted learning technologies among students. The overwhelming majority suggests that AI tutors are widely recognized as effective tools supporting language acquisition, likely due to their ability to provide immediate feedback, personalized learning experiences, and flexible access to educational resources.

The presence of a smaller proportion of neutral responses indicated that some students remain uncertain about the effectiveness of AI tutors. This ambivalence may stem from limited familiarity with the technology, insufficient digital literacy, or concerns regarding the reliability and accuracy of AI-generated feedback. Such uncertainty underscores the need for further exposure, guidance, and training to help students fully comprehend and utilize AI tools in their learning processes. Meanwhile, the very low percentage of disagreement suggests minimal resistance to the integration of AI in language education, although it may still reflect concerns about overreliance on technology or the perceived limitations of AI compared to human instructors.

Overall, the findings demonstrated that AI tutors were largely perceived as beneficial in enhancing English language learning, particularly in fostering learner autonomy, engagement, and skill development. However, the existence of neutral and dissenting responses underscores the importance of balancing AI integration with human pedagogical support and improving students' digital competence to ensure more effective and confident use of AI-driven learning tools.

DISCUSSION

The Effectiveness of AI Tutors on Improving Speaking Skills

The findings of this study indicate a statistically significant improvement in all key dimensions of speaking skills, fluency, pronunciation, grammar, and vocabulary among high school students following the AI tutor-based intervention. These results are consistent with existing literature that highlights the critical role of AI tutors in providing real-time feedback, personalized materials, and interactive exercises, which effectively reduce speaking anxiety while significantly enhancing student confidence and linguistic performance (Miralles et al., 2025).

The paired sample t-test results between the pre-test and post-test demonstrated a statistically significant enhancement across all measured aspects of speaking skills fluency, pronunciation, grammar, and vocabulary. This compelling quantitative evidence confirms the transformative impact of AI English Tutor-based learning on students' mastery of speaking skills, underscoring the proven efficacy of AI tutoring systems in improving linguistic performance across multiple dimensions and fostering greater fluency and confidence (Suh, 2025). These results clearly demonstrate that the real-time feedback, grammar autocorrection, and adaptive conversational exercises provided by AI tutors enable high school students to engage in speaking practice with significantly enhanced fluency and confidence, thereby reducing anxiety and improving overall linguistic performance.

Specifically, the effectiveness of AI tutors is evidenced by their provision of a safe and flexible learning environment, allowing students to practice speaking at any time without social pressure a feature empirically supported by studies demonstrating marked improvements in fluency and pronunciation through advanced speech recognition technologies (Iio et al., 2024; Qiao & Zhao, 2023). For instance, Qiao and Zhao's research on AI-based instruction, such as Duolingo, revealed substantial gains in EFL learners' speaking skills through personalized feedback and adaptive exercises, directly aligning with the core findings of enhanced fluency, pronunciation, grammar, and vocabulary observed in this study. Similarly, documented significant fluency advancements among EFL high school juniors using AI tools, further corroborating the technology's efficacy for adolescent learners and reinforcing the transformative role of AI tutors in enhancing overall linguistic performance (Wang & Li, 2025).

Students' Perceptions and Attitudes towards the Use of AI Tutors

Most students reported increased motivation for learning, enhanced comfort in practicing speaking without social pressure, and significantly improved confidence in their oral performance. These findings are consistent with established research indicating that AI-based chatbots effectively reduce speech anxiety while fostering a supportive, low-pressure learning environment (Ding & Yusof, 2025). The inherent personalization and adaptability of AI tutors further empower students' learning autonomy, promoting proactive engagement and self-directed practice (Nguyen, 2024). This personalized approach, coupled with immediate, data-driven feedback, has been shown to result in notable improvements in pronunciation, grammar, and fluency, thereby enhancing communicative competence (Ahmad & Khasawneh, 2023; Zhang, 2025).

