



Improving English Speaking Skills Through AI-Based Voice Chatbots: A Systematic Review of Vocational Education Studies

A N Halimah¹, *A Budianto¹, M U Hoesny², J C Cabuquin³, S Ulfa⁴

¹Department of Informatics and Computer Engineering Education, Faculty of Teacher Training and Education, Universitas Sebelas Maret, Indonesia

²Department of English for the Tourism Industry, Business Administration Sector, Politeknik Negeri Malang, Malang, Indonesia

³Department of Science and Mathematics Education, School of Education, Eastern Visayas State University, Philippines

⁴Department of technology education, Faculty of Education, Universitas Negeri Malang, Indonesia

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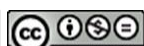
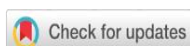
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ABSTRACT

Artificial intelligence offers teachers the opportunity to improve English-language skills among vocational high school students, enabling them to compete globally. This study aims to evaluate the effectiveness of AI-based voice chatbots through a systematic literature review. Following the PRISMA protocol, 16 articles were comprehensively analyzed after rigorous screening of 374 studies from the Scopus and ScienceDirect databases. The findings revealed a diverse range of platforms, with Duolingo dominating as the primary learning medium. The integration of voice chatbots has been shown to significantly improve students' oral performance, particularly in pronunciation, grammatical accuracy, coherence, and fluency. This improvement in speaking skills is driven by automated feedback based on repeated practice. AI-based chatbots have also been shown to increase motivation by enhancing Willingness to Communicate (WTC) and learning enjoyment through gamification elements and a non-judgmental interaction environment. Practically, vocational high school teachers are advised to integrate AI as a partner in authentic communication simulations. The study recommends learning designs that combine instant AI feedback with specific scenarios to create an adaptive and low-stress learning ecosystem.



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INTRODUCTION

English proficiency is a fundamental component of overall language mastery. This is particularly crucial for vocational students, who are expected to enter the workforce immediately after completing their education. Speaking ability not only reflects linguistic competence but also demonstrates an individual's capacity to convey ideas and information effectively in diverse professional contexts (Ramana et al., 2025). In practice, speaking skills encompass grammar, pronunciation, intonation, and non-verbal communication such as body language. Mastery of these aspects greatly influences students' confidence and communication fluency, especially in meeting the demands of global communication (Essafi & Students, 2025).

However, the English Proficiency Index (EPI) report by EF Education First (2023) indicates that Indonesia ranks 79th among 113 countries, with a score of 473, which remains below the global average of 503 (T. Huang et al., 2025). This ranking reflects relatively low English proficiency among Indonesians, particularly in speaking, compared with other Asian countries

(Kurniati et al., 2025). Several factors contribute to this issue, including a limited vocabulary (Du, 2025), pronunciation errors (Fathi et al., 2024), a lack of speaking opportunities due to teacher-centered learning approaches, and speaking anxiety that affects students' psychological state (Fauzi & Asi, 2025; Nguyen, 2025). An unsupportive learning environment and limited access to practice facilities further exacerbate these challenges (Zhuo, 2025).

To address these challenges, various technology-based solutions have been developed to support English language learning. The integration of technology in education has been shown to enhance learning effectiveness (Mahat, 2026). Common approaches include the use of educational videos from platforms such as YouTube (Alrashidi et al., 2025), language learning applications like Duolingo (Belda-Medina & Calvo-Ferrer, 2022), and artificial intelligence (AI) as a learning aid (Shazly, 2021). AI technology enables flexible and interactive learning, allowing students to practice speaking and listening independently. Moreover, technologies such as Natural Language Processing (NLP) have proven effective in improving oral communication skills (F. Huang & Zou, 2024).

One application of AI technology in language learning is the use of chatbots. Geng et al. (2025) describe chatbots as modern tools that facilitate direct interaction between users and computer systems. ChatGPT (Generative Pre-trained Transformer), an AI-based chatbot, is designed to interact in a human-like manner and assist in various tasks, including language learning (Xodabande et al., 2025). In educational contexts, ChatGPT has demonstrated positive impacts, such as enhancing students' confidence (Belda-medina & Calvo-Ferrer, 2022), creating more interactive learning experiences (Lo, 2023), and providing automated feedback with consistent speaking practice (Çakmak, 2022; Tue et al., 2023). Although research on AI in the Indonesian education context remains limited, the role of teachers as facilitators in digital learning is becoming increasingly important to bridge the gap between technology and pedagogy (Jakonen et al., 2025). Jakonen et al. (2025) note that AI assists students in improving pronunciation and vocabulary acquisition. Furthermore, Alarifi et al. (2025) and Xiao (2025) found that AI has a positive influence not only on cognitive aspects but also on students' motivation, self-confidence, and communication skills.

