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Artificial intelligence integration in English language teaching and learning: A systematic literature review

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Abstract
The rapid advancement of artificial intelligence (AI) has created new opportunities for transforming English as a Foreign Language (EFL) teaching and learning. However, its integration involves not only technological adoption but also pedagogical practices, learning processes, stakeholder competencies, and ethical considerations. This study aims to systematically review research on AI integration in EFL education, focusing on technological applications, pedagogical implementation, learning outcomes, challenges, and future research directions. A qualitative systematic literature review was conducted using the Scopus database, covering journal articles published between 2021 and 2026. The search initially identified 100 records, which were reduced to 48 following the application of publication year, document type, and language filters. The literature was examined through qualitative content analysis and organized into five thematic categories: AI technologies and applications, pedagogical integration, language skills development, stakeholder experiences and competencies, and challenges and ethical considerations. The synthesis indicates that AI integration encompasses generative AI, conversational agents, automated writing evaluation, speech recognition, natural language processing, intelligent tutoring systems, and adaptive learning platforms. These technologies support instructional material development, personalized learning, language practice, automated feedback, and assessment across writing, speaking, reading, and listening. Reported contributions include increased learning flexibility, opportunities for individualized feedback, learner engagement, and autonomous learning. Nevertheless, concerns regarding information accuracy, overdependence, academic integrity, data privacy, algorithmic bias, unequal access, and teacher readiness remain significant. The review highlights the need to move beyond technology adoption toward meaningful pedagogical integration, critical AI literacy, and human–AI collaboration. It concludes that effective AI integration requires pedagogically grounded, equitable, and ethically responsible implementation that complements teachers' expertise and strengthens learner agency.

Keywords: Artificial intelligence, english language teaching, EFL education, pedagogical integration, systematic literature review, responsible AI

Introduction

The rapid advancement of artificial intelligence (AI) has increasingly reshaped educational practices, transforming how knowledge is accessed, learning activities are designed, and educational interactions are facilitated. The emergence of AI-powered technologies, including intelligent tutoring systems, natural language processing (NLP), automated writing evaluation, speech recognition, adaptive learning platforms, and generative artificial intelligence (GenAI), has expanded the possibilities for delivering personalized, interactive, and data-informed learning experiences (Alaudinova *et al*, 2026) [1]. Unlike conventional educational technologies that primarily facilitate access to digital content, contemporary AI systems can perform more sophisticated functions, such as generating instructional materials, providing immediate feedback, analyzing learner performance, simulating communicative interactions, and adapting learning activities to individual needs. These developments have positioned AI as an increasingly influential component of educational innovation, with implications extending beyond technological enhancement toward the transformation of pedagogical practices and teacher–learner interactions (Asrifan *et al*, 2024) [8].

Within English as a Foreign Language (EFL) education, the integration of AI presents considerable opportunities to address longstanding challenges associated with language learning and instruction. EFL learners frequently encounter difficulties in developing communicative competence, maintaining consistent language practice, receiving individualized feedback, and accessing authentic opportunities to use English beyond the classroom (Yessenbekova, 2024) [21]. AI-powered applications offer potential solutions by facilitating interactive language practice, supporting autonomous learning, providing real-time corrective feedback, and creating adaptive learning environments. For instance, AI-based writing assistants can support grammatical accuracy, vocabulary development, and textual organization, while conversational agents and speech recognition technologies can provide opportunities for speaking practice, pronunciation development, and listening comprehension. Similarly, intelligent tutoring systems and adaptive learning platforms can support reading comprehension, vocabulary acquisition, and individualized learning pathways. Consequently, AI integration in EFL education is increasingly associated with the potential to enhance language proficiency, learner engagement, motivation, and self-regulated learning (Pei, 2026) [16].

