# CHAPTER 3: AI-POWERED CHATBOTS FOR DEVELOPING SPEAKING SKILLS IN ENGLISH LANGUAGE TEACHING: A SYSTEMATIC REVIEW[1]

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## 1. Introduction

Technology is recognized as a potential tool to innovate and change the dynamics of teaching and learning practices. Specifically, the recent technological advancements in artificial intelligence (AI) have caused AI to make its way into education. Learners and teachers widely utilize AI for several educational purposes by incorporating various tools and applications such as intelligent tutoring systems, teaching robots, and adaptive learning systems (Chen et al., 2020). Among these, AI-powered chatbots have attracted noticeable interest for their potential to promote language learning. An AI-powered chatbot is a computer program that can engage in conversations through audio and text interfaces (Kim et al., 2021). Significant advancements in AI promoted the use of chatbots in language education (Jeon, 2022). Incorporating AI-powered chatbots for educational purposes allows learners to practice a foreign language (Kim et al., 2021). Interacting with these chatbots also provides plenty of opportunities for speaking practice (Kim et al., 2021). Moreover, AI-powered chatbots could engage in intelligent dialogues with language learners while evaluating their speaking skills (Huang et al., 2023). Thus, AI-powered chatbots can provide personalized learning experiences and accommodate students' individual needs and proficiency levels.

AI-powered chatbots have become increasingly popular in English language teaching over the past few years (Kim et al., 2019). Additionally, chatbots developed for commercial use have increased significantly in recent years. Therefore, studies on AI-powered tools and their effects on language skills are gaining importance, which also shows that researchers have growing interest in using AI tools in language education (Huang et al., 2023). Several systematic reviews have investigated the efficacy of chatbots and AI-powered chatbots, summarizing their application in language education overall (Huang et al., 2021; Kuhail et al., 2023; Pérez et al., 2020; Wollny et al., 2021). However, a notable gap exists in the literature regarding systematic

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reviews specifically addressing the use of AI-powered chatbots for English as a foreign language (EFL) learners' speaking skills.

This review paper aims to address this gap by examining the methodological trends, descriptives, and main findings in studies on AI-powered chatbots for developing EFL learners' speaking skills. This research provides insights into the use of AI-powered chatbots on EFL learners' speaking skills and a comprehensive analysis of current research in the field. It contributes to understanding AI-powered chatbots' potential to support EFL speaking skill development in the digital age.

## 2. Literature Review

### 2.1 Artificially Intelligent Chatbots

Various AI tools have been used in education to facilitate language learning. Nowadays, within the diverse AI applications in language education, chatbots have become prominent for their ability to mimic human speech and provide interactive language practice. Most chatbots employ AI algorithms and Natural Language Processing (NLP) techniques to generate responses, providing users with a conversational experience that closely mimics human interaction (Hsu et al., 2023). They have a sophisticated conversational system designed to mimic human interaction through written or spoken language, and these systems can communicate through text, speech, visuals, virtual gestures, or physical gestures with feedback (Belda-Medina & Calvo-Ferrer, 2022).

The history of chatbots dates back to the early 1960s with the development of ELIZA, a program that interacted with human users through typed English input (Kim et al., 2019). Since then, chatbots have evolved from retrieval-based systems to more advanced generative models. ALICE, Cleverbot, Elbot, Eve, Replika, Lyra, Andy, Mondly, and Duolingo are chatbots invented after ELIZA. Although numerous chatbot applications share similarities, some stand out for their effectiveness in promoting and motivating users to learn, engage in conversation, and communicate effectively (Kim et al., 2019). They can provide students with increased interactivity and expanded opportunities to utilize foreign languages despite the limitations in language learning (Kim et al., 2019).

Some chatbots are specifically designed for foreign language learning, such as CLIVE, an early AI-powered chatbot. CLIVE is an AI-powered chatbot that can provide users with authentic conversations by utilizing an instant messaging interface to facilitate conversational language practice (Zakos & Capper, 2008). Several AI mobile applications have been created for EFL

speaking practice, including Duolingo, Liulishuo, and EAP Talk, all utilizing speech evaluation technology and NLP (Zou et al., 2023). Advanced AI models such as ChatGPT contributed to the popularity and use of chatbots. The emergence of new applications like Talk-to-ChatGPT has provided significant growth in conversations between humans and chatbots (Jeon et al., 2023). Moreover, ChatGPT 4.0 offers users a human-like communication experience by providing text- and voice-based interaction. These advancements have led AI technology to have a significant role as a conversational tool in language education. In their systematic review, Ji et al. (2022) stated that the primary function of conversational AI was to serve as a speaking partner. Most of the studies they reviewed utilized conversational AI as a speaking partner that uses learners' spoken input for interaction. Similarly, Jeon et al. (2023) reviewed studies on speech recognition chatbots for language learning and found that conversational partner was the most common role of chatbots.

Thus, the potential of AI-powered chatbots to improve EFL speaking skills as effective conversational partners has been the focus of research. However, understanding how these tools specifically impact EFL speaking skills is essential.

### 2.2 AI-powered Chatbots and Speaking Skills

Interacting with AI can help language learners improve their speaking skills (Yin & Satar, 2020). Zou et al. (2023) stated that various studies have proved that AI-powered speaking applications effectively develop EFL speaking skills. Similarly, Kim (2017) found that text- and voice-based chatbots enhance EFL learners' speaking skills, although the voice-based chatbots were more favorable. Likewise, Van Doremalen et al. (2016) indicated that voice-based chatbots are more suitable for language learning. Considering that the majority of today's AI-powered chatbots include both text and voice chatting, they can be more interactive and provide learners with correct pronunciation and intonation of the words, as well as feedback.

Several studies highlighted various benefits of AI-powered chatbots in developing foreign language learners' speaking skills. Kang (2022) conducted a study using Replika by comparing the outcomes of non-native English speakers interacting with AI to those interacting with native English speakers. The study showed that AI had a more positive effect on improving EFL learners' speaking skills compared to the group interacting with native English speakers, particularly in terms of accuracy, fluency, coherence, and interaction. Similarly, Lin and Mubarok (2021) examined how Replika affected EFL learners' speaking skills. The results showed that learners improved their fluency, consistently used appropriate structures, and

developed topics logically and coherently, with minimal hesitation or repetition. In another study, Shafiee Rad (2024) found that Speeko positively influenced language learners' speaking skills, willingness to communicate (WTC), and perceptions. Yang et al. (2022) used a voice-based chatbot, Ellie, and investigated its performance as a conversational partner. It was stated that the chatbot encouraged Korean EFL students to interact. Chien et al. (2022) examined English-speaking exercises using the LINE ChatBot. The findings of their study revealed that using the LINE ChatBot within a contextual learning environment led to the development of EFL learners' speaking skills. Moreover, Kim (2016) examined how voice chat influenced the speaking skills of Korean EFL learners. The findings of this study revealed that engaging in voice chat enhanced speaking skills across various proficiency levels among the learners. It was also emphasized that voice chat offers EFL learners opportunities to boost motivation, build confidence, and reduce anxiety. The study by Shafiee Rad and Roohani (2024) indicated that integrating the ELSA Speak App significantly improved the accuracy and comprehensibility of pronunciation among language learners. Their study revealed that AI-based teaching was more effective than traditional face-to-face teaching. However, according to Kim et al. (2021), interactions through both face-to-face communication and AI chatbots are equally beneficial for enhancing speaking skills. Furthermore, Hsu et al. (2023) designed TPBOT to eliminate non-native English speakers' speaking anxiety and achieved this goal by improving their English-speaking skills. Jeon (2022) showed that chatbots can help alleviate students' speaking anxiety because they can freely express themselves without fear of making mistakes in front of their peers.

