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EDITED BY
Raona Williams,
Ministry of Education, United Arab Emirates

REVIEWED BY
Kee-Man Chuah,
University of Malaysia Sarawak, Malaysia

*CORRESPONDENCE
Beatriz Peña-Acuña
beatriz.pa@dfilo.uhu.es

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Learning English as a second language with artificial intelligence for prospective teachers: a systematic review

Beatriz Peña-Acuña[1]* and Rosana Corga Fernandes Durão[2]

[1]Faculty of Education, University of Huelva, Huelva, Spain, [2]Escola Superior de Educação e Comunicação, University of Algarve, Faro, Portugal

Introduction: Artificial intelligence is revolutionizing English language teaching with personalized assessments and advanced tools, though more studies are needed on its effectiveness and equitable accessibility.

Method: A systematic literature review (SLR) was conducted using articles from Web of Science, Scopus, and ERIC to establish theoretical foundations.

Results: AI in learning English as a second language offers personalized tools such as chatbots, pronunciation improvement apps, and platforms that adapt content according to student progress.

Discussion: The study highlights how AI is revolutionizing English learning by personalizing lessons, improving pronunciation, and promoting cultural understanding.

KEYWORDS

artificial intelligence, computer assisted instruction, educational research, language learning, teacher education

1 Introduction

Artificial intelligence (AI) is transforming the assessment of English as a Foreign language (hereinafter ESL) learning by combining traditional pedagogical methodologies with advanced technologies (Huang, 2020) to provide more accurate and personalized assessments (Al-Jaward, 2023). These tools allow large volumes of data to be analyzed in real time, providing teachers with detailed information about each student's strengths and weaknesses, facilitating rapid adjustments in teaching methods (Chinda et al., 2022; Lesia et al., 2022). Moreover, these digital tools are being examined to see if they are really effective for language learning (Rosell, 2021), as Papua app (Peña-Acuña and Crismán-Pérez, 2022) that includes AI for developing pronunciation in second language. Questionnaire has been developed (Henrichsen, 2018) to investigate the effectiveness of computer assisted pronunciation of second language learning through apps.

An AI-driven teaching approach differentiates between adaptive second language learning applications, which personalize content, and interactive applications, which encourage conversational practice and real-time feedback. There are chatbots for conversation, tutoring, simulation, recommendation and emotional support, using natural language processing and machine learning technologies to enhance language learning. There are language learning chatbots that use AI, AR and gamification.

TABLE 1 Squeme of chatbot's benefits for learning additional language.

Categories	Codes
Learning achievement	Communication, written, oral, listening, and reading skills; vocabulary and grammar
Attitudinal aspect	Motivation, interest, fun, proactivity (referred to autonomy) and learning commitment
Emotional aspect	Anxiety, emotional comfort, self-confidence and self-esteem

Source: Cislowska and Pena-Acuna (2024).

Some combine these technologies, such as Duolingo, which incorporates AI and gamification, and Mondly, which uses augmented reality (hereafter AR) and gamification.

Golonka et al. (2014) in their systematic review (hereinafter SLR), they reveal that chat using chat, both the volume and complexity of students' language production increased significantly. However, the literature provided moderate support for claims that technology enhanced students' output and interaction, affect and motivation, feedback, and metalinguistic knowledge. In a broad sense, Cislowska and Pena-Acuna (2024), in a SLR of learning additional language through chatbots, found that studies highlight three beneficial categories: the learning achievement, attitudinal facets and emotional aspects. The description of the codes derived from these categories is reflected in Table 1.

Belda-Medina and Calvo-Ferrer (2022) highlight that the perceived usefulness and ease of use of chatbots improves their acceptance among pre-service teachers. For future teachers, AI represents a valuable training tool by teaching them to interpret complex data and apply this knowledge to improve their pedagogical strategies (Bozavli, 2021; Lesia et al., 2022). One of the main advantages of AI is the instant and detailed feedback it provides, allowing for real-time adjustments and facilitating more equitable teaching by identifying gaps in learning that might be missed with traditional methods (Jeon et al., 2023; Yan and Bristol, 2024; Al-Jaward, 2023). This ensures that all students receive the support they need to reach their full potential (Lap et al., 2022) Sapkota and Bondurant (2024) examine ChatGPT's ability to generate math tasks with varied cognitive demands, analyzing concepts, procedures, and cognitive levels.