The growing body of empirical research demonstrates that AI integration in EFL education extends across diverse

instructional contexts, language skills, and pedagogical purposes. Research has examined the application of AI in writing instruction, particularly through automated feedback and generative AI applications, as well as its contribution to speaking development, pronunciation practice, vocabulary acquisition, and reading comprehension. For example, Almayez *et al*., (2026) [2]. examined Saudi EFL learners' perceptions of AI and its impact on writing skills, while explored learners' perspectives on AI tools in reading instruction. Research has also examined AI-powered vocabulary acquisition and AI-supported language assessment (Gao *et al*., 2026) [2]. Research has also addressed AI-supported vocabulary acquisition and the potential of AI technologies to improve language learning outcomes through personalized and interactive experiences. Beyond learners' direct engagement with AI applications, studies have increasingly investigated teachers' perceptions, technological readiness, pedagogical adaptation, and behavioral intentions to integrate AI into instructional practices (Granstrom & Oppi, 2025) [13]. These developments suggest that AI integration is not confined to the adoption of particular technological applications but increasingly involves broader changes in instructional design, classroom interaction, assessment, and the professional responsibilities of EFL teachers.

Despite these promising developments, the integration of AI into EFL education is neither straightforward nor universally beneficial. The pedagogical value of AI depends not only on the technological capabilities of particular applications but also on how teachers and learners engage with, evaluate, and incorporate AI-generated outputs into meaningful learning activities. Concerns have emerged regarding the accuracy and reliability of AI-generated information, algorithmic bias, data privacy, academic integrity, plagiarism, and learners' potential overdependence on automated assistance. Furthermore, unequal access to technological infrastructure, differences in digital competence, and insufficient teacher preparation may constrain the effective implementation of AI, particularly in educational contexts characterized by limited resources. These concerns highlight the importance of distinguishing between the availability of AI technologies and their meaningful pedagogical integration. In this regard, human-centered approaches emphasize that AI should complement rather than replace teachers' professional judgment, pedagogical expertise, and interpersonal engagement with learners (Chandan & Srivastava, 2026) [10]. Therefore, understanding AI integration requires consideration of its technological, pedagogical, ethical, and human dimensions.

Although scholarly attention to AI in language education has expanded considerably, existing review studies have addressed different aspects of this evolving research landscape. Sharadgah and Sa'di, (2022) [19] systematically reviewed research on AI in English language teaching and learning published between 2015 and 2021. Alshumaimeri and Alshememry (2024) [4] examined the extent of AI applications in EFL learning and teaching, while Crompton *et al*. (2024) [11] synthesized the affordances and challenges of AI in English language teaching. More recent reviews have addressed empirical evidence and emerging research directions: Kundu and Bej (2025) [15] reviewed empirical studies on AI-supported EFL teaching; Qin and Chuaychoowong (2025) [17] examined trends and gaps in China; and Rebolledo and Gisbert (2026) [18] focused on adaptive AI-supported EFL learning. Hidayat *et al*. (2025) [14] additionally mapped research trends through bibliometric analysis. Taken together, these reviews provide important overviews, but they also indicate the need to connect technological applications with pedagogical implementation, stakeholder roles, learning processes, and responsible use.

While these reviews provide valuable foundations for understanding the development of AI in language education, the existing literature remains dispersed across technological applications, language skills, educational levels, instructional approaches, and stakeholder perspectives. Some reviews primarily emphasize the effectiveness of AI applications or their affordances and limitations, whereas others are geographically or pedagogically restricted. Consequently, a broader synthesis is needed to explain how different forms of AI are integrated into EFL teaching and learning, how such integration influences pedagogical practices and learner experiences, and what conditions facilitate or constrain its implementation. In particular, the relationship between technological applications and pedagogical decision-making requires further examination. The integration of AI should not be understood merely in terms of which tools are available or whether learners demonstrate improved performance; rather, it should also be examined through the instructional purposes, learning processes, teacher competencies, learner participation, and ethical considerations that shape their educational use. Addressing these interconnected dimensions may provide a more comprehensive understanding of the transition from technology adoption to meaningful AI integration in EFL education.