This review article fills the gap between previous reviews. The last review by Du (2025) focused on the implementation of chatbots in education and their impact, including AI chatbots on English-language learning. Meanwhile, Amin et al. (2023) reviewed the implementation of AI chatbots and their interactions with students. Therefore, there remains a lack of systematic studies specifically examining the effectiveness of voice chatbots for teaching speaking skills in vocational education in Indonesia. This is highly relevant, given the importance of strong professional communication competencies for vocational students. Based on this background, this study aims to analyze the effectiveness of AI-based voice chatbots in improving the speaking skills of vocational students. This study uses a systematic review of relevant studies published in the past five years. The findings are expected to inform the development of technology-based English language teaching strategies and serve as a reference for integrating AI into vocational education in Indonesia.

RESEARCH METHOD

Systematic Literature Review Framework

This study employed a Systematic Literature Review (SLR) approach, guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework (Page et al., 2021). This method was chosen to systematically identify, evaluate, and synthesize findings from relevant scholarly articles. The primary objective was to examine the use of voice chatbots to enhance students' English-speaking skills in educational settings.

Search Strategy

The literature search was conducted in two main databases, namely Scopus and ScienceDirect, with the following keywords: TITLE-ABS-KEY ((AI voice AND chatbot AND Speaking) OR (AI-based AND chatbot AND Speaking) OR (AI-Powered AND chatbot AND Speaking)). To ensure the relevance of the findings to current technological developments, the search was limited to articles published between 2021 and 2025. The selection process was facilitated by Rayyan AI, an AI-powered tool designed to assist systematic reviews. Rayyan AI-supported screening and article management through features such as automatic classification, tagging, and collaborative review (Ouzzani et al., 2016).

Data Extraction and Analysis

Studies were included based on predefined inclusion criteria to ensure alignment with recent advancements in voice chatbot technology. For each eligible article, the following key data were extracted, including 1) the research objectives to identify the study's purpose and scope, 2) the year of publication 2021–2025 to confirm relevance to recent trends, 3) the main findings to summarize core results and contributions, 4) relevance to English-speaking skills, particularly within educational contexts. The extracted data were analyzed using descriptive statistics to summarize frequencies, topic distributions, usage trends, and general study characteristics. Additionally, VOSviewer was employed to visualize thematic patterns and interconnections among studies, presented through tables, charts, and network maps.