Recent studies displayed the positive effects of integrating AI-powered chatbots into language learning. The use of these tools is influential in improving speaking skills and reducing anxiety. The positive outcomes can be attributed to some of the characteristics of AI-powered chatbots. Exploring these features can help explain how AI-powered chatbots enhance speaking skills. Several key factors contribute to the effectiveness of AI-powered chatbots in improving speaking skills. First, they are accessible anytime and anywhere, allowing learners to practice at their convenience (Dokukina & Gumanova, 2019), especially for those with time constraints. Second, they provide immediate feedback, allowing learners to correct mistakes and refine their skills in real-time (Dokukina & Gumanova, 2019; Hakim & Rima, 2022; Shafiee Rad, 2024). These applications give individualized, instant feedback, allowing students to identify and correct errors immediately, improving pronunciation, fluency, and grammar (Shafiee Rad, 2024). Another feature is that chatbots provide a less stressful environment (Mageira et al.,

2022; Shafiee Rad, 2024). Learners can engage in tasks at their own pace, free from the fear of making mistakes, in a friendly setting (Mageira et al., 2022). This supportive atmosphere boosts WTC (Shafiee Rad, 2024). Moreover, chatbots' authentic conversation gives learners a better understanding of the target language (Shafiee Rad, 2024). These factors significantly affect the development of speaking skills.

Considering the positive outcomes and findings from the available literature, it is significant to investigate the use of AI-powered chatbots on EFL learners' speaking skills. While previous reviews have explored chatbots in a broader context, this systematic review focuses specifically on AI-powered chatbots used to develop EFL learners' speaking skills. Considering that the focus is on speaking skills, this study investigates AI-powered chatbots that support voice-based interactions. This study aims to offer an overview of the state-of-the-art and suggest directions for future studies by identifying the key research trends and gaps. Lastly, the review synthesizes the findings from available literature to assess the overall impact of AI-powered chatbots on EFL learners' speaking skills.

This systematic review aims to examine the descriptives, methodological trends, and main findings in studies on using AI-powered chatbots to develop EFL learners' speaking skills. To achieve this, the following research questions were addressed:

- What are the descriptives and methodological trends in studies on AI-powered chatbots for developing EFL learners' speaking skills?
- What are the main findings from studies on the use of AI-powered chatbots for developing EFL learners' speaking skills?

## 3. Examining the state-of-the-art in AI-powered chatbots for EFL speaking skills

The current study utilized a systematic review methodology to examine available literature and present the current research landscape. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guideline (Page et al., 2021) was followed to identify and analyze the relevant studies systematically. Studies utilizing AI-powered chatbots with voice-based interaction on EFL speaking skills were identified to identify descriptives, methodological trends, and main findings.

This systematic review focused on identifying relevant studies within the electronic databases Web of Science (WoS), Scopus, and ERIC. These databases were selected for their extensive

coverage of educational research and inclusion of high-quality, peer-reviewed publications. The screening process followed three steps:

1. Potential studies were identified through search strings.
2. Titles and abstracts were examined to determine the relevance of studies to the research objectives, and inappropriate studies were extracted according to the inclusion criteria.
3. A full-text assessment was conducted to evaluate the eligibility of studies for inclusion in the review.

Figure 1 presents the PRISMA flowchart that displays the process.

The first screening step was conducted on the databases on May 20th, 2024. Two rounds of search were conducted to avoid missing any records. Table 1 displays all the search strings used for both screenings. The search accessed 321 studies on WoS, 186 on Scopus, and 161 on ERIC, utilizing the categorical filter (educational research category). After duplicates were removed (n=50), 618 studies remained. The records were screened by title and abstract, and 542 studies were extracted. After the full screening of the studies, 22 articles were found eligible for the systematic review according to the inclusion and exclusion criteria (Table 2).

