



Artificial Intelligence in Language Education: A Systematic Review of Trends, Tools, and Challenges

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ABSTRACT

The rapid advancement of Artificial Intelligence (AI) technologies has significantly influenced language education, offering innovative tools that enhance both teaching and learning experiences. This systematic review investigates how AI has been applied in language education, with a focus on emerging trends, widely adopted tools, and key implementation challenges. Based on studies published between 2010 and 2025, 35 peer-reviewed articles were analyzed using predefined inclusion criteria across major academic databases. The study is grounded in the framework of AI-assisted learning, emphasizing autonomous, adaptive, and interactive language acquisition. Findings reveal that AI applications such as chatbots, automated writing assessment systems, and speech recognition tools are increasingly used across language skill instruction. However, challenges persist, including issues of technological accessibility, teacher preparedness, and ethical considerations. This review offers a comprehensive overview of AI's role in modern language education and identifies critical gaps for future research and pedagogical development.

Keywords: artificial intelligence, language education, AI-assisted learning, systematic review, educational technology

Introduction

In the recent years, Artificial Intelligence (AI) has gone from being a science fiction concept to a functional and innovative technology in education. Primarily in language acquisition, AI has begun to reshape traditional pedagogical approaches with automation, adaptive learning environments, and smart tutoring systems. The emergence of large language models (LLMs), machine learning, and natural language processing (NLP) technologies has opened up opportunities for the enhancement of teaching by teachers and more independent and tailored learning by students. Crompton et al. (2024) remind us that AI offers both far-reaching affordances and challenges in English language teaching, including greater engagement and effectiveness but also concerns over data privacy and pedagogical fit. The global literature reflects an increasing interest in the role played by AI in language learning, driven in part by the overall popularity of tools such as ChatGPT and other generation AI technologies (Kartal, 2023; Kostka & Toncelli, 2023; Nguyen & Tran, 2023).

These tools facilitate dialogue for impact, provide real-time feedback, and allow realistic applications of languages even outside classrooms. Hockly (2023) calls this trend a blessing and a pedagogical problem—while AI democratizes language practice access, it also leads to over-reliance and diminished critical thinking. AI has been used on reading comprehension exercises (Allaithy & Zaki, 2025), grammar correction exercises (Al-khresheh, 2024), vocabulary enhancement (Floris et al., 2024), and listening practice (Hinzi, 2024) with encouraging results often seen in learners' performance and motivation. While it has a lot of promise, integrating AI into language courses is plagued with a number of challenges. Teachers indicated difficulty in selecting proper tools, insufficient training, and a lack of clarity on how to blend AI with curriculum goals (Hazaymeh et al., 2024; Taşçı & Tunaz, 2024).

There are also concerns regarding the authenticity of AI-generated content, learner privacy, and algorithmic bias (Szabó & Szoke, 2024). Studies such as Chung and Jeong (2024) and Chetveryk and Veretiuk (2024) have even documented diverse pre-service teacher attitudes and evidenced a mismatch between pedagogical preparedness and technological preparedness. The rapid evolution of AI technologies has even resulted in a fractured literature. While there are some case studies, experiments, and narrative reviews (e.g., H'==hz, 2024; Omar et al., 2024; Daulay & Ginting, 2024), not much integrative synthesis exists that follows world trends, identifies commonly employed tools, and systematically examines adoption concerns. The literature is more centered on single AI tools or one skill applications (e.g., ChatGPT for dialogue), rather than viewing AI adoption as an all-around phenomenon as it spans skill domains, grade levels, and environments.

This need requires systematic and updated examination. The current study aims to fulfill the following aims:

- a) To identify emerging trends in the use of AI in language learning.
- b) To elaborate on the variety and type of AI tools used in the language teaching and learning process.



c) examine challenges faced by teachers and learners in the implementation of AI in language learning.

By synthesizing 35 peer-reviewed studies conducted from 2010 to 2025, this review offers a profound insight into how AI is currently being utilized in language teaching. The studies sample countries, languages, environments of learning, and levels of technology integration, therefore offering a worldwide view of the phenomenon. Drawing on previous empirical studies and theory (e.g., Muñoz-Basols & Gutiérrez, 2025; Ma et al., 2024), it is hoped that this review can provide a foundation for the development of future pedagogical practices, research agendas, and policy frameworks for AI-facilitated language learning.

Finally, the worth of this work lies in its effort to bridge the gap between rapid technological advancement and sustainable pedagogical praxis. It not only contributes to the knowledge of trends in use and impacts of tools but also warns educators, instructional designers, and policymakers together of the subtleties and complexities required for effectively incorporating AI in language instruction.

Methods

This study adopted a Systematic Literature Review (SLR) design to examine how Artificial Intelligence (AI) has been applied in language education. The approach, grounded in PRISMA guidelines, ensured methodological rigor, transparency, and replicability in identifying trends, tools, and challenges across the literature.

1. Search Strategy

A comprehensive search was conducted across six databases—Scopus, Web of Science, ERIC, SpringerLink, ScienceDirect, and Google Scholar—covering studies from 2010 to 2025. Boolean terms included: ("Artificial Intelligence" OR "AI" OR "ChatGPT") AND ("language education" OR "EFL" OR "ESL"). The search yielded 246 records.

2. Inclusion and Exclusion Criteria

Eligible studies were peer-reviewed, published in English, focused on AI in language teaching/learning, and included empirical or theoretical analysis. Exclusions involved non-academic publications, studies unrelated to language education, and those lacking AI implementation. After screening, 35 studies were selected.