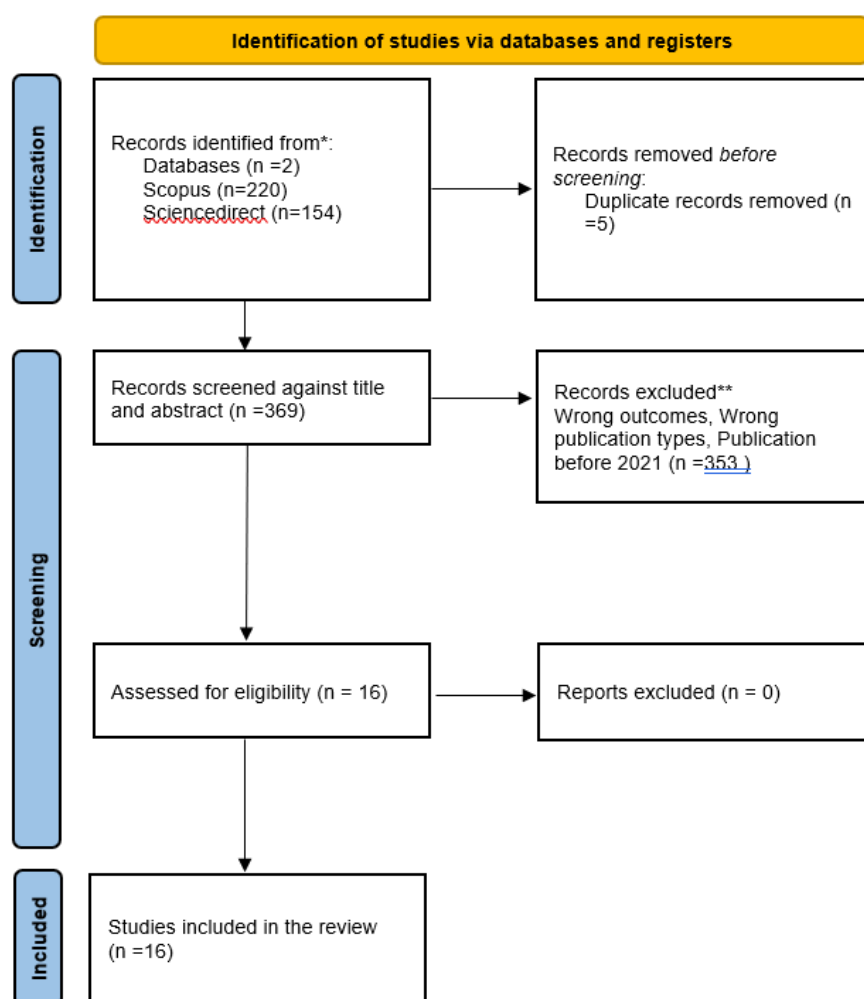


Figure 1. PRISMA flowchart of the selection process

Screening and Selection Process

As shown in Figure 1, the initial search in Scopus and ScienceDirect yielded 374 articles (220 from Scopus and 154 from ScienceDirect). Ten duplicates were identified; only five were removed because the remaining duplicates contained different metadata and were treated as unique, leaving 369 articles. Title and abstract screening excluded 353 articles that did not meet the research focus or selection criteria, leaving 16 for further evaluation. In the full-text review stage, a total of 16 articles were included in this analysis, as illustrated in Figure 1.

RESULTS AND DISCUSSION

Result

This study employs a descriptive statistical approach to analyze research trends and distributions concerning the use of artificial intelligence (AI)-based voice chatbots, particularly ChatGPT, in the context of English-speaking learning for vocational students. The analysis was conducted systematically through keyword mapping using VOSviewer, article selection in accordance with the PRISMA framework, and institutional affiliation mapping via geographic visualization. The results are presented in three parts. The first part discusses research trends derived from keyword co-occurrence analysis, which are visualized as a network map. The second part describes the publication patterns of selected articles from 2021–2025, highlighting annual trends. The third part examines the institutional distribution of contributing authors and collaborators by country, illustrating the global involvement in research on AI-driven voice chatbots to enhance vocational students' English-speaking skills. In addition, this section also presents a review of 16 selected articles, providing information about the authors, sample populations, research designs, and key findings relevant to the application of AI-based voice chatbots in English-speaking instruction.