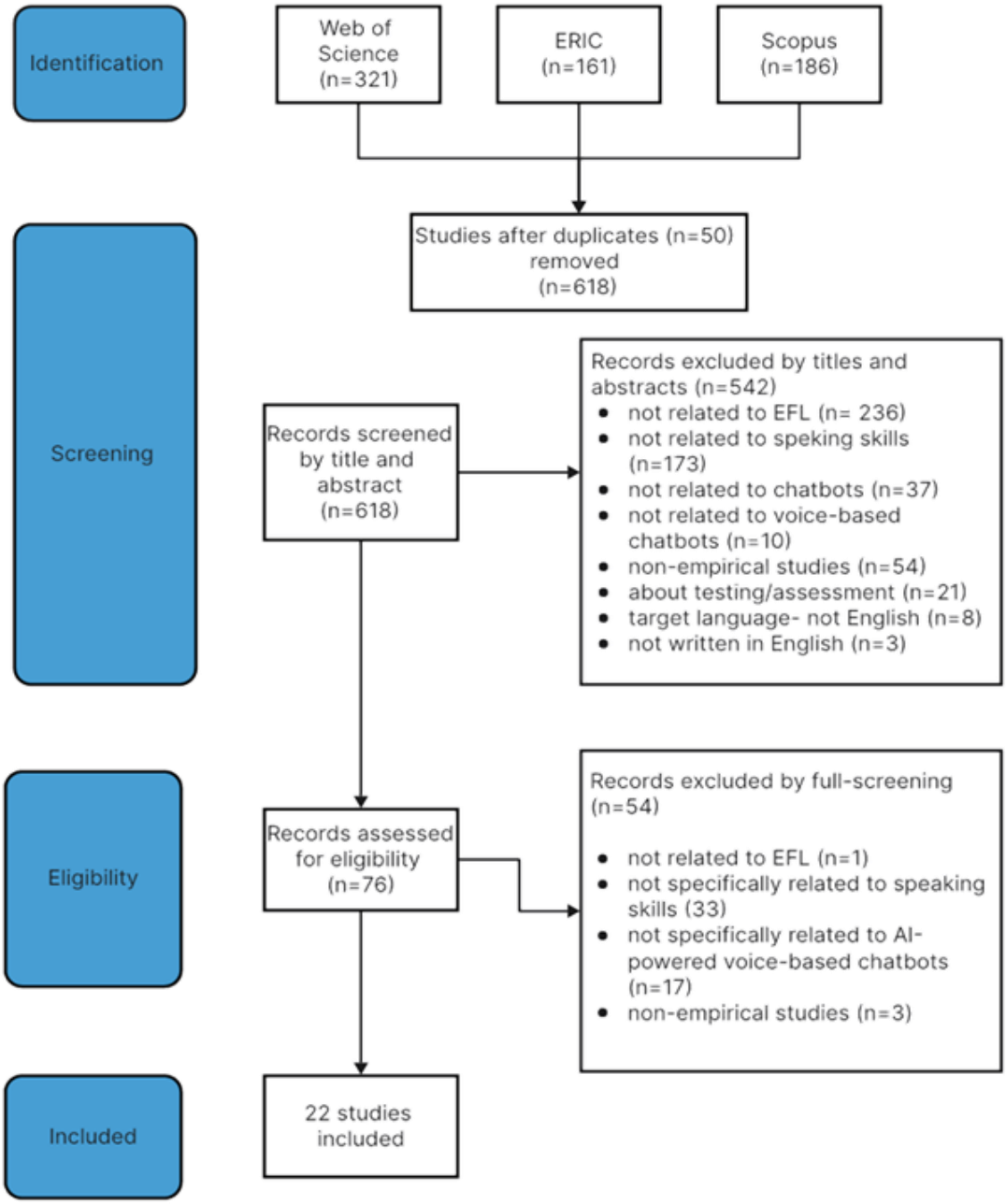


**Figure 1.** PRISMA flowchart (adapted from Page et al., 2021)

**Table 1.** Search strings

| Round | Search strings (Group 1) | Boolean operator | Search strings (Group 2) |
|---|---|---|---|
| 1 | "chatbot*" OR "chatterbot*" OR "voicebot" OR "AI chatbot*" OR "artificial intelligence chatbot*" OR "conversational agent*" OR "artificial intelligence" | AND | "speaking" OR "speaking skill*" OR "speaking performance" OR "pronunciation" OR "fluency" OR "accuracy" OR "intonation" OR "oral proficiency" OR "speaking anxiety" OR "willingness to communicate" OR "language education" OR "language acquisition" OR "language learning" OR "language teaching" OR "EFL" OR "ESL" |
| 2 | OR "artificial intelligence and speaking skill*" OR "artificial intelligence speaking tool*" OR "interactive conversational agent*" | | |

The asterisk (*) indicates that the keyword was screened with the flexibility to include various forms of the word. For example, 'skill' will find 'skill', 'skills', 'skillful', etc."

**Table 2.** Inclusion and exclusion criteria

| Criteria | Inclusion | Exclusion |
|---|---|---|
| Publication year | 2020-2024 | Before 2020 |
| Publication type | Peer-reviewed articles | Review articles, Editorial material, Book chapters, Early access articles, Proceedings |
| Context | Educational contexts, EFL | Other language skills than speaking, Disciplines different from EFL |
| Language | English | Other languages |
| Focus | Al-powered chatbots with a focus on foreign language speaking skill | Non-Al chatbots, Only text-based chatbots |
| Chatbot | Al-powered chatbots providing voice-based communication | Non-Al chatbots, Only text-based chatbots |

The included studies were analyzed through content analysis to categorize the data (Fraenkel & Wallen, 2000). Content analysis allows for the analysis and interpretation of the included studies by reducing them into identified categories (Harwood & Garry, 2003). For this purpose, research questions were subcategorized. Table 3 displays the research questions and their subcategories.

**Table 3.** Subcategories of the research questions

| Research Question | Subcategories |
|---|---|
| RQ1. What are the descriptives and methodological trends in studies on AI-powered chatbots for developing EFL learners' speaking skills? | Number of studies per year<br>Number of studies per country<br>Research design<br>Study group<br>Size of study group<br>Context of intervention<br>Duration of intervention<br>Chatbots<br>Studied topic |
| RQ2. What are the main findings from studies on the use of AI-powered chatbots for developing EFL learners' speaking skills? | Mechanics of speaking<br>Affective dimensions of speaking<br>Advantages of AI-powered chatbots<br>Disadvantages of AI-powered chatbots |

## 4. The state-of-the-art AI-powered chatbots for EFL speaking skills

### 4.1. Descriptives and Methodological Trends

The predetermined subcategories were examined to answer the first research question and explore the descriptives and methodological trends in studies related to the use of AI-powered chatbots in EFL speaking skills. These subcategories include the number of studies per year, the number of studies per country, the research design, the study group and size, the context and duration of the interventions, chatbots, and the studied topic.

#### *4.1.1. Number of studies per year*

Figure 2 demonstrates the distribution of the studies on AI-powered chatbots and EFL speaking skills published between 2020 and 2024. While no study specifically focused on AI-powered chatbots and EFL speaking skills in 2020, the number of studies increased in the following years: n=5 in 2021, n=4 in 2022, and n=7 in 2024. As the cut-off date was May 2024, additional studies may emerge by the end of the year.

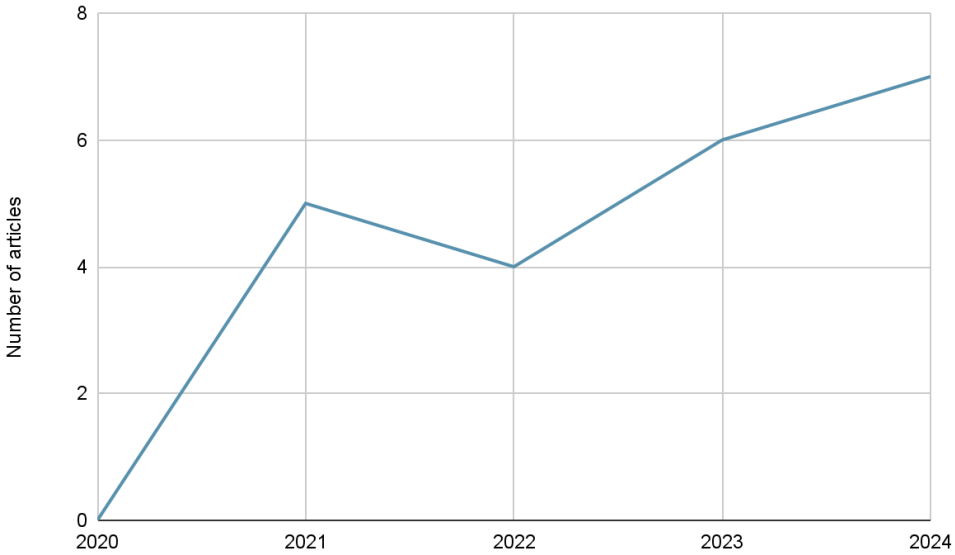


**Figure 2**. Distribution of studies per year

### *4.1.2. Number of studies per country*

The reviewed studies took place in a wide range of countries. Figure 3 presents the distribution of studies per country. Most of the studies examining AI-powered chatbots and EFL speaking skills were implemented in Taiwan (n=4), followed by China (n=3), Korea (n=3), and Iran (n=3). The rest of the studies took place in a range of countries: Sweden (n=2), India (n=2), Malaysia (n=1), Türkiye (n=1), Indonesia (n=1), Vietnam (n=1), and Kazakhstan (n=1).