To address this need, the present study conducts a systematic literature review of research on artificial intelligence integration in English as a Foreign Language education. Rather than restricting the investigation to generative AI or a particular language skill, this review adopts a broader perspective encompassing different AI technologies and their applications across EFL teaching and learning. Specifically, the study seeks to synthesize the technological applications employed in EFL contexts, examine the pedagogical practices and language learning processes supported by AI, investigate the reported contributions to teaching and learning, and identify the challenges and conditions influencing effective integration. By connecting technological, pedagogical, and human dimensions, this review aims to move beyond an application-oriented understanding of AI toward a more comprehensive account of its educational integration. The findings are expected to contribute to the theoretical and practical development of AI-integrated EFL pedagogy, inform teacher education and institutional decision-making, and identify directions for future research on effective, equitable, and responsible AI implementation in language education. Accordingly, this study addresses the following research questions:

1. What types of artificial intelligence technologies and applications have been integrated into EFL teaching and learning?
2. How are AI technologies integrated into pedagogical practices, instructional activities, and language skills development in EFL education?

3. What contributions and outcomes of AI integration have been reported in EFL teaching and learning?
4. What challenges, ethical considerations, and contextual factors influence the effective integration of AI in EFL education?
5. What research gaps and future directions can inform the development of effective, human-centered, and responsible AI-integrated EFL education?

Method

a. Research Design

This study employed a qualitative Systematic Literature Review (SLR) design to examine the integration of artificial intelligence (AI) in English as a Foreign Language (EFL) education. The systematic review approach was adopted to identify, analyze, and synthesize existing research on the use of AI technologies in EFL teaching and learning across different educational contexts, participant groups, pedagogical practices, language skills, and research perspectives. Rather than examining individual studies independently, this review aimed to identify recurring patterns, emerging trends, relationships, and research gaps concerning the integration of AI in English language education.

A qualitative synthesis was considered appropriate because AI integration in EFL education encompasses multiple interconnected dimensions, including technological applications, pedagogical approaches, language learning processes, teacher competencies, learner engagement, learning outcomes, and ethical considerations. The review therefore sought to move beyond a descriptive account of AI tools and their functions toward a broader understanding of how AI technologies are incorporated into instructional practices and learning experiences. Particular attention was given to the relationship between technological affordances, pedagogical implementation, and the opportunities and challenges associated with AI-supported EFL education.

b. Data Sources and Search Strategy

The literature search was conducted using the Scopus database to identify relevant publications addressing artificial intelligence integration in EFL education. Scopus was selected because it provides access to a broad collection of peer-reviewed academic publications across educational and technological disciplines, enabling the identification of interdisciplinary research on AI applications in language education.

The search focused on publications from 2021 to 2026 to capture recent developments in AI integration in EFL teaching and learning, including the increasing application of AI-powered technologies, intelligent learning systems, and generative artificial intelligence in educational contexts. Because the search was conducted in November 2026, the 2026 records represent publications indexed and retrieved up to the search date rather than a complete publication year. The search strategy was designed to identify studies examining the application, implementation, adoption, and integration of AI technologies in English language teaching and learning.

The search terms were developed using three main conceptual categories: (1) artificial intelligence and related technological terminology, (2) English language teaching and learning contexts, and (3) terms associated with technology integration and implementation. Relevant keywords included the following:

"artificial intelligence", "AI", "AI-powered", "AI-assisted", "AI-based", "intelligent technology", "English as a Foreign Language", "EFL", "English language teaching", "ELT", "English language learning", "integration", "implementation", "adoption", "application", "utilization", "use"

These keywords were combined using Boolean operators (AND and OR) to construct the following search string:

Scopus Search String

```
TITLE-ABS-KEY (
("artificial intelligence" OR AI OR "AI-powered" OR
"AI-assisted" OR "AI-based" OR "intelligent technology")
AND
("English as a Foreign Language" OR EFL OR
"English language teaching" OR ELT OR
"English language learning")
AND
(integration OR implementation OR adoption OR
application OR utilization OR use)
)
```