Furthermore, the consistent availability of AI tools allows for extensive, cost-free language practice through simulated conversations and role-playing, which students perceived as a multifaceted benefit (Qassrawi et al., 2024).

This overwhelmingly positive reception underscores how AI technologies enhance intrinsic motivation and autonomy, as supported by the literature on chatbots and virtual tutors that enhance engagement through gamification, instant feedback, and ubiquitous accessibility (AbuSahyon et al., 2023). This facilitates a more engaging and less intimidating learning environment, enabling students to practice at their own pace and receive immediate corrections (Ipatov et al., 2024). Moreover, AI-driven platforms often provide data-driven insights into individual progress, enabling tailored learning paths and reinforcing self-regulated learning behaviors (Wei, 2023). The integration of natural language processing capabilities within these platforms allows for nuanced conversational interactions, further mimicking human-like tutoring and deepening the learning experience.

The Role of Generative AI and NLP Technologies in Language Learning

The English Tutor AI, developed using Google AI Studio, masterfully harnesses cutting-edge Natural Language Processing and Generative AI technologies to profoundly comprehend conversational context and deliver highly precise, contextually attuned feedback. This empowers the system to dynamically calibrate difficulty levels precisely to the user's proficiency, thereby yielding a supremely immersive and personalized learning experience that demonstrably boosts engagement and retention. This adaptive approach, leveraging AI's capacity for personalized instruction, addresses the diverse needs of learners by providing individualized feedback and support (Liu et al., 2025). Such sophisticated integration of AI into educational frameworks fundamentally transforms traditional pedagogical paradigms by enabling real-time adjustments to learning pathways and content delivery (Maity & Deroy, 2024).

Specifically, these systems can offer targeted guidance on pronunciation, grammar, and vocabulary usage, adapting to individual learner profiles and progress (Lawrance et al., 2024). Furthermore, generative AI, particularly through large language models, facilitates the creation of interactive tutoring systems capable of simulating human-like conversations, which is crucial for developing practical language skills (Pérez-Ortiz et al., 2024). This enables learners to practice dialogue, receive immediate corrections, and engage in scenarios that mirror real-world communication, thereby accelerating the acquisition of conversational fluency (Alhamam, 2025). This personalized approach, driven by AI, not only addresses the varied learning styles and paces of students but also provides a scalable solution to challenges such as limited access to individualized feedback and specialized instructors in traditional language education settings (Li, 2025).

This is particularly pertinent in contexts like English education in Japan, where such technologies can mitigate communication barriers, build confidence, and support a digital transformation of learning (Lee & Eronen, 2025). By integrating automatic speech recognition and knowledge tracing, AI-powered systems can meticulously analyze learner performance, identify specific areas for improvement, and subsequently tailor content to address these deficiencies effectively (Mahadeokar et al., 2025).

Its integrated speech recognition module accurately detects pronunciation and intonation errors, while real-time grammar corrections and adaptive dialogues refine sentence accuracy and structural coherence (Praveena & Anupama, 2025). This powerful synergy elevates the AI Tutor beyond a mere tool into a sophisticated, adaptive pedagogical assistant that effectively augments the human teacher's capabilities, handling scalable linguistic practice while allowing educators to prioritize higher-order skills (Wang, 2025).

These demonstrated capabilities provide compelling evidence supporting the integration of AI tutors into Indonesian high school curricula, particularly in resource-constrained areas lacking native English instructors (Mulkiyah, 2024). Teachers can offload self-paced drills to AI, freeing them to focus on socio-emotional guidance and cultural nuance. To rigorously substantiate long-term efficacy, future research should adopt multi-group quasi-experimental designs, expanded sample sizes, and longitudinal assessments evaluating skills retention alongside culturally tailored adaptations (Sundaram et al., 2025).