Research Trends

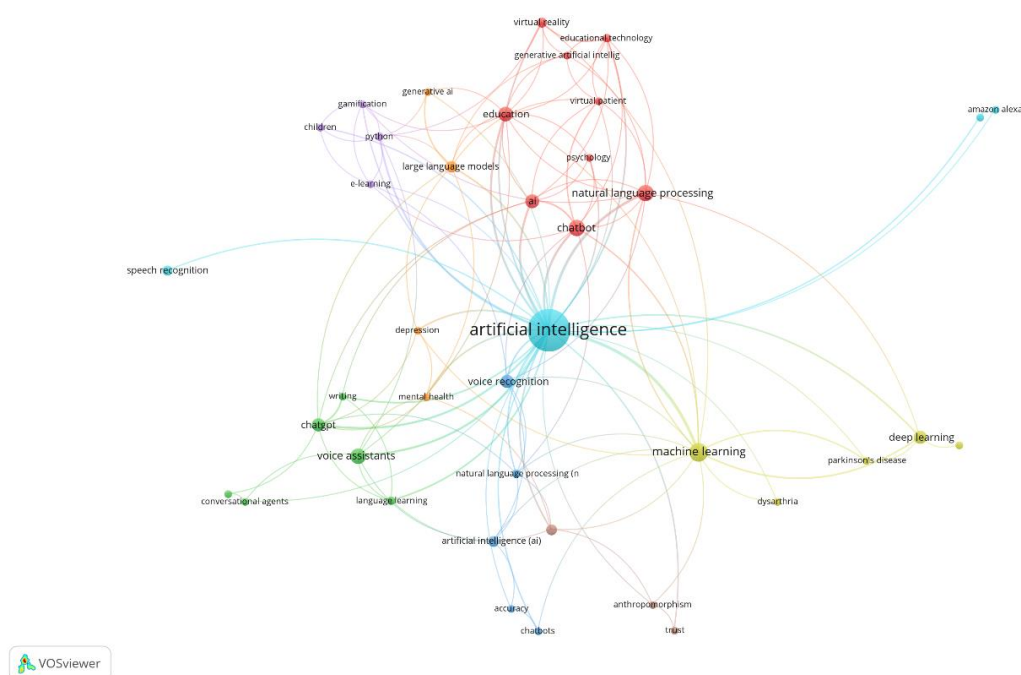


Figure 2. VOSviewer keyword map

Research trends related to the use of AI-based voice chatbots, particularly ChatGPT, in education can be categorized into several main clusters based on keyword co-occurrence analysis, as visualized in Figure 2. Each cluster reflects a specific thematic focus within the fields of educational technology and artificial intelligence. Cluster 1 (red) emphasizes the application of

chatbots and natural language processing technologies in technology-enhanced education. Cluster 2 (green) highlights the use of voice assistants and chatbots in language learning and examines their influence on students' psychological aspects. Cluster 3 (yellow) explores the application of machine learning to speech disorder detection and the issues of user trust in artificial intelligence systems. Cluster 4 (blue) focuses on the development and accuracy of speech recognition technology in voice-based learning environments. Cluster 5 (purple) illustrates the integration of generative artificial intelligence and gamification in children's e-learning.

Article Selection Results

This section presents the results of the identification and selection of articles conducted in accordance with the PRISMA guidelines. Figure 3 illustrates the distribution of articles that passed the PRISMA selection process during the period 2021–2025. The data show a consistent upward trend in the number of publications from 2021 to 2024, with the highest increase observed in 2024, when more than 80 articles were recorded. In contrast, the number for 2025 appears lower, likely because data collection is still ongoing. Since 2025 has not yet ended, the number of publications that pass the PRISMA selection this year may still increase and may even exceed the total from the previous year.