Notable innovations include automated adaptive assessment, which adjusts the difficulty of questions according to student performance, providing more accurate assessment (Bozavli, 2021; Lap et al., 2022; Thongprasit and Wannapiroon, 2022). In addition, natural speech analysis using natural language processing (NLP) allows for the assessment of aspects of spoken language such as fluency and pronunciation, providing detailed feedback to improve oral communication (Ekrem, 2024; Al-Jaward, 2023). Applications such as ChatGPT facilitate conversational practice, while HelloTalk and Tandem enable language exchanges with native speakers. Tools such as Lingvist and Busuu adapt course content to the learner's progress, and Beelinguapp and Memrise optimize reading comprehension and memorisation.

However, gaps remain in research as some scientific SLR studies (Cislowska and Pena-Acuna, 2024; Rodríguez Fuentes et al., 2024; Soler et al., 2024) recognize. There are still many approaches and variables to be explored as the field of learning second language with AI is expanding and technology is also constantly evolving. Also it is reported by Moonma and Kaweera (2022) on the long-term effectiveness of these recent technologies. While initial results are promising, longitudinal studies are needed to assess the sustainability of improvements in language skills (Bozavli, 2021; Lesia et al., 2022; Yan and Bristol, 2024). In addition, equity in access to these technologies is a concern, as they tend to be more available in advantaged socio-economic contexts. It is critical to investigate how to make these technologies accessible to a more diverse student population, including those in disadvantaged areas (Thongprasit and Wannapiroon, 2022; Meng-Yue et al., 2020; Bozavli, 2021).

In this context, a systematic review is focused on specific actors in this field. The study looks into current interventions with artificial intelligence for prospective teachers and the teaching contexts where they occur. The general research question is: What AI tools do pre-service teachers work with in second language learning interventions, perceiving skills development according to different AI applications?

2 Materials and methods

A systematic literature review (SRL) has been proposed for this article. To this end, a detailed reading of scientific articles was carried out to establish the theoretical basis and define the current state of the subject. The collection of documents was carried out in three databases: Web of Science (WOS), Scopus and ERIC.

First phase: general research question. The central research question is formulated. Based on this question, the review is planned, a hypothesis is formulated and the methodological criteria that will guide the study are established.

Second phase: selection of the sample. The search and selection of relevant bibliographic sources is carried out. Due to the large volume of information available, specific selection methods and inclusion and exclusion criteria are applied as established in the initial planning.

Third phase: assessment of the quality of the studies. The quality of the selected studies is assessed, ensuring that they meet the standards of scientific rigor defined in the methodological protocol. At this stage, duplicate articles, illegible articles and those that do not meet the necessary quality criteria are eliminated. Additionally, the Cohen's Kappa method is utilized to ensure reliability, verifying that the process is not solely dependent on the decision of a single reviewer. This method measures the level of agreement between evaluators, ensuring consistency and reliability in the quality assessment process.

Fourth phase: data extraction and preparation of the review (report). Once the articles had been selected, data extraction was carried out to compose the results and their discussion.

The item selection process is described in Figure 1 through a Prisma 2020 flow chart (Page et al., 2021).