3. Data Extraction and Analysis

A structured extraction sheet recorded publication details, context, educational level, AI tools used, research methods, findings, challenges, and implications. Thematic

synthesis was used to categorize data into three themes: emerging trends, tool types, and implementation barriers.

4. Quality Assessment

Using an adapted CASP checklist, each study was evaluated for methodological rigor, clarity, and relevance. Studies falling below the quality threshold were excluded.

5. Ethical Considerations

As this review used secondary data from published sources, ethical approval was not required. Proper citation and academic integrity were maintained throughout.

Findings and Discussion

This systematic review reviewed 35 peer-reviewed articles to examine the ways in which Artificial Intelligence (AI) is revolutionizing language education. Three overarching themes were identified: (1) Emerging Trends, (2) Tools and Applications, and (3) Challenges of Implementation. These outcomes build on existing studies by synthesizing pedagogical, ethical, and technology aspects of AI adoption in various learning environments.

a) Emerging Trends in AI Integration

AI is increasingly being utilized to facilitate learner autonomy and personalization. Empirical studies show a shift from pedagogy centered on teachers to AI-mediated, student-focused learning environments with the use of chatbots and large language models (e.g., ChatGPT) for supporting self-paced interaction and feedback. Moreover, AI is facilitating inclusive learning for disadvantaged groups through adaptive and multimodal support systems.

b) Tools and Applications of AI

A range of AI resources were identified, targeting writing, speaking, vocabulary, and related skills. Writing and speaking productive skills were most frequently targeted.

Table 1. Summary of AI Tools and Their Functions in Language Education

AI Tool / System	Language Skill Targeted	Function / Use Case	Sample Study
ChatGPT / GPT-3 / GPT-4	Writing, Speaking	Interactive dialogue, feedback generation	Hockly (2023), Kartal (2023)
Grammarly / AI Grammar Tools	Writing	Grammar correction, stylistic improvement	Al-khresheh (2024), Omar et al. (2024)

AI Tool / System	Language Skill Targeted	Function / Use Case	Sample Study
AI-based Vocabulary Apps	Vocabulary	Personalized word lists, spaced repetition	Floris et al. (2024)
Speech Recognition AI	Listening, Pronunciation	Voice-based comprehension and feedback	Hınız (2024), Chung & Jeong (2024)
Adaptive Learning Systems	Integrated Skills	Custom learning pathways, learner analytics	Ma et al. (2024), Hazaymeh et al. (2024)

Interestingly, writing and speaking skills dominate the focus of AI applications, with 70% of studies targeting these productive skills. This aligns with the need for more output-focused activities in EFL/ESL environments, where learners often lack real communicative contexts.

AI is also increasingly used in assessment and feedback delivery, offering real-time scoring, error detection, and suggestions for improvement (Taşçı & Tunaz, 2024). However, few studies critically examine the accuracy and pedagogical appropriateness of this feedback, signaling a need for future empirical validation.

c) Implementation Challenges and Pedagogical Concerns

While the promise of AI in language education is evident, the literature also surfaces substantial barriers to effective integration. Among the most reported challenges are:

- Lack of teacher training: Many educators feel unprepared to incorporate AI meaningfully in their classrooms (Chung & Jeong, 2024).
- Over-reliance and academic dishonesty: Learners often depend too heavily on tools like ChatGPT, leading to questions about originality and learning integrity (Hazaymeh et al., 2024).
- Bias and data limitations: AI tools trained on biased corpora may produce stereotypical or culturally insensitive content (Szabó & Szoke, 2024).
- Infrastructure constraints: In low-resource settings, limited internet access and outdated devices hinder AI adoption (Floris et al., 2024; Daulay & Ginting, 2024).

Moreover, some scholars express concern over the “black box” nature of AI, where users receive output without understanding how decisions or responses are generated. This opaqueness can undermine both teacher trust and learner agency if not addressed transparently.

Implications and Advancement of Knowledge

This review provides an integrated synthesis of AI in language learning across contexts beyond tool-based analysis. This highlights that AI must be implemented to enhance, and not replace, effective pedagogical practices. Strategic integration, guided by ethical and instructional principles, is crucial.

Conclusion

This systematic review of 35 peer-reviewed articles (2010–2025) illuminates the evolving function of Artificial Intelligence (AI) in language learning across three prominent themes: novel AI-driven learning trends, language learning tool diversification, and enduring implementation challenges. AI technologies such as chatbots, grammar checkers, and adaptive platforms possess great potential to advance customized and self-directed learning, particularly in writing, speaking, and vocabulary development.

Although these advantages are present, serious issues, including inadequate teacher preparation, ethics (e.g., reliance, academic dishonesty, and biased information), and transparency of AI systems, prevail. Existing literature also reflects a dearth of longitudinal and classroom studies on actual learning outcomes.

Future research has to move beyond perceptions and usability and, instead, focus on the pedagogic impact of AI on learner engagement, linguistic capacity, and critical thinking. At the practical level, this entails teacher education, ethical guidelines, and non-discriminatory access. Intersecting action among developers, teachers, and linguists has to be ensured so that AI technology is pedagogically informed and culturally aware.

Though AI is no magic solution, its strategic incorporation—driven by pedagogy centered on humans—can strongly reinforce language learning and instruction.

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