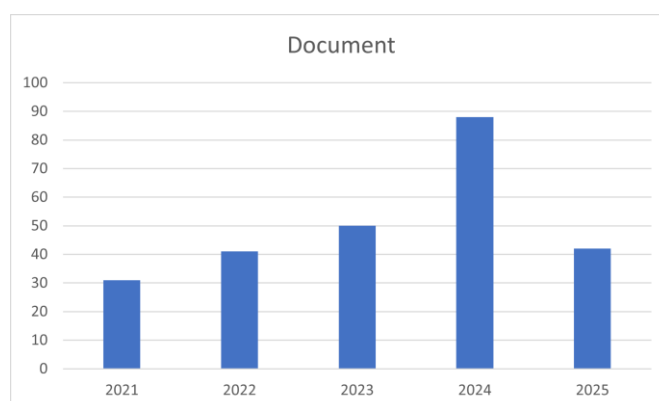


Figure 3. Distribution of articles by publication year

Institutional Distribution

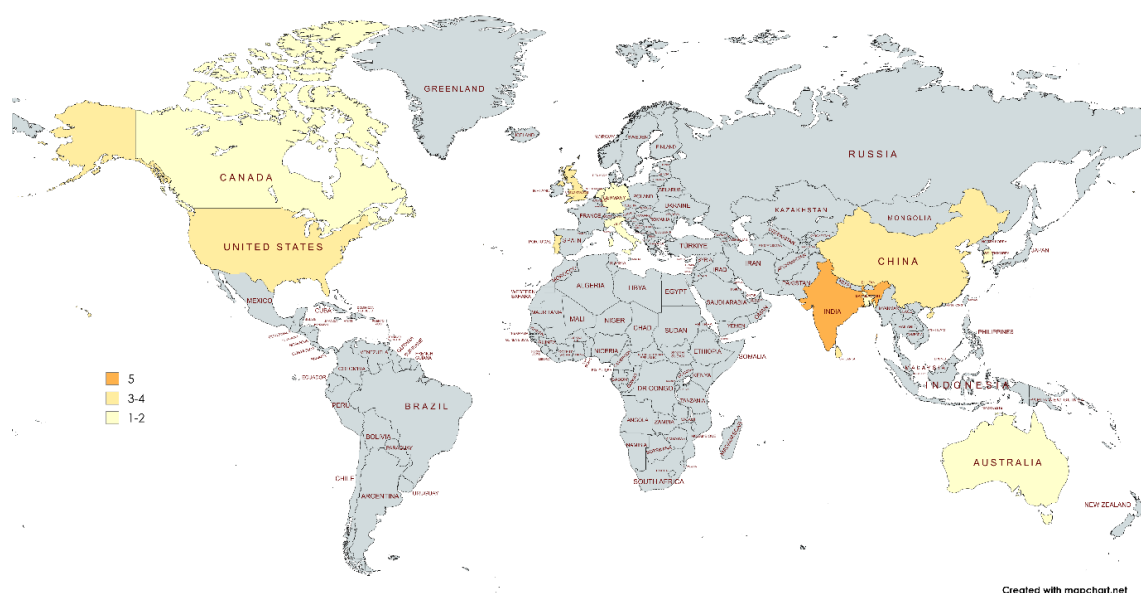


Figure 4. Map of institutional affiliations

A total of 158 authors and collaborators from 133 institutions across 54 countries contributed to the publication of the selected articles. Figure 4 presents an overview of the number of institutions in various countries that publish relevant articles. The five countries with the highest number of contributions are the United States (52), India (47), China (33), the United Kingdom (20), and Germany (13). These findings indicate a high level of global attention and engagement in the research topics under discussion.

The Results of Review Articles

This section presents the research findings derived from a systematic analysis of 16 selected articles on the use of artificial intelligence-based voice chatbots in English-speaking instruction for vocational high school students. The discussion further connects these findings to recent research trends, the distribution of articles by year of publication, and the global institutional affiliations of the authors. The primary focus of this section is to address two research questions:

1. RQ (1): What AI-based chatbots are used for speaking skills enhancement?
2. RQ (2): Does the use of voice chatbots have a significant impact on students' speaking skills?
3. RQ (3): How can voice chatbots influence students' motivation to improve their speaking skills?

Research Question 1 (RQ 1)

The study results indicate that several chatbots are used to improve speaking skills, as shown in Table 1.

Table 1 Types of AI-based Chatbots used

AI-based Chatbots	Number Article	Articles
Duoligual.	9	(Alarifi et al., 2025; Annamalai et al., 2023; Essafi & Students, 2025; Fauzi & Asi, 2025; Hoang et al., 2024; Jakonen et al., 2025; Kurniati et al., 2025; Shazly, 2021; Tue et al., 2023)
Eliza Chatbot	6	(Belda-medina & Calvo-Ferrer, 2022; Çakmak, 2022; Duong, 2024; Fathi et al., 2024; Shazly, 2021; Wang et al., 2024)
Replika	6	(Belda-medina & Calvo-Ferrer, 2022; Çakmak, 2022; Duong, 2024; Guo & Li, 2024; Hoang et al., 2024; Liu et al., 2025)
Cleverbot	5	(Belda-medina & Calvo-Ferrer, 2022; Çakmak, 2022; Duong, 2024; Hoang et al., 2024; Wang et al., 2024)
Alice	5	(Çakmak, 2022; Duong, 2024; Shazly, 2021; Wang et al., 2024; Zheng et al., 2025)
Andy English Chatbot	5	(Annamalai et al., 2023; Duong, 2024; Fathi et al., 2024; Guo & Li, 2024; Wang et al., 2024)
ELSA Speak	5	(Alarifi et al., 2025; Annamalai et al., 2023; Hoang et al., 2024; Tai & Chen, 2024; Tue et al., 2023)
EAP Talk	4	(F. Huang & Zou, 2024; Jakonen et al., 2025; Liu et al., 2025; Wang et al., 2024; Zou et al., 2024)
Mondly	3	(Annamalai et al., 2023; Duong, 2024; Shazly, 2021)
Lyra	2	(Duong, 2024; Grab, 2025)
Elbot	2	(Belda-medina & Calvo-Ferrer, 2022; Duong, 2024)
Talk to Eve	1	(Duong, 2024)
CoolE Bot	1	(Tai & Chen, 2024)
Poket Friend	1	(Duong, 2024)

Based on the data in Table 1 regarding the types of AI-based chatbots used in various studies, significant variation in the choice of learning aids is evident, ranging from popular commercial applications to custom-developed systems. Duolingo was ranked as the most frequently researched platform, appearing in nine articles. Our analysis found that one of the main factors