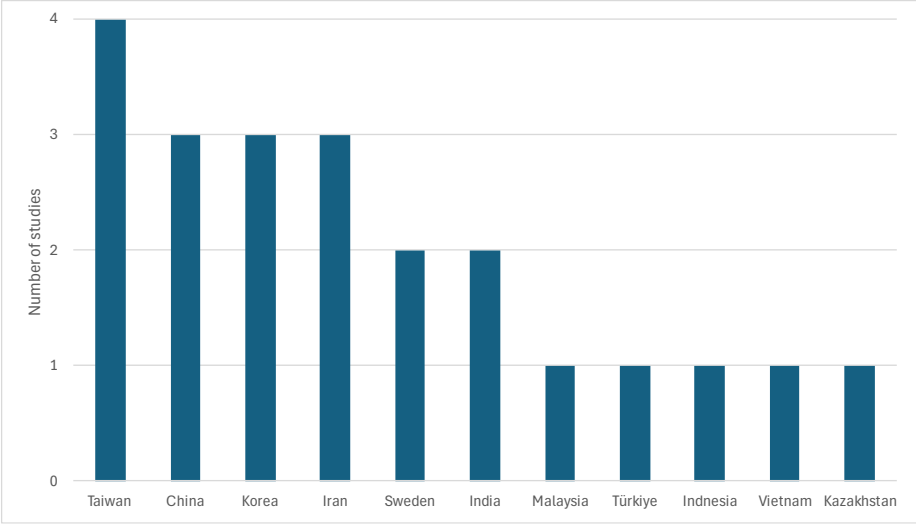


**Figure 3.** Countries of the studies

### *4.1.3. Research design*

As shown in Figure 4, the mixed method (81,8%, n=18) was the most frequently used design in the reviewed studies. The quantitative method (18,2%, n=4) was also preferred, while the qualitative method was not preferred. Most studies chose mixed method design to get a deep insight into students' perspectives towards using AI-powered chatbots on EFL speaking skills and their effects. In most of these studies, the quantitative and qualitative findings support each other.

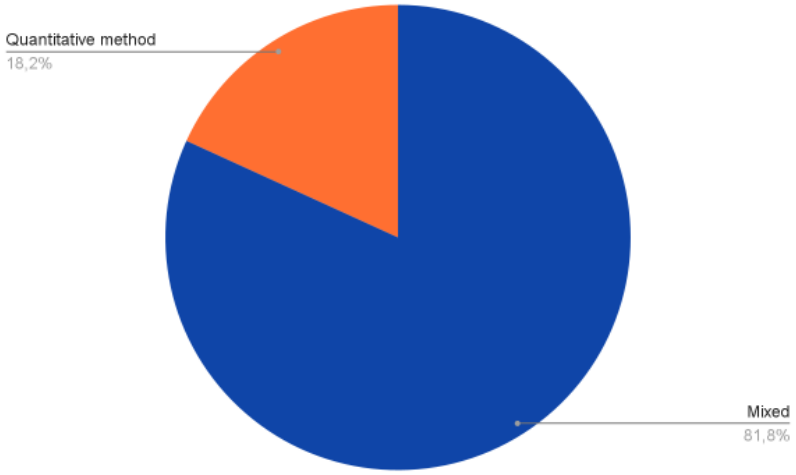


**Figure 4.** Utilized research methodology in the reviewed articles

### *4.1.4. Study group*

Figure 5 illustrates the distribution of study groups in the reviewed studies. University students comprised the largest group, representing 50% (n=12) of the total. Elementary school students comprised 25% (n=6), followed by high school students at 12.5%. Adult learners accounted for 8.3% (n=2), while teachers constituted the smallest group, representing 4.2% (n=1).

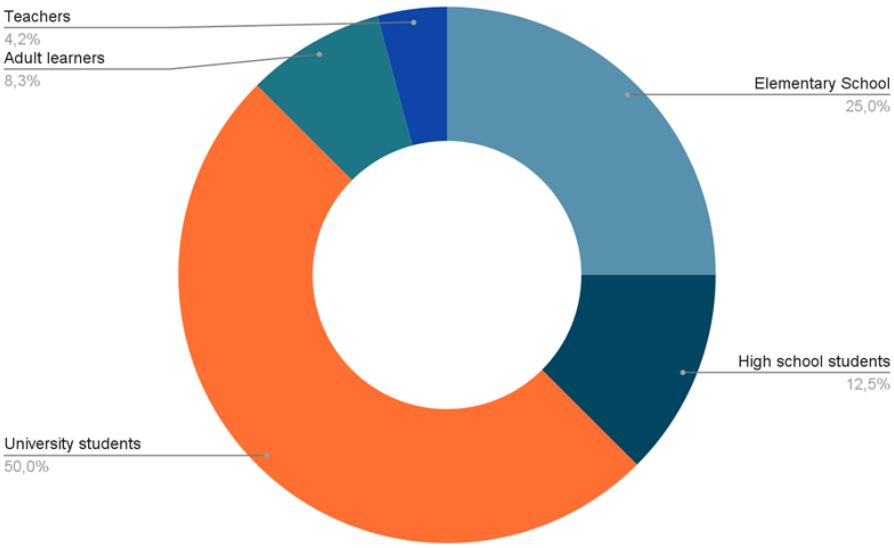


**Figure 5.** Study groups in the reviewed studies

### *4.1.5. Size of study groups*

In the reviewed studies, the size of study groups varies from n=314 (Chung et al., 2022) as the largest to n=22 (Ericsson & Johansson, 2023) as the smallest. However, most of the studies had study groups with more than 60 participants. Figure 6 shows the distribution of studies based on their study group size.

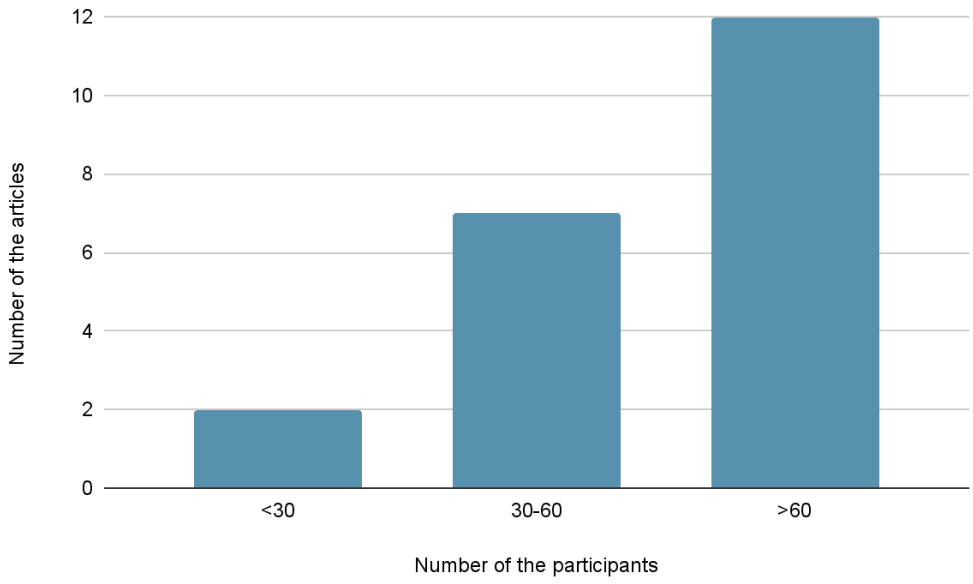


**Figure 6.** Sample size in the reviewed studies

### *4.1.6. Context of intervention*

In the reviewed studies, AI-powered chatbots were used in class, outside the class, or both. While the central tendency is in-class (n=9) (e.g., Tai & Chen, 2021), many studies used AI-powered chat outside the class (n=7) (e.g., Yang et al., 2022). In addition, some studies preferred both in-class and outside the class (n=6) (e.g., Kim et al., 2021), as shown in Figure 7.