The initial Scopus search retrieved 100 records. After applying the stated filters for document type (journal articles), language (English), and publication year (2021–2026), 48 records remained. These 48 records constituted the dataset exported from Scopus for screening and analysis. Importantly, the number of records remaining after database filters should not automatically be reported as the final number of included studies. The manuscript should separately report duplicate removal, title-and-abstract screening, full-text eligibility assessment, and the final number of studies included. Those stage-specific counts and exclusion reasons must be confirmed from the researchers' screening records and should not be inferred from the CSV export

c. Inclusion and Exclusion Criteria

To ensure the relevance and consistency of the selected literature, inclusion and exclusion criteria were established based on the research objectives, publication characteristics, educational context, and substantive contribution to understanding AI integration in EFL education.

- **Inclusion Criteria**

Studies were considered eligible for inclusion when they met the following criteria:

1. They investigated the integration, application, implementation, adoption, or use of artificial intelligence in EFL education or English language teaching and learning contexts.
2. They examined AI technologies and applications used to support English language teaching, learning activities, language skills development, assessment, or educational practices.
3. They addressed EFL learners, student-teachers, practicing English language teachers, or other relevant stakeholders involved in English language education.
4. They discussed at least one dimension of AI integration, including technological applications, pedagogical practices, teaching strategies, language

learning processes, learner engagement, teacher competencies, learning outcomes, or ethical considerations.
5. They were published as journal articles in English between 2021 and 2026.
6. They provided sufficient information to support the identification of research patterns, thematic categorization, and qualitative synthesis.

- **Exclusion Criteria**

Studies were excluded from consideration when they met any of the following conditions:

1. They did not investigate artificial intelligence in EFL education or English language teaching and learning contexts.
2. They focused exclusively on general educational technology without a substantive connection to AI integration.
3. They examined AI applications in educational disciplines unrelated to English language teaching or learning.
4. They were not published as journal articles, including conference papers, book chapters, editorials, reviews, or other publication types.
5. They were published in languages other than English or outside the specified publication period of 2021–2026.
6. They did not provide sufficient empirical findings or substantive discussions relevant to the research objectives.

These criteria were applied to establish a consistent scope for the literature review and ensure that the selected publications addressed the integration of AI in EFL education. The resulting dataset of 48 articles provided the basis for examining the technological applications, pedagogical practices, learning processes, reported contributions, and challenges associated with AI integration in English language education.

d. Data Analysis

The selected studies were analyzed using qualitative content analysis to systematically examine and synthesize research findings concerning artificial intelligence integration in English as a Foreign Language (EFL) education. This approach enabled the researcher to identify, categorize, compare, and interpret the findings reported across the selected publications. Rather than treating AI applications as isolated technological innovations, the analysis focused on understanding how different AI technologies were incorporated into EFL teaching and learning, their pedagogical functions, their contributions to language learning processes, and the challenges associated with their implementation.

The analysis proceeded through three interconnected analytical activities. First, the researcher examined the characteristics and substantive content of each selected study, including publication year, research context, participant characteristics, AI technologies employed, research objectives, methodological approaches, and reported findings. Particular attention was given to the types of AI applications investigated and the educational purposes for which they were used. Second, the findings were compared across studies to identify recurring patterns, similarities, differences, and relationships concerning the integration of AI into EFL education. This comparison considered how AI technologies supported instructional activities, language skills development, assessment practices, learner engagement, and teachers' pedagogical practices. Third, the synthesized findings were interpreted to identify broader developments, emerging issues, and underexplored areas in the literature, particularly concerning the transition from technological adoption to meaningful pedagogical integration.

The analysis was organized around five principal thematic categories: (1) AI technologies and applications in EFL education, (2) pedagogical integration of AI in EFL teaching and learning, (3) AI-supported language skills development and learning processes, (4) teachers' and learners' experiences, competencies, and readiness, and (5) challenges, ethical considerations, and responsible AI integration. These categories provided an analytical framework for examining the technological, pedagogical, learning-related, and human dimensions of AI integration in EFL contexts.