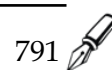
in Duolingo's appeal is its playful approach. Duolingo is classified as an effective, goal-oriented chatbot because it employs gamification to support students' learning of English. This approach makes the learning process feel like a game, which can increase user motivation and engagement. Following this, conversational chatbots Eliza and Replika were discussed in six articles each; Replika was often highlighted for its ability to simulate human-like social interactions. Other popular chatbot groups, with five articles each, included Cleverbot, Alice, Andy English Chatbot, and ELSA Speak; Andy English Chatbot and ELSA Speak are often used specifically for practicing speaking, pronunciation, and grammar. EAP Talk, a tool specifically designed for academic English, appears in four articles, indicating its use focuses on higher education contexts. Other tools, such as Mondly, Lyra, and Elbot, are used with moderate frequency (2-3 articles). Finally, several chatbots appear in single studies, such as the generative AI-based CoolE Bot for primary school students, as well as Talk to Eve and Poket Friend, indicating the exploration of new or specific tools in the current literature.

Research Question 2 (RQ 2)

In general, the integration of Artificial Intelligence (AI)-based chatbots shows significant potential in optimizing linguistic outcomes, particularly in the context of English as a Foreign Language (EFL) learning. This technology facilitates comprehensive improvements in oral interaction and communication (Shazly, 2021). Improving speaking skills through AI media includes several fundamental dimensions, namely fluency, coherence, lexical range, grammatical accuracy, and pronunciation (Fathi et al., 2024). The use of specific platforms such as EAP Talk contributes to the provision of high-quality learning materials that support continuous development in the aspects of comprehension and articulation (Zou et al., 2024). The first subskill of speaking is fluency. In terms of fluency, voice chatbot intervention creates a conducive learning environment by providing students with time to process information before responding. This relaxed atmosphere significantly increases students' comfort, confidence, and motivation to communicate (Duong, 2024). Empirically, the effectiveness of this technology is demonstrated by an average 28% increase in pronunciation scores, characterized by clearer articulation of individual sounds and more precise stress patterns in multisyllabic words (Grab, 2025).

The second critical subskill of speaking competence is pronunciation, which, according to recent findings, represents the area of most significant improvement when integrated with AI technology. Grab (2025) demonstrated that experimental groups utilizing a diverse suite of chatbots, including TalkPal AI, Gliglish AI, Langotalk, and ChatGPT (Voice Mode), achieved a 28% increase in pronunciation proficiency. This improvement was characterized explicitly by enhanced articulation of individual phonemes and superior accuracy in applying stress patterns to polysyllabic words. Fathi et al. (2024) provided empirical evidence of this trajectory, noting a statistically significant rise in mean scores from 5.26 (pre-test) to 6.83 (post-test) among users of the *Andy English Chatbot*. A comparative analysis revealed that the AI-integrated group significantly outperformed traditional face-to-face instruction groups. The pedagogical advantage of the *Andy Chatbot* lies in its ability to provide immediate corrective feedback in a low-pressure environment, thereby reducing the affective filter and encouraging repetitive practice. Complementing these results, Duong (2024) observed that Vietnamese undergraduate students achieved statistically significant gains ($p < 0.05$) in overall speaking accuracy across grammar, vocabulary, and pronunciation. The study highlights two primary mechanisms facilitated by the *Andy English Speaking Bot*: audio-visual imitation. Students engaged in iterative listening and imitation of the chatbot's native-like vocal output.

The third subskill is coherence. The chatbot not only answers but also guides users to continue the conversation. The chatbot strategically encourages students to expand on ideas and continue speaking, which directly trains their ability to develop topics coherently (Zhang et al., 2024). Fathi et al. (2024) used an IELTS assessment rubric that specifically assesses fluency and coherence. The experimental group using the *Andy English Chatbot* showed a statistically



significant improvement. Andy English Chatbot communicated with native speakers and provided personalized feedback. Taeza's (2025) research showed a substantial increase in overall coherence from the pre-test to the post-test. Students spoke in longer sentences and had fewer hesitations. The use of CoolE Bot helped students learn communication strategies such as initiating coherent follow-ups and staying on topic (Tai & Chen, 2024). Zou et al. (2024) used speaking, learning, and using EAP Talk. The results showed that 58.5% of participants agreed that this tool improved idea organization skills, a key component of coherence in speaking, especially in academic presentations.