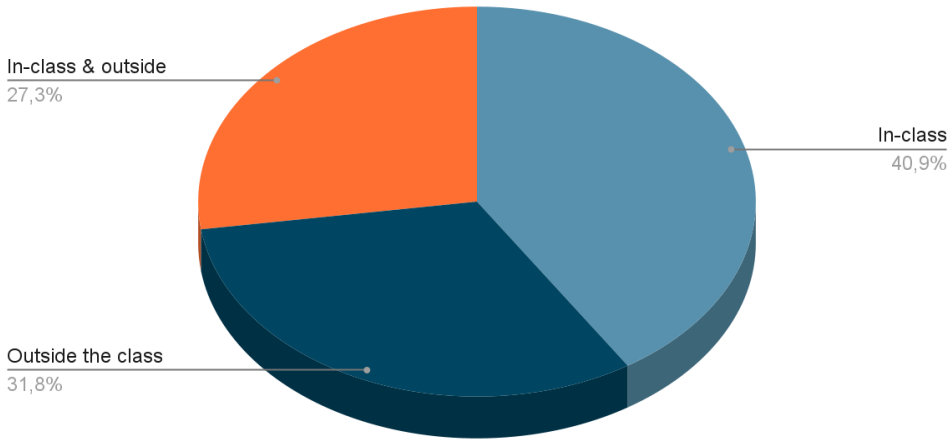


**Figure 7.** Context of AI-powered chatbots

### *4.1.7. Duration of intervention*

AI-powered chatbots were used in the reviewed studies for various durations. The usage of chatbots ranges from two weeks (Ericsson et al., 2023) to an entire semester (16 weeks in Korea) (Kim et al., 2021). However, most studies gave 1-3 months (n=12) and more than three months (n=7) for the intervention. In some studies, intervention durations were less than one month (n = 3). Figure 8 shows the distribution of studies based on their intervention durations.

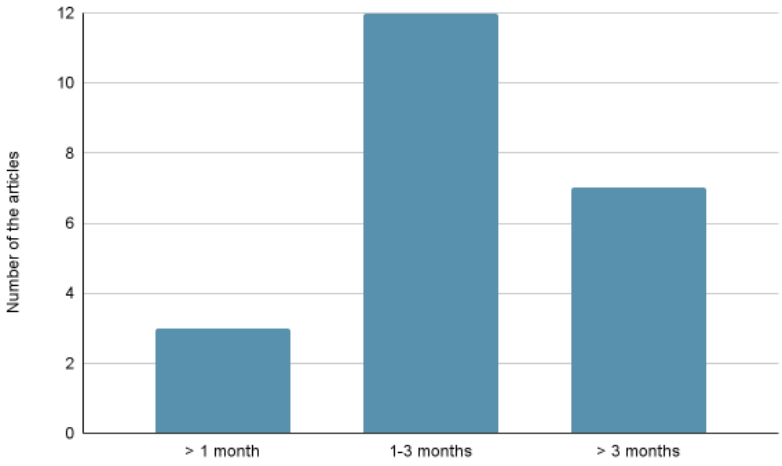


**Figure 8.** Duration of the interventions in the reviewed studies

### *4.1.8. The most common AI-powered chatbots*

As Figure 9 shows, the reviewed studies utilized various AI-powered chatbots. The most common AI-powered chatbots used in the reviewed studies are Google Assistant, Andy, and Replika.

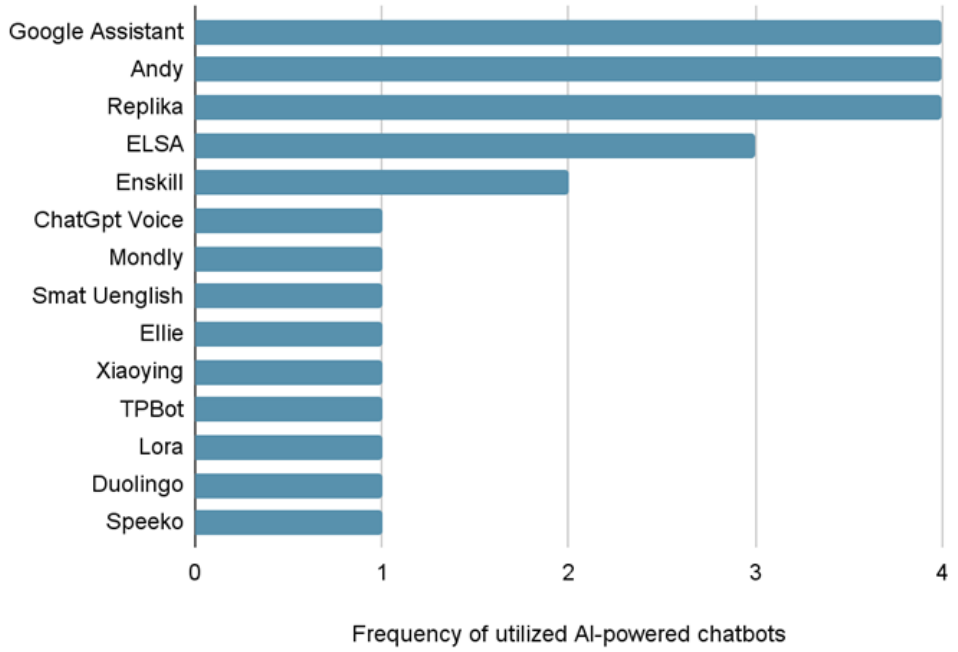


**Figure 9.** AI-powered chatbots utilized in the reviewed studies

### *4.1.9. Frequently studied topics*

Most studies examined more than one topic. Table 4 displays the frequency of these topics with the sample articles, while Figure 10 illustrates the topics examined in the reviewed studies. The most studied topic is student perceptions of AI-powered chatbot communication (n=17), which was typically explored in the qualitative phases of mixed-method studies. The second main topic is the overall speaking skills of learners (n=14), including some of the speaking mechanics: pronunciation (n=9), fluency (n=3), intonation and stress (n=2), and grammar accuracy (n=3) in speech. Apart from speaking skills, WTC (n=5) and speaking anxiety (n=3) are other trend topics related to speaking. Only one study examined teacher perceptions toward AI-powered chatbot communication.

**Table 4.** Studied Topics with Frequencies and Sample Articles

| Studied topics | N | Sample article |
|---|---|---|
| Overall Speaking Proficiency | 14 | Hwang et al., 2022 |
| Pronunciation | 9 | Shafiee Rad & Roohani, 2024 |
| Fluency | 3 | Duong & Suppasetseree, 2024 |
| Grammatical Accuracy | 3 | Fathi et al., 2024 |
| Intonation and stress | 2 | Kemelbekova et al., 2024 |
| WTC | 5 | Yuan, 2023 |
| Speaking Anxiety | 3 | Rahman & Tomy, 2023 |
| Student Perceptions toward chatbot communication | 17 | Kim et al., 2021 |
| Teacher perceptions toward chatbot communication | 1 | Kemelbekova et al., 2024 |

## 4.2. Main findings

The main findings concerning the effects of AI-powered chatbots on EFL speaking skills were analyzed to answer the second research question.