Cross-study synthesis was subsequently conducted to examine three broader developments in the literature. The first concerned the transition from AI adoption to meaningful pedagogical integration, focusing on how AI applications were incorporated into instructional design, teaching strategies, learning activities, and assessment practices. The second concerned the development of AI-supported language learning and human–AI collaboration, particularly how AI technologies facilitated language skills development, learner engagement, autonomous learning, and interactions between learners and AI systems. The third concerned the transition from technological efficiency to critical and responsible AI engagement, emphasizing the importance of AI literacy, evaluation of AI-generated outputs, academic integrity, ethical awareness, and the preservation of human judgment in educational practices.

Particular attention was given to the relationships between technological affordances and pedagogical purposes, the roles of teachers and learners in AI-supported learning environments, and the contextual conditions influencing the effectiveness of AI integration. The analysis also considered differences in reported findings across educational settings and research contexts rather than assuming that AI applications produce uniform outcomes across all EFL learning environments. Through this analytical process, the review sought to identify research gaps concerning the pedagogical implementation of AI, the development of meaningful human–AI collaboration, and the conditions required for effective, equitable, and responsible AI integration in EFL education.

e. Trustworthiness of the Study

The trustworthiness of this systematic literature review was addressed through attention to methodological transparency, consistency of the analytical framework, credibility of interpretation, and traceability of the synthesis process. The use of the Scopus database, a predefined Boolean search string, specified publication filters, and explicit inclusion and exclusion criteria provided a structured foundation for identifying relevant literature. These procedures were intended to ensure that the selection of studies was aligned with the research objectives and focused on publications addressing artificial intelligence integration in EFL education.

The consistency of the analysis was supported by the use of five predefined thematic categories covering AI technologies and applications, pedagogical integration, language learning processes, stakeholder experiences and competencies, and challenges and ethical considerations. These categories provided a common analytical basis for examining and comparing the selected studies. Furthermore, the three broader analytical developments enabled the synthesis to move beyond the identification of individual AI applications toward an examination of the relationships between technological innovation, pedagogical practices, and responsible educational implementation.

Credibility was strengthened by grounding the interpretations in the findings and discussions reported in the selected studies. Cross-study comparison was used to distinguish recurring patterns from context-specific findings and to identify both converging and contrasting perspectives. For example, the review considered the distinction between the availability of AI technologies and their meaningful pedagogical application, the contributions of AI to different language skills, and the challenges teachers and learners encounter when incorporating AI into educational practices. Differences in reported outcomes and contextual conditions were retained in the synthesis to avoid presenting AI integration as a universally consistent or uniformly beneficial process.

Methodological transparency was further supported by documenting the search strategy, publication period, database selection, search filters, and eligibility criteria. The initial Scopus search identified 100 records, which were reduced to 48 records following the application of publication filters. The manuscript must additionally document duplicate removal, title-and-abstract screening, full-text assessment, and reasons for exclusion. These counts are not available in the Scopus export alone and therefore require confirmation from the review log before a PRISMA flow diagram and final study count can be completed.

Overall, these procedures provided a structured basis for synthesizing the selected literature and interpreting the development of AI integration in EFL education. By combining predefined analytical categories with cross-study comparison and thematic interpretation, the review aimed to produce a credible and context-sensitive synthesis of existing research while identifying directions for future investigations into meaningful, human-centered, and responsible AI integration in English language teaching and learning.

Results and Discussion

a. Types of Artificial Intelligence Technologies and Applications Integrated into EFL Teaching and Learning

The integration of artificial intelligence in EFL education encompasses a diverse range of technologies designed to support language instruction, facilitate learning activities, and provide individualized educational assistance. The literature indicates that AI applications extend beyond a single technological category, involving intelligent tutoring systems, natural language processing (NLP), automated writing evaluation (AWE), speech recognition technologies, conversational agents, adaptive learning platforms, and generative artificial intelligence (GenAI). These technologies differ in their operational functions and pedagogical affordances, reflecting the increasingly diverse ways in which AI can support English language teaching and learning (Alshumaimeri & Alshememry [4], 2024; Crompton *et al*., 2024 [11]; Kundu & Bej, 2025 [15]).