The fourth sub-skill within speaking competence is grammatical accuracy, in which chatbot integration serves as an automated tutor, providing instant corrections. The computerized feedback mechanism allows students to identify and correct syntactic errors in real time, thereby strengthening their independent understanding of language structure. Research by Grab (2025) revealed that the experimental group experienced a 20% increase in grammatical accuracy scores. Participants demonstrated greater consistency in verb tense usage and sentence structure complexity. This improvement was primarily driven by the chatbot's conversational transcription and diagnostic feedback features, which allowed students to reflect on their errors. These findings are supported by Duong (2024) and Fathi et al. (2024), who reported statistically significant improvements in the "Grammatical Range and Accuracy" dimension. The data showed an increase in mean scores from 6.14 in the pre-test to 6.93 in the post-test in the AI-based group. The intervention using the Andy English Chatbot provided personalized corrective feedback, resulting in students feeling more competent in using sentence structures appropriate to the communication context. Furthermore, research by Tai & Chen (2024) and Zhang et al. (2024) using the CoolE Bot showed similar results at the elementary school level. Elementary school students showed significant grammatical progress on the post-test compared to a control group that did not use the bot. This indicates that chatbots are effective across age groups in reducing grammatical errors through guided practice.

Research Question 3 (RQ 3)

The review findings indicate that voice chatbots not only impact the cognitive aspects of speaking skills but also significantly improve students' learning motivation. Based on a synthesis of available studies, students' motivation to learn to speak generally increases significantly when using chatbots. The use of chatbots, especially those based on generative AI (GenAI), has been shown to improve students' willingness to communicate (WTC), learning enjoyment, and self-confidence.

The first aspect of motivation is WTC (Fathi et al., 2024; F. Huang & Zou, 2024; Wang et al., 2024; Zhang et al., 2024). The use of chatbots in self-paced learning creates a safe and non-judgmental environment (Annamalai et al., 2023; Belda-Medina & Calvo-Ferrer, 2022; Grab, 2025; Nguyen, 2025; Rahman, 2025; Taeza, 2025; Tai & Chen, 2024). This environment makes students feel uncomfortable. Students feel safer talking to a machine because the chatbot will not judge, question, or embarrass them when they make mistakes, unlike the social pressures of a face-to-face class. This sense of safety encourages students to try new sentences, increasing their willingness to communicate (Fathi et al., 2024; F. Huang & Zou, 2024; Wang et al., 2024; Zhang et al., 2024). The use of avatars provides real emotional support. The avatar's facial expressions and natural voice create the illusion of social presence, making students feel as if they are talking to a supportive friend rather than a cold machine. Lively interactions make the conversation open-ended and dynamically responsive. This triggers students' desire to continue talking and sharing ideas because the conversation is energetic rather than boring.

The second aspect of motivation is learning enjoyment, which this study demonstrated to increase significantly through the synergy among psychological factors, interface design, and interactive features in chatbots. The use of avatars or visual characters is a key determinant in increasing students' positive affect. Tai & Chen (2024) found that integrating popular characters

(such as Pikachu) with lifelike voice synthesis generated high levels of enthusiasm, as students felt as if they were communicating with their idols. Characters with a "charismatic conversational style" and human-like voice modulation transformed the interaction into a more dynamic one and reduced mechanical rigidity. The implementation of gamification elements, such as a points system, star awards, and level-up mechanisms, provided a pleasurable sense of achievement for students (Taeza, 2025). Platforms such as EAP Talk use color-coded feedback and star ratings to design engaging challenges that motivate students to improve their performance in a competitive yet recreational manner. The availability of a safe environment free from social judgment is crucial in reducing anxiety. Students tend to enjoy the process of language exploration more because they have the freedom to experiment without the risk of being embarrassed by human interaction (Annamalai et al., 2023; Taeza, 2025). Empathetic chatbot responses help build a warm emotional connection (rapport) with users—the novelty and curiosity surrounding advanced technology fuel intrinsic excitement. Wang et al. (2024) noted that interacting with tools perceived as innovative and "modern" naturally increases student engagement. The sense of pride in using updated technology encourages students to be more proactive in exploring the language features it offers.