### *4.2.1. Mechanics of speaking*

Table 5 presents the main findings related to the mechanics of speaking in the reviewed studies. Most of the studies examined overall speaking skills; the results of the reviewed studies indicated an improvement in speaking skills (n=12) and students' perceived speaking skills (n=2). In terms of speaking mechanics, the majority of the studies indicated improvement, with a few exceptions. Almost all the studies investigating pronunciation proficiency found that students' pronunciation skills advanced (n=9). Only in one article (Kemelbekova et al., 2024) was it observed that there was no significant difference in pronunciation accuracy. For fluency and grammatical accuracy, the findings demonstrated that students made progress in these areas in all the articles. In two studies examining intonation and stress, while one improved students' skills, the other showed variety in their findings.

**Table 5.** The main findings regarding the mechanics of speaking

| Findings regarding the mechanics of speaking | N | Sample Study |
|---|---|---|
| Overall speaking skills | | |
| Improvement in speaking skills | 12 | Hwang et al., 2022 |
| Improvement in perceived speaking skills | 2 | Muniandy & Selvanathan, 2024 |
| Pronunciation | | |
| Improvement in pronunciation accuracy | 9 | Shafiee Rad & Roohani, 2024 |
| No improvement in pronunciation accuracy | 1 | Kemelbekova et al., 2024 |
| Fluency | | |
| Improvement in fluency | 8 | Duong & Suppasetseree, 2024 |
| Grammatical accuracy | | |
| Improvement in grammatical accuracy | 6 | Fathi et al., 2024 |
| Intonation and stress | | |
| Improvement in intonation and stress | 1 | Kim et al., 2021 |
| No improvement in intonation and stress | 1 | Kemelbekova et al., 2024 |

### *4.2.2. Affective dimensions of speaking*

Table 6 presents the main findings related to the affective dimensions of speaking in the reviewed studies. WTC was one of the most studied topics. All the studies related to WTC (n=5) revealed that interaction with an AI-powered chatbot increased WTC among students. One main reason is that communication with AI-powered chatbots reduces speaking anxiety. Thus, with regard to this, the findings of reviewed studies also displayed a decrease (n=4) in speaking anxiety in students. However, in one study, it was quite the opposite: communicating with an AI-powered chatbot increased students' speaking anxiety (Çakmak, 2022).

Regarding student perspectives, the results showed that students' attitudes towards interacting with an AI-powered chatbot were positive (n=15), neutral to positive (n=1), and negative (n=1). Teachers also had a positive attitude (n=1) towards AI-powered chatbot communication with students.

**Table 6.** The main findings regarding the affective dimension of speaking

| Findings regarding the affective dimension of speaking | N | Sample Study |
|---|---|---|
| WTC | | |
| Improvement in WTC | 5 | Tai & Chen, 2023 |
| Speaking anxiety | | |
| Decrease in speaking anxiety | 4 | Rahman & Tomy, 2023 |
| Increase in speaking anxiety | 1 | Çakmak, 2022 |
| Student perceptions towards chatbot communication | | |
| Positive | 16 | Shafiee Rad & Roohani, 2024 |
| Negative | 1 | Çakmak, 2022 |
| Teacher perceptions towards chatbot communication | | |
| Positive | 1 | Kemelbekova et al., 2024 |

### 4.2.3. Advantages of AI-powered chatbots

Figure 10 presents the advantages attributed to the use of AI-powered chatbots for EFL speaking skills. Some of the main advantages mentioned in student perceptions were authentic communication, immediate feedback, personalized feedback, a comfortable learning environment, accessibility, and an interactive environment.

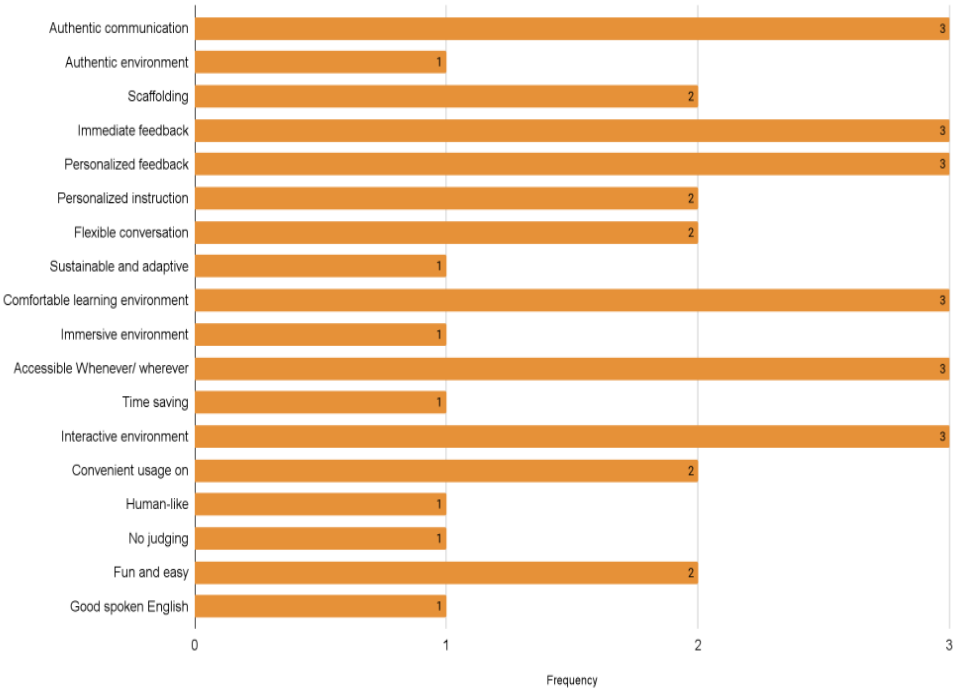


**Figure 10.** Advantages of AI-powered chatbots for EFL speaking skills

### *4.2.4. Disadvantages of AI-powered chatbots*

Despite the numerous advantages reported, some disadvantages are also mentioned in the reviewed studies. Figure 11 reveals the most frequently mentioned disadvantages. Disadvantages include communication breakdowns, issues with speech recognition, and the feeling of having an artificial conversation. While not as prominent as the advantages, these disadvantages highlight some limitations that AI-powered chatbots may pose in creating a seamless and natural language learning experience.