One prominent category involves AI-powered writing applications, particularly automated writing evaluation systems and generative AI tools. These applications aid with grammatical accuracy, vocabulary selection, sentence construction, textual organization, and writing revision. AI-based writing systems can analyze learners' written production and generate feedback, while generative AI applications can assist with brainstorming, idea development, text generation, and language refinement. Research on AI-supported writing, including Alyami *et al*. (2025) [5] and Syafei and Nuraeningsih (2025) [20], illustrates growing interest in applying AI to writing instruction and assessment.

A second category involves conversational agents and intelligent tutoring systems. These applications facilitate interactive communication between learners and AI systems, allowing learners to practice English through simulated conversations, receive immediate responses, and engage in individualized language activities. Their conversational capabilities offer opportunities to extend language practice beyond conventional classroom interactions (Crompton *et al*., 2024 [11]). Such applications are particularly relevant to speaking development, communicative competence, and autonomous language practice.

A third category comprises speech recognition and pronunciation technologies. These applications are designed to recognize spoken language, evaluate pronunciation, and provide feedback on oral production. By enabling repeated speaking practice and immediate responses, speech recognition technologies can support learners in identifying pronunciation difficulties and developing greater confidence in oral communication. Similarly, AI-supported listening applications can facilitate language exposure through interactive listening activities and speech-related feedback.

Another category involves intelligent and adaptive learning technologies. These systems can analyze learner performance and adjust instructional content or learning activities according to individual progress and needs (Rebolledo & Gisbert, 2026) [11]. Their potential applications include vocabulary acquisition, grammar practice, reading comprehension, and personalized learning pathways. Such technologies reflect a shift toward more individualized learning experiences, in which instructional support can be adjusted to learners' developing language competencies.

More recently, generative artificial intelligence has expanded the range of possible applications in EFL education. Unlike conventional AI systems that primarily perform predefined functions, GenAI applications can generate context-sensitive responses, explanations, examples, learning materials, and communicative scenarios. These capabilities provide opportunities for learners and teachers to use AI across multiple language skills and instructional activities. Nevertheless, the educational value of these applications depends on the accuracy of generated information and the extent to which their outputs are critically evaluated and pedagogically adapted.

Overall, the range of AI technologies identified in the literature suggests that AI integration in EFL education is

characterized by functional diversity. Different applications serve different educational purposes, from providing corrective feedback and facilitating language practice to generating instructional resources and supporting personalized learning. Therefore, understanding AI integration requires examining not only the technologies being adopted but also the pedagogical functions they perform and the learning needs they are intended to address.

b. Integration of AI into Pedagogical Practices, Instructional Activities, and Language Skills Development

The integration of AI in EFL education involves more than the introduction of technological applications into language classrooms. It also concerns how these technologies are incorporated into instructional design, teaching strategies, learning activities, and assessment practices. The literature suggests that AI can support various stages of the teaching and learning process, including lesson preparation, instructional delivery, language practice, feedback provision, assessment, and independent learning. This development reflects a broader transition from technology adoption toward pedagogically informed AI integration.

In instructional planning and material development, AI applications offer opportunities for teachers to generate learning resources, develop contextualized language activities, prepare reading materials, and design exercises according to learners' proficiency levels. Generative AI can assist teachers in producing examples, explanations, discussion prompts, and communicative tasks. Such applications may reduce the time required for routine instructional preparation and provide additional flexibility in adapting learning materials to different classroom needs. However, teachers remain responsible for evaluating the relevance, accuracy, and appropriateness of AI-generated materials before incorporating them into instruction.

In classroom instruction, AI can function as a supplementary learning resource that facilitates individualized practice and interaction. Conversational agents, for example, can provide simulated communicative situations in which learners practice expressing ideas, responding to questions, and developing conversational competence. AI-supported activities may also encourage learners to engage in independent practice outside formal instructional settings. This flexibility is particularly relevant in EFL environments where opportunities for authentic English communication may be limited.