2.1 Inclusion and exclusion criteria

The inclusion and exclusion criteria are as follows:

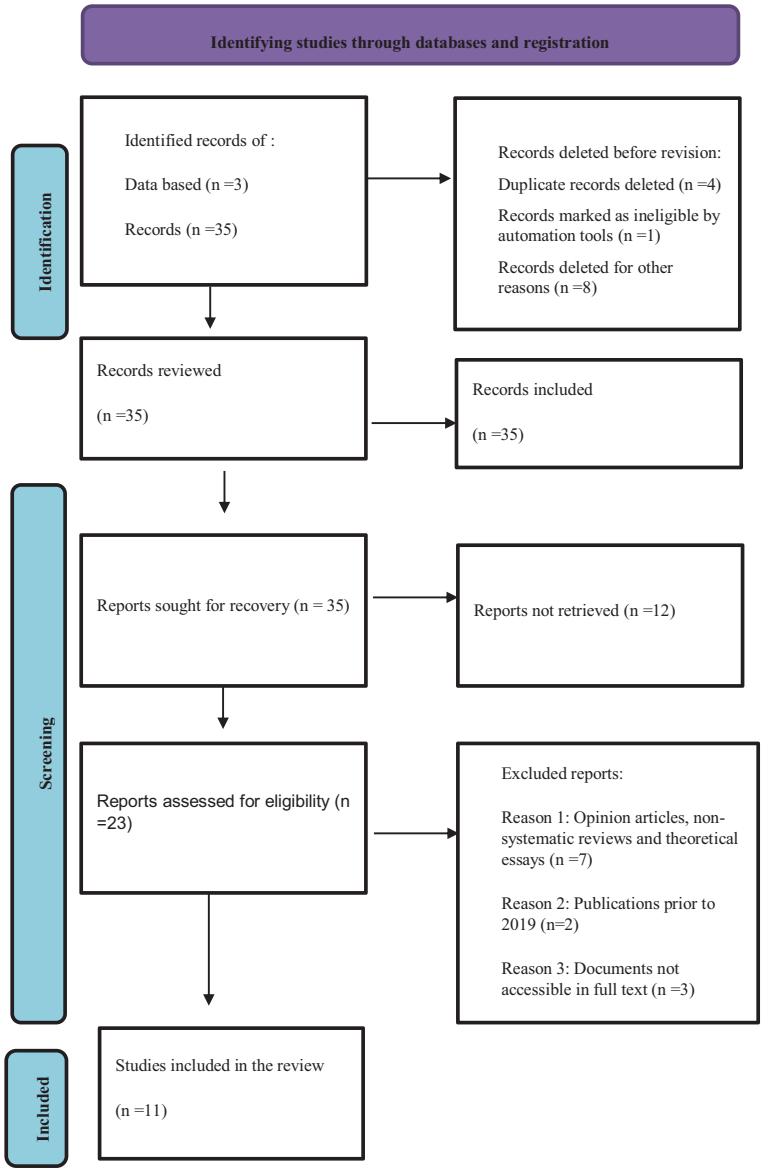

FIGURE 1
Flowchart Prisma 2020.

- Search source: Scopus, Web of Science and ERIC databases.
- Keywords: English second language assessment interventions; English second language interventions using artificial intelligence; English as a second language assessment tools using artificial intelligence.
- Search criteria: using keywords and free-text terms. Also with Boolean operators (AND and OR), as well as controlled vocabulary (truncation, thesauri) and application of inclusion and exclusion criteria.
- Specific inclusion and exclusion criteria:

a. Bibliographic sources from the last five years (2019–2024).
b. Language: English.
c. Document categories: peer-reviewed, open access
d. Document type: scientific articles (from scientific journals). Gray literature, dissertations and non-peer-reviewed articles are discarded.

ChatGPT version 4 has been used to proofread English writing.

3 Results

The advancement of artificial intelligence (AI) in English as a second language learning has fostered more effective and personalized tools that are increasingly attractive to future teachers (Mabuan, 2024). These technologies tailor educational content to individual needs and provide real-time feedback, enhancing the learning experience (Korkmaz et al., 2024; Olubola and Ramnarain, 2024). Examples such as educational chatbots, including ChatGPT, allow users to practice conversations, resolve grammatical doubts and transform teaching processes from the teaching approach (Olubola and Ramnarain, 2024).

TABLE 2 Functions available from chatbots.