Psychological Impact and Learning Motivation

The results from interviews and observations reveal that AI tutors enhance students' confidence and intrinsic motivation in speaking. Students view interactions with AI systems as non-judgmental, enabling them to make mistakes without fear. Moreover, many noted that the AI's interactive conversation features promote spontaneous thinking in English, thereby improving linguistic improvisation skills. This fosters a growth mindset, where learners are more willing to take risks and experiment with the language, thereby accelerating their acquisition of spoken English (Wei, 2023). The personalized feedback and tailored learning experiences provided by these AI-powered adaptive systems further contribute to this accelerated acquisition by addressing individual needs and learning styles (Qin, 2024). This individualized approach not only optimizes the learning trajectory but also cultivates sustained engagement by offering dynamic and relevant content ("*A Systematic Review on Cognitive And Motivational Impact on English Language Learning through Artificial Intelligence," 2024*).

This individualized approach not only optimizes the learning trajectory but also cultivates sustained engagement by offering dynamic and relevant content. AI's role extends beyond cognitive benefits, significantly impacting the emotional and psychological aspects of learning, such as reducing anxiety and enhancing motivation (Nguyen, 2024). Specifically, AI-generated feedback has been shown to improve the quality of student text revisions and increase positive affect toward learning (Lee & Eronen, 2025). This psychological advantage is particularly evident in foreign language acquisition, where AI-driven assessment

tools have been shown to significantly reduce foreign language anxiety and foster a more conducive learning environment (Zhang & Liu, 2025).

However, limitations are still found in complex conversations that require cultural context and human emotions, aspects that AI has not yet been fully replicated. This confirms that AI should be positioned as a complement to conventional learning, not a substitute for teachers. This blended approach, integrating AI's personalized feedback and adaptive content with human instructors' nuanced cultural and emotional intelligence, optimizes learning outcomes and addresses the multifaceted demands of language acquisition (Konyrova, 2024). Furthermore, AI applications can alleviate the workload on educators by automating repetitive tasks, thereby enabling teachers to dedicate more time to personalized support and fostering critical-thinking skills in students. The implementation of AI technology in spoken English education specifically allows for personalized practice and real-time feedback, addressing individual learner needs and significantly improving pronunciation, grammar, and fluency (Zhang, 2025; Zhou, 2023). AI-powered tools, such as those employing Natural Language Processing, can provide instant feedback on these linguistic elements, facilitating an efficient and individualized learning process (Ulfa, 2023).

Adaptive Learning and Technological-Humanistic Synergy

The integration of adaptive systems, particularly those leveraging artificial intelligence, has profoundly reshaped educational paradigms by fostering personalized learning environments that cater to individual cognitive, social, affective, and linguistic aptitudes (Honke & Becker-Genschow, 2025). This pedagogical shift is underpinned by AI-driven educational innovations that customize content, pacing, and learning pathways to optimize student outcomes (Cao et al., 2025). Such systems analyze learner performance data in real-time, enabling continuous adaptation and targeted interventions that address specific areas of weakness (Akavova et al., 2023). This dynamic responsiveness, while highly valued for its capacity to individualize instructional support, introduces pedagogical challenges related to determining what precisely can be effectively learned through adaptive methods and the requisite self-regulation skills students must possess to avoid over-reliance on these tools (Poëllhuber et al., 2024).

Further discussion must therefore explore the optimal balance between AI-driven adaptive instruction and human pedagogical intervention, especially in contexts such as English as a Second Language where nuanced linguistic challenges and motivational factors require educator expertise (Saleem et al., 2025). Specifically, AI in English as a Second Language contexts offers adaptive learning systems that tailor content and difficulty based on individual student progress, moving beyond traditional one-size-fits-all approaches (Konyrova, 2024; Praveena & Anupama, 2025). These AI-powered platforms, such as Duolingo and Rosetta Stone, effectively engage learners through gamification and interactive elements, utilizing adaptive algorithms to create personalized learning paths and adjust difficulty based on individual performance. The

efficacy of these systems is further enhanced by their capacity to provide instantaneous, detailed feedback and to simulate conversational practice, which are critical for second language acquisition (Acuña & Durão, 2024).