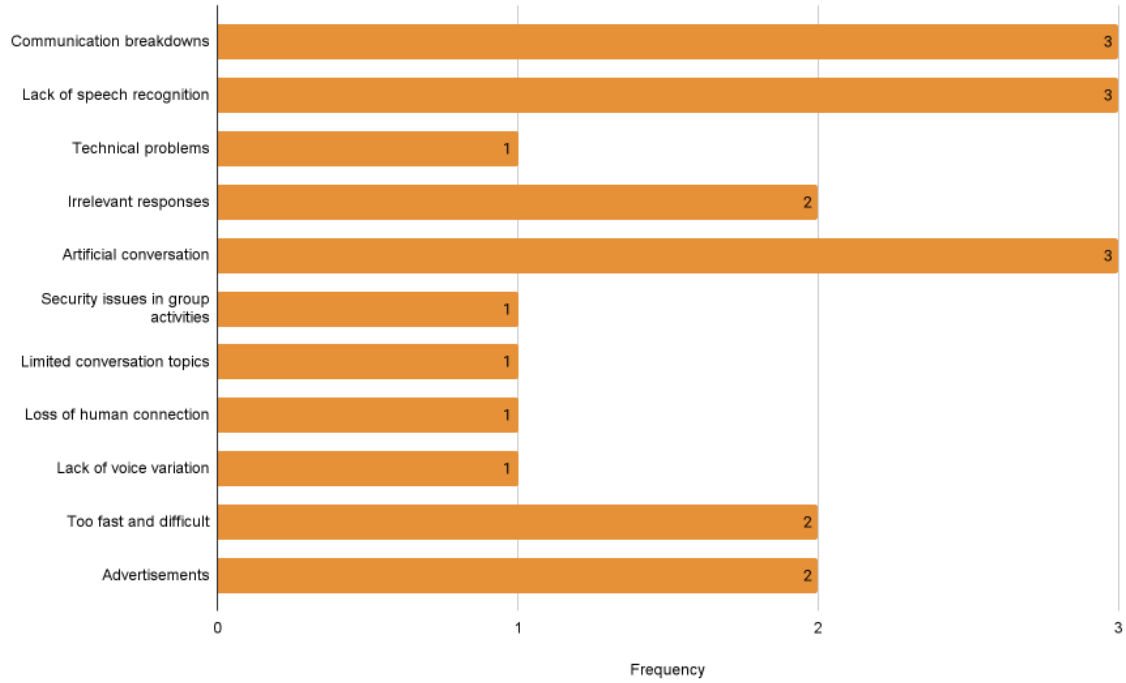


**Figure 11.** Disadvantages of AI-powered chatbots for speaking

## 5. Interpretation of state-of-the-art in AI-powered chatbots on EFL speaking skills

This article reviewed 22 articles from the WoS, Scopus, and ERIC databases, with the main purpose of examining the use of AI-powered chatbots on EFL learners' speaking skills. The selected articles were examined in terms of descriptives, methodological trends, and main findings.

The analysis revealed an increase in the number of articles from 2020 to 2024. It was seen that there has been a higher interest in the last two years, which could be attributed to the advancements in AI and speech recognition technology and the rising popularity and accessibility of chatbots in language learning. Similarly, in the systematic review by Jeon et al. (2023), the number of articles related to speech recognition chatbots for language learning

increased after 2020 and reached a peak in 2022. The rise could be attributed to the emergence of ChatGPT and voice-based extensions of it (Jeon et al., 2023). Lin and Yu (2023) also support this increasing trend in the number of studies about chatbots' usage in education, especially after 2020. While there are several studies regarding AI-powered chatbots in language learning, the number of studies on their usage in the area of speaking is still scarce in the literature. This review found solely 22 empirical studies from three databases, which examined speaking skills and perceptions through interventions with AI-powered chatbots. Thus, this upward trend in publications may continue due to the growing tendency to integrate technology into language learning.

The countries of the research studies varied, but there is an intensity in the Asian countries, specifically Taiwan (n=4), China (n=3), Korea (n=3), and Iran (n=3). The majority of the studies were based in Asia, a trend similarly noted by Huang et al. (2023) in their systematic review of chatbots for language learning. The higher number of studies in these countries may be linked to governmental initiatives related to AI and education—Taiwan's Ministry of Education provides funding for chatbots designed for K12 students (Chen, 2023), while the Chinese government aims to be a global leader in AI and promotes its integration into education for personalized learning (Bhutoria, 2022). Other countries where studies were conducted include Sweden, Indonesia, Türkiye, Kazakhstan, Malaysia, and Vietnam. Thus, expanding research on AI-powered chatbots for EFL speaking to other regions and cultures could bring more generalizable data and significant insights to the field.

Mixed methods design is prevalent in the reviewed studies concerning the research design. For most articles, a quantitative phase was conducted to assess the impact of AI-powered chatbots on speaking, and an additional qualitative phase was implemented to explore and understand the perceptions of the study groups. As Dornyei (2007) indicates, employing both qualitative and quantitative methods provides the chance to yield the most comprehensive results. A total of 18 studies used a mixed methods design, while only four studies preferred a quantitative research design. None of the articles used qualitative design, which could be attributed to the perceived necessity of measuring the development of skills numerically.

The study group size in the examined articles ranges from 22 to 314, with most studies having groups larger than 60. The rest are between 30 and 60, with less than 30 participants in only two studies. Moreover, the study groups in the reviewed studies were mainly university students. The studies with larger study groups mostly included university students. In the review

by Jeon et al. (2023), higher education was found to be the most favored sample. The number of studies that selected high school and elementary school students as study groups is less than that of university students. University students might have easier access to the necessary technological tools, and as a study group, they may be more accessible and convenient for researchers. Additionally, conducting a study with younger students could be challenging due to privacy issues and ethical considerations. Only two studies included adults. There is a need for further research, including adult and younger students, who are underrepresented in this area of research. Lastly, only one study (Kemelbekova et al., 2024) examined teachers' perceptions on AI-powered chatbot communication of students. Although there are other studies on teachers' perceptions, there still might be a gap in the literature on the speaking aspect of the topic.

Another dimension of methodology is the intervention duration, during which participants were exposed to AI-powered chatbots. Most studies allowed participants to engage with the chatbot for 1-3 months. Of all the reviewed articles, seven studies have a longer interval duration than three months. These studies displayed AI-powered chatbots' effects on EFL speaking skills over the long term, with a tendency for improvement in speaking. In contrast, some studies' intervention time is less than a month, and it might be hard to attribute the difference in participants' speaking skills to the tool utilized.

In the reviewed studies, the use of AI-powered chatbots in educational settings was in-class, outside the class, and both inside and outside the class. The in-class administration of chatbots was the most common. This context might be more convenient for teachers to observe and evaluate students' behavior in addition to monitoring students' advancement in the regular school environment. In addition, in this way, teachers can interfere if any problem occurs with the technological device. Though less than in-class context, outside-the-class context is also used for chatbot communication. When in-class time is not enough, or the use of chatbot is not convenient or officially supported in the school environment, its use outside the classroom may be advantageous. This could also offer flexibility for students to advance at their own pace and promote autonomous learning. One of the most notable aspects of AI applications is their ability to provide students autonomy during training (Shafiee Rad & Roohani, 2024). Moreover, outside the school environment, students might feel more relaxed and less pressured, which could lower speaking anxiety. The rest of the studies used chatbots in class and outside the class contexts. The advantages of both contexts are combined in this design.

In terms of AI-powered chatbots, the results revealed that Google Assistant, Replika, and Andy chatbots were the tools used the most, along with many others. The primary criterion was accessibility for the selection of these tools, except for the ones that were designed for research purposes. Commercial chatbots like Xiaoying from Microsoft (e.g., Ye et al., 2022) are also advantageous for researchers regarding accessibility. For instance, in Lin and Mubarok's study (2021), Replika was used because it has free access and is convenient for students to use on their phones. Also, Intelligent Personal Assistants (IPA) such as Google Assistant are becoming very common, and researchers used this opportunity for investigation purposes in language education because IPAs can act as conversational partners (Jeon et al. (2023). Another study (Yuan, 2023) chose the Mondly application because it is specifically designed for language learning. ELSA is also designed to improve English pronunciation, and Shafiee Rad and Roohani (2024) investigated its effect in their study. Some studies also consider students' preferences for the selection process of chatbots (e.g., Kim et al., 2021). In many studies, utilized chatbots also provided interaction in everyday life scenarios, as in Enskill (e.g., Ericson et al., 2023). Thus, the number of chatbots is still rising today, and there could be many options for investigating their effects on language learning.