Chatbot	Conversation	Tutoring	Simulation	Recommendation	Emotional support
Elsa Speak	✓	✓	✓	✓	
ChatGPT	✓	✓		✓	✓
Duolingo	✓	✓	✓	✓	
Babble	✓	✓		✓	
LingoChamp	✓	✓	✓	✓	
Pimsleur	✓	✓			
Memrise	✓	✓	✓	✓	
Copilot	✓	✓		✓	✓

Source: Own elaboration.

On the other hand, tools such as Microsoft's Copilot, integrated into applications such as Word and Teams, assist in the improvement of written texts, so that they can be used in parallel to traditional writing models by teachers (Tamayo et al., 2020).

Kessler et al. (2023) compared popular apps such as Babbel and Duolingo, finding that Babbel offers specialized English lessons that adapt to student progress through AI (Mendes et al., 2021; Wiwin et al., 2022). Although both groups of users showed similar progress, Babbel demonstrated a higher correlation between study time and results, being more effective in teaching grammar and speaking skills (Mendes et al., 2021; Neuschafer, 2024).

Specialized applications such as Elsa Speak focus on improving pronunciation through AI that analyses and corrects the user's pronunciation, providing instant feedback (Zeng and Fisher, 2024). Research by Anggraini (2022) confirms that Elsa Speak identifies differences in pronunciation, including intonation, rhythm and specific sounds (Eun and Maeng, 2023).

Platforms such as EnglishCentral combine educational videos with speech recognition and AI chatbots to improve pronunciation and listening comprehension (Tamayo et al., 2020). LingoChamp focuses on improving fluency and grammar through simulations of real conversations (Neo, 2021). Grammarly uses advanced AI to correct and improve English writing, offering suggestions that go beyond grammar correction to improve style and clarity (Taskin, 2023).

Finally, tools such as Pimsleur and Memrise are effective in teaching pronunciation and vocabulary, respectively. Pimsleur has been shown to be effective in promoting attention and long-term memory retention (Choe, 2019). Memrise has shown a significant impact on collocation learning (Esmaeili and Shahrokhi, 2020).

The research reflects the use of 8 popular chatbots by pre-service teachers. Of these chatbots, all are adaptive and interactive, except for LingoChamp which is only adaptive. Of these chatbots, the ones that use gamification are the following: ChatGPT, LingoChamp, Memrise, Copilot. There are none that use AR. These chatbots functions are presented in Table 2.

Each study has reflected areas of improvement in second language learning reflecting consistency with other general studies about chatbot (Belda-Medina and Calvo-Ferrer, 2022; Cislowska and Pena-Acuna, 2024; Rosell, 2021). The research studies about it found reflect a small sample size, with only two cases exceeding 100 individuals. Of these, 6 are evaluative (3 are mixed, 2 are qualitative, 1 is quantitative) and 5 are exploratory documentary reviews. Of these, 4 are North American and 4 are Asian, showing a greater interest in the subject. We found much less representation from Europe (Spain) and Africa (Nigeria). All these indications suggest that researching artificial intelligence chatbots by initial teacher trainees at classrooms is an expanding field that is still in its infancy. The area for improvement according to the chatbot or platforms is presented in Table 3.

4 Discussion

The study indicates that emerging technologies, in particular chat with artificial intelligence (AI), adaptative or interactive, combined with other technologies, as AR, or teaching methodologies, as gamification, are revolutionizing English language teaching from a teaching perspective (Huang, 2020; Mabuan, 2024). This study finds that pre-service teachers are being introduced to using some variety of types of chatbots that are available for second language learning, thanks to its ease of use and because they are perceived as useful (Belda-Medina and Calvo-Ferrer, 2022). Teachers in training use complex chatbots in design, incorporating adaptative, interactive and emotional functions and teaching methods as gamification. They have the advantage of being digital natives incorporating them naturally into their learning and teaching practice perceiving the learning advantages of these chatbots.