However, the full potential of AI in ESL and EFL education is realized when it is integrated with teacher facilitation, aligning with constructivist and sociocultural learning theories (Saleem et al., 2025). This synergy allows AI to manage repetitive tasks and data analysis, freeing educators to focus on higher-order pedagogical functions, such as fostering critical thinking, addressing complex linguistic nuances, and cultivating socio-emotional development (Immanuel & A, 2024). This blended approach leverages AI's capability for personalized, data-driven instruction while ensuring that human educators address the intricate, context-dependent aspects of language learning and student well-being (Saleem et al., 2025). However, it is crucial to acknowledge that despite these advancements, AI tools often lack the nuanced understanding of idiomatic expressions, cultural specificities, and pragmatic language use that human instructors inherently possess (Saleem et al., 2025). Moreover, their effectiveness is intrinsically linked to the availability of extensive data for accurate adaptation, highlighting the need for robust data collection and analytical infrastructures (Praveena & Anupama, 2025).

The ethical implications of data privacy, algorithmic bias, and the transparency of AI tools, particularly when used with minors, also warrant careful consideration (Korkut, 2025). For instance, AI tools trained on limited or biased datasets can perpetuate stereotypes and fail to accommodate linguistic diversity, thereby marginalizing learners from underrepresented backgrounds. Furthermore, the practical implementation of AI in diverse educational settings is hampered by disparities in technological access and digital literacy, which can exacerbate existing educational inequalities (Althobaiti, 2025). These challenges necessitate a balanced approach that integrates AI as a powerful tool within language education while preserving the irreplaceable human element (Konyrova, 2024). This suggests that while AI can significantly enhance personalized learning and engagement through adaptive algorithms, its optimal utility in language education is realized through a mediated integration that prioritizes teacher expertise and sociocultural learning principles (Saleem et al., 2025).

This balanced perspective emphasizes that AI should serve as a supplementary tool to human instruction, particularly for developing higher-order language and cultural competencies crucial for authentic communication (Praveena & Anupama, 2025). Therefore, a balanced pedagogical approach is essential, emphasizing the complementary strengths of both AI and human educators to cultivate a holistic language learning experience that extends beyond mere linguistic acquisition to encompass cultural immersion and interpersonal interaction (Fountoulakis, 2024).

CONCLUSIONS AND RECOMMENDATIONS

The empirical evidence from this study robustly demonstrates the superior efficacy of AI tutor-based learning in dramatically enhancing English-speaking skills among high school students. Rigorous quantitative analyses confirm statistically significant and comprehensive gains across all linguistic dimensions, with pre-test scores (57.5-60) surging to post-test averages of 71-74, an overall improvement exceeding 20%. Fluency exhibited the most striking advance (14-point gain), pronunciation reached the pinnacle post-test score (73.5), and grammar/vocabulary progressed steadily (23.5% and 22.0% increases, respectively). These results compellingly affirm that AI interventions foster holistic linguistic mastery, transcending fragmented skill gains.

In addition to these quantifiable linguistic advancements, this study compellingly demonstrates the profound transformative impact of AI on the affective dimensions of language learning. By providing a safe, non-judgmental environment replete with instantaneous feedback and personalized conversational exercises, AI tutors decisively alleviate the anxiety and social inhibitions inherent in traditional oral practice. This bespoke approach not only bolsters structural accuracy and lexical richness but also cultivates indispensable confidence and communicative autonomy in students. Consequently, integrating AI tutoring systems heralds a revolutionary advancement toward equitable, inclusive, and supremely effective pedagogical paradigms in secondary English education.

ADVANCED RESEARCH

Future researchers may integrate other psychological variables, such as foreign language anxiety or students' intrinsic motivation, to examine how the AI Tutor influences students' affective aspects of speaking.

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