Regarding language skills development, AI integration can be examined across four principal language skills;

1. Writing. AI-supported writing applications have been used to facilitate different stages of the writing process, including brainstorming, drafting, editing, and revising. Automated writing evaluation systems can provide feedback on grammatical accuracy, vocabulary, and sentence construction, while generative AI applications can support idea development and textual organization. These functions create opportunities for iterative writing practice and feedback-based learning. Nevertheless, the pedagogical value of AI-assisted writing depends on whether learners critically examine suggestions rather than simply accepting generated revisions.
2. Speaking. Conversational AI and speech recognition technologies provide opportunities for oral language practice through simulated communication, pronunciation feedback, and interactive responses. These applications may help learners practice speaking more frequently and develop confidence in using English. Their potential contribution is particularly relevant to learners who have limited opportunities to communicate in English outside the classroom. However, AI-generated conversational interactions cannot fully reproduce the complexity of authentic human communication, including spontaneous interpersonal negotiation and sociocultural interpretation.
3. Reading. AI applications can support reading comprehension by providing explanations of unfamiliar vocabulary, simplifying complex passages, generating comprehension questions, and offering contextual information. Such assistance may help learners engage with texts that would otherwise be difficult to understand. Research examining learners' perspectives on AI applications in reading instruction, including. Pei (2026) [16], illustrates the relevance of AI-supported resources in reading-related learning activities. However, excessive reliance on automated explanations may reduce opportunities for independent interpretation and critical engagement with texts.
4. Listening. AI-supported listening activities can incorporate speech technologies, interactive conversational systems, and generated audio materials. Recent work has specifically examined AI-driven speech recognition in relation to listening comprehension and pronunciation accuracy. These applications may provide opportunities for repeated listening, exposure to different language expressions, and individualized practice. When integrated into structured instructional activities, AI can supplement listening materials and support learners' comprehension development. Nevertheless, the extent to which these applications improve listening competence needs to be examined through systematic assessment rather than inferred solely from technological availability.

Beyond the four language skills, AI integration also has implications for vocabulary development, grammar learning, learner autonomy, and self-regulated learning. AI applications can provide explanations, examples, corrective feedback, and individualized learning support. These functions may encourage learners to take greater responsibility for their learning activities. However, the development of learner autonomy requires more than independent access to AI tools; it also involves the ability to establish learning goals, evaluate feedback, monitor progress, and make informed decisions.

AI integration also introduces new considerations for language assessment. AI-powered systems can support automated feedback, evaluate aspects of written or spoken production, and provide information that may assist teachers in monitoring learner progress. Such functions can complement conventional assessment practices by facilitating more frequent feedback. Nevertheless, automated evaluation should not be treated as a complete substitute for teacher judgment, particularly when assessment involves creativity, communicative appropriateness, critical thinking, and contextual understanding.

Taken together, the integration of AI into EFL pedagogy involves multiple instructional functions and learning processes. Its effectiveness depends not simply on the presence of AI applications but on the alignment between technological capabilities, instructional objectives, learner characteristics, and teachers' pedagogical decisions. This distinction highlights the importance of meaningful pedagogical integration rather than technology adoption alone.

c. Contributions and Outcomes of AI Integration in EFL Teaching and Learning

The integration of AI into EFL education has been associated with several potential contributions to language teaching and learning. These contributions can be understood through interconnected dimensions, including language learning support, feedback and assessment, learner engagement, autonomous learning, instructional efficiency, and pedagogical flexibility. However, the reported benefits should be interpreted in relation to the specific technologies, educational contexts, and research designs examined in individual studies.

One important contribution concerns the provision of individualized and immediate feedback. Conventional classroom instruction may limit the frequency and specificity of feedback that teachers can provide, particularly in large classes or contexts involving learners with different proficiency levels. AI-powered applications can supplement teacher feedback by identifying language-related problems and providing suggestions for improvement (Alyami *et al*., 2025 [5]; Syafei & Nuraeningsih, 2025 [11]). In writing instruction, for example, automated writing evaluation systems can help learners identify grammatical and lexical issues, while generative AI can offer alternative expressions and explanations. These functions may support repeated revision and encourage learners to engage more actively with feedback.