The third aspect of motivation is self-confidence. A non-judgmental environment is a major factor in increasing self-confidence. Students feel safe talking to a machine because the chatbot will not interrupt, mock, or judge them when they make mistakes. Rahman et al. (2025) reported that students explicitly stated, "Chatbots do not laugh," which removes a major psychological barrier to practice. Taeza (2025) noted that this environment allows students who are usually quiet in class to experiment with complex sentences without fear. Emotional support through avatars that nod or provide empathetic responses helps students feel supported, thereby directly increasing their self-competence. Tai & Chen (2024) found that friendly and charismatic characters (such as Pokémon) encourage students rather than intimidate them. Unlimited Practice Opportunities: Self-confidence grows from competence developed through repeated practice. Fatigue-Free Repetition: Annamalai et al. (2023) noted that the chatbot never became fatigued or frustrated, allowing students to repeat the same pronunciation or sentence exercises until they felt satisfied and confident before speaking to a human. Private Feedback: Feedback provided privately helps students improve without losing face in public. Validation of Skills: Receiving instant scores or gentle corrections provides tangible evidence of students' progress, which builds confidence in their ability to communicate (Fathi et al., 2024; Grab, 2025). Preparation for Real Interactions: By practicing in a simulated environment beforehand, students feel more prepared for real-world interactions. Zou et al. (2024) noted that practicing with AI serves as a stepping stone that reduces anxiety when transitioning to speaking in front of a class.

CONCLUSION

The findings of this review focus on the importance of integrating AI-based voice chatbots. AI-based chatbots are emerging as an English language learning tool, particularly for vocational students who require practical communication skills. The findings of this review identified the dominance of mobile learning apps, such as Duolingo, followed by conversational agents, such as Replika, and specialized tools, such as ELSA Speak. The use of chatbot technology has been shown to improve speaking skills, particularly pronunciation and grammatical accuracy, significantly. Automatic feedback mechanisms and instant corrections allow students to practice independently, directly improving their fluency and coherence.

The findings indicate that chatbots play a significant role in increasing learning motivation by creating a safe, nonjudgmental environment for interaction. This significantly increases students' Willingness to Communicate (WTC) and self-confidence, especially for those with high anxiety about speaking in front of the class. Practical implications: Educators are advised to integrate chatbots not merely as a supplement but as authentic simulation practice partners within the curriculum to build a low-stress, high-engagement learning ecosystem.

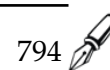
Despite its positive findings, this study has several limitations. First, the literature search was limited to the Scopus and ScienceDirect databases, potentially missing relevant studies indexed elsewhere. Second, the final dataset comprised 16 articles, which may limit the generalizability of the results to the vocational education context. Finally, the focus on specific keywords may have excluded studies that use different terminology for conversational AI tools. Future research should focus on optimizing chatbot features across diverse learning contexts, particularly by refining AI-based assessment systems for open-ended speaking tasks and by enhancing cultural responsiveness. It is also important to examine the long-term impact of chatbot use on learning outcomes, the role of emotional engagement through avatar-based interactions, and strategies for integrating chatbot technology into blended or personalized learning models. These directions will further strengthen the pedagogical and psychological dimensions of language learning in the era of artificial intelligence.

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Author (s):

Adik Nur Halimah

Department of Informatics and Computer Engineering Education, Faculty of Teacher Training and Education
Universitas Sebelas Maret,

Jl. Ir. Sutami No. 36, Surakarta 57126, Indonesia

Email: adiknurhalimah@student.uns.ac.id

* Aris Budianto (Corresponding Author)

Department of Informatics and Computer Engineering Education, Faculty of Teacher Training and Education
Universitas Sebelas Maret,

Jl. Ir. Sutami No. 36, Surakarta 57126, Indonesia

Email: arisbudianto@staff.uns.ac.id

Mariana Ulfah Hoesny

Department of English for the Tourism Industry, Business Administration Sector,
Politeknik Negeri Malang,

Jl. Soekarno Hatta No. 9, Malang 65141, Indonesia

Email: marianahoesny99@gmail.com

Jomar C. Cabuquin

Department of Science and Mathematics Education, School of Education,
Eastern Visayas State University,

Salazar St, Downtown, Tacloban City, Leyte, Philippines

Email: jomar.cabuquin@evsu.edu.ph

Saida Ulfa

Department of technology education, Faculty of Education
Universitas Negeri Malang,

Jalan Semarang No. 5, Malang, Indonesia

Email: saida.ulfa.fip@um.ac.id