Future teachers who recognize that there is achievement in learning using chatbots are able to use these tools to work on reading comprehension, pronunciation, writing, and other aspects of the English language. This is supported by the general use of chatbots for learning additional languages, as highlighted by Cislowska and Pena-Acuna (2024), including learning achievement, attitudinal, and emotional aspects. The methods used are increasingly personalized, interactive and context-specific (Wiwin et al., 2022; Olubola and Ramnarain, 2024).

A prominent trend is the personalisation of learning through artificial intelligence (AI), which adapts lessons to the learner's needs and progress (Wang et al., 2023). Applications such as Duolingo and Babbel use AI to adjust the difficulty and content of exercises, working with texts of increasing complexity and providing challenges appropriate to the user's level (Jarrah et al., 2023). This approach improves comprehension and knowledge retention, promoting more meaningful and lasting learning (Tamayo et al., 2020; Korkmaz et al., 2024).

Another relevant trend is the improvement of pronunciation through interactive chatbots that offer continuous and targeted practice (Sevnarayan, 2024), which is difficult in a traditional

TABLE 3 Area for improvement according to chatbot or platform based on the studies analyzed.

Application	Areas for improvement	Authors	Research type	Sample quantity	Nationality of the sample
Elsa Speak	Pronunciation	Eun and Maeng, 2023	Qualitative documentary review	34	South Korea
		Anggraini, 2022	Mixed study	30	Indonesia
ChatGPT	Writing, grammar communication	Olubola and Ramnarain, 2024	Qualitative research	15	Nigeria
		Korkmaz et al., 2024	Qualitative documentary review	20	–
		Mabuan, 2024	Mixed study	115	United States
Duolingo	Reading comprehension, grammar, vocabulary	Neuschafer, 2024	Qualitative documentary review	20	United States
Babble	Reading comprehension, grammar, vocabulary, interculturality	Mendes et al., 2021	Mixed study	59	United States
LingoChamp	Pronunciation, grammar, communication	Neo, 2021	Qualitative documentary review	102	Malaysia
Pimsleur	Pronunciation, interculturality	Choe, 2019	Qualitative documentary review	–	United States
Memrise	Reading comprehension, vocabulary	Esmaeili and Shahrokhi, 2020	Quantitative study	75	Iran
Copilot	Writing	Tamayo et al., 2020	Qualitative study	65	Spain

Source: Own elaboration.

classroom (Ali et al., 2023), expecting that using chat the volume and complexity of their language production increase significantly (Golonka et al., 2014). In addition, apps such as Babbel and Duolingo integrate cultural content from English-speaking countries, promoting cultural openness and preparing learners to interact in multicultural contexts (Baidoo-anu and Owusu, 2023).

The use of audiovisual formats and immersive realities on platforms such as EnglishCentral and LingoChamp adds an extra dimension to learning (Vanichvasin, 2022). These technologies allow learners to practice in simulated environments that replicate real-life situations, improving listening comprehension, pronunciation, fluency and confidence in communication (Gupta et al., 2020). The ability to simulate real conversations and provide personalised feedback in real time is changing the way English is learned (Andina et al., 2020; Joshi and Pondel, 2019).

The ability to simulate real conversations and provide personalized feedback in real time is changing the way English is learned (Andina et al., 2020; Joshi and Pondel, 2019). Finally, writing skills benefit from applications such as Microsoft's Grammarly and Copilot, which work with complex texts and offer assistance tailored to the context of the writing (Downes, 2022; Jeon et al., 2023). This is especially useful for prospective teachers who wish to work cross-culturally (Chaipram et al., 2020; Fryer et al., 2019), sometimes facing challenges in multicultural classrooms with immigrants (Fernández-Corbacho et al., 2024).

Author contributions

BP-A: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Supervision, Validation, Visualization, Writing – original draft, Writing – review and editing. RC: Conceptualization, Investigation, Methodology, Project administration, Resources, Supervision, Validation, Visualization, Writing – original draft, Writing – review and editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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