In the reviewed studies, students' perceptions were of great interest to researchers. As the most studied topic, students' perceptions and feedback on communication with AI-powered chatbots are crucial to understanding the effect of chatbots. Jeon et al. (2022) also concluded that the most common research focus was learners' perceptions in their systematic review of speech recognition chatbots. This shows researchers' high interest in understanding students' perspectives on the topic. In contrast, only one study investigated teachers' perceptions; even then, it was a minor part of the study. This may be because the study primarily focused on speaking skills rather than teachers' perceptions. Nevertheless, further exploration of teachers' perspectives on using AI-powered chatbots for EFL speaking skills could offer valuable insights into the practical implementation of chatbots in educational settings.

Another focus of the studies is overall speaking skills with speaking mechanics like pronunciation, fluency, grammatical accuracy, intonation, and stress. While some studies evaluate speaking skills as a whole, others delve into detail and assess speaking skills separately. This shows that chatbots may have different effects on specific speaking skills. Although there is a general improvement in speaking skills, the limited number of articles makes it difficult to draw definitive conclusions. The importance of pronouncing accurate and precise speech may explain why pronunciation is the most studied skill in the studies. Fluency,

grammatical accuracy, intonation, and stress are under-researched topics related to AI-powered chatbots, the main reason for which might be the difficulty in assessing those skills. Other studies examined some affective factors in speaking, such as WTC and speaking anxiety. Increased WTC and low speaking anxiety would lead to a more comfortable learning environment and ease of speaking. Similarly, Jeon et al. (2023) noted the impact of chatbots on learners' affective variables in their review. This suggests that researchers are increasingly interested in the affective and psychological dimensions of speaking that AI-powered chatbots influence.

The findings reveal significant positive effects of AI-powered chatbots on EFL speaking skills. In the reviewed studies, AI-powered chatbots were found to enhance overall speaking skills. In addition to this, AI-powered chatbots were also shown to enhance students' self-perceived speaking skills. This suggests that AI-powered chatbots promote self-assessment and boost language learners' self-confidence in their speaking skills. Additionally, except for one, all studies showed that AI-powered chatbots improved speaking mechanics. Studies focused on pronunciation accuracy reported improvement, with one exception, which found no significant difference. This finding shows the potential of AI-powered chatbots to develop pronunciation by providing personalized feedback and targeted practice. Improvement in pronunciation by technological tools is supported in the literature. For example, computer-assisted pronunciation instruction with AI has been shown to enhance pronunciation in L2 learners, especially in low-anxiety environments (Wang et al., 2023). However, Kemelbekova et al. (2024) found no significant difference in pronunciation accuracy. This might be due to individual differences or cultural/contextual factors. Additionally, Kim (2016) indicated that AI-powered chatbots might be more effective in improving lower-level students' pronunciation. Moreover, according to the findings, AI-powered chatbots promote fluent and accurate speech by improving fluency and grammatical accuracy. However, the inconsistent results on intonation and stress require more research.

Moreover, conversational AI has been developed as a conversational partner to support language learners by enhancing their WTC (Ayedoun et al., 2015) and reducing speaking anxiety (Bao, 2019). The increase in WTC in studies is another consistent and outstanding finding for the potential of AI-powered chatbots, which could be attributed to lower anxiety levels. Studies related to speaking anxiety also have positive outcomes for students except for one (Çakmak, 2022). Several studies reported students' positive perceptions of AI-powered chatbot communication, which shows that students become more motivated, engaged, and

willing to speak. These affective factors are crucial and significant in the language learning journey. Only one research study (Çakmak, 2022) found an increase in speaking anxiety, which is interesting because the negative results about speaking anxiety and student perceptions are from the same study. She attributes the results to the novelty effect of AI technology and communication problems with the AI-powered chatbot. Furthermore, contextual factors might also influence students. The sources of the negative findings may also be the unfamiliarity with technology, technical problems, the design of the utilized chatbot, and individual differences. Thus, more studies in similar contexts are needed to comprehend the real reasons behind the divergent results.

The review also reveals several advantages and disadvantages of using an AI-powered chatbot for EFL speaking skills. Chatbots provide a comfortable, flexible, and advantageous interactive environment. Personalized feedback and instruction are crucial features of chatbots for individualized learning. According to Chen et al. (2023), AI agents provide personalized training and plenty of practice opportunities in stress-free learning settings. Through AI-powered apps, students can determine the weaknesses in their skills and get individualized feedback and instruction to improve them (Shafiee Rad & Roohani, 2024). However, communication breakdowns, lack of speech recognition, and irrelevant responses from chatbots display the disadvantages or deficiencies of chatbots. While some students perceived chatbot communication as authentic, some thought it to be artificial. The contrast in chatbot communication may be due to the various tools utilized. Therefore, comparative research of different tools will yield valuable findings on the effectiveness of various chatbots.

The examination of the studies reveals the efficacy of AI-powered chatbots on EFL learners' speaking skills. The study's findings can guide teachers, students, researchers, and chatbot designers in developing strategies and ideas for effectively incorporating chatbot communication into language learning practices. Students can use AI-powered chatbots autonomously to improve their speaking skills and reinforce the gains they have gained from school lessons. Teachers can integrate different kinds of chatbots into their lessons as an in class and outside the class tool to enhance speaking proficiency.

## 6. Conclusion

In conclusion, this study examines the descriptives, methodological trends, and main findings of studies concerning using AI-powered chatbots on EFL speaking skills. It presents an overview of the state-of-the-art. The analysis revealed a significant improvement in EFL speaking skills with the help of AI-powered chatbots. These tools have positive effects on WTC and speaking anxiety as well. The findings emphasize the potential of AI-powered chatbots as effective tools specifically for speaking skills. The study has also aimed to determine the gaps and suggest possible areas for further research to guide researchers. Based on the synthesis of the study's findings, several suggestions for future research are outlined in the following section.

### 6.1. Recommendations for future research

Further research is necessary on the effects of AI-powered chatbots on speaking mechanics, especially intonation and stress, which are less explored in the reviewed studies. The affective factors, such as WTC and speaking anxiety, should not be ignored. The studies need to broaden demographic diversity, including participants such as adult and younger learners. In future research, comparing the effects of different chatbots on the development of speaking skills and learner perceptions could provide valuable insights into the key features that make these tools effective. These insights could help educators and chatbot designers select the most beneficial tools and refine existing chatbots, addressing deficiencies and improving their effectiveness. Contextual or cultural factors could also be examined to adjust chatbots for specific learner needs to maximize the benefits.

### 6.2. Limitations

This review only included studies from the WoS, Scopus, and ERIC databases, potentially overlooking valuable research published in other databases. The reviewed studies were published between 2020 and 2024. This time frame excludes earlier relevant studies, which may provide some historical perspective on the development and impact of AI-powered chatbots on EFL speaking skills.

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