Another contribution concerns opportunities for increased language practice. Conversational agents and speech recognition applications can facilitate additional speaking and pronunciation practice beyond scheduled classroom activities. Learners can interact with AI systems, repeat communicative tasks, and receive responses without depending exclusively on teacher availability or peer participation. This potential is particularly relevant in EFL contexts where opportunities for authentic English communication may be relatively limited.

AI integration may also contribute to learner autonomy and self-regulated learning. Through individualized explanations, adaptive activities, and on-demand feedback, learners can access support according to their immediate learning needs. AI applications can therefore function as supplementary resources for independent learning. However, meaningful autonomy requires learners to develop the capacity to evaluate AI-generated information, monitor their learning progress, and determine when technological assistance is appropriate. Without these capacities, frequent AI use may lead to dependency rather than genuine self-regulation.

A further contribution concerns learner engagement and motivation. Interactive AI applications can create opportunities for personalized activities, immediate responses, and repeated practice. Such features may make language learning more accessible and responsive to individual preferences. AI-supported conversational activities, for example, can provide additional opportunities for participation, while generative AI can facilitate the development of contextualized learning tasks. Nevertheless, engagement should not be understood solely in terms of the frequency of interaction with AI. The quality of cognitive involvement, critical reflection, and meaningful language production also needs to be considered.

From the teachers' perspective, AI integration can support instructional efficiency and pedagogical flexibility. Teachers may use AI to generate preliminary learning materials, develop examples, prepare assessment items, and provide supplementary explanations. These functions can potentially reduce time spent on repetitive preparation tasks and create opportunities for more individualized instructional support. However, such benefits depend on teachers' ability to evaluate AI outputs and adapt them to curricular objectives and learners' needs.

Overall, the contributions of AI integration extend beyond the immediate improvement of language-related tasks. AI can potentially transform how learners access feedback, practice language skills, manage independent learning, and interact with instructional resources. Similarly, it can expand teachers' options for designing learning activities and supporting assessment. Nevertheless, the relationship between AI use and improved learning outcomes should not be assumed to be automatic. The educational impact of AI depends on the quality of pedagogical implementation, learners' critical engagement, teacher guidance, and the appropriateness of the technology for specific instructional purposes.

d. Challenges, Ethical Considerations, and Contextual Factors Influencing AI Integration in EFL Education

Despite its potential contributions, the integration of AI into EFL education presents several pedagogical, technological, ethical, and institutional challenges. These challenges demonstrate that the availability of AI applications does not necessarily guarantee effective educational implementation. Instead, successful integration requires appropriate technological infrastructure, teacher preparation, learner competencies, institutional guidance, and responsible use.

One major concern relates to the accuracy and reliability of AI-generated information. Generative AI systems may produce inaccurate explanations, misleading linguistic suggestions, fabricated references, or contextually inappropriate responses. In EFL learning, such errors may negatively influence learners' understanding of grammatical structures, vocabulary, academic conventions, and language use. Learners who lack sufficient linguistic knowledge may find it difficult to distinguish accurate feedback from incorrect suggestions. Therefore, AI-generated outputs require critical evaluation and, when necessary, verification through reliable learning resources and teacher guidance.

Another concern involves learners' overdependence on AI applications. Although AI can support language production and facilitate access to explanations, excessive reliance may reduce opportunities for independent thinking, problem-solving, and language production. For example, learners who repeatedly use generative AI to produce complete written texts may complete assignments more efficiently but have fewer opportunities to develop their own ideas, organize arguments, and make independent linguistic

decisions. This issue highlights the distinction between using AI as a learning scaffold and allowing AI to replace essential cognitive and linguistic processes.

Academic integrity represents another significant challenge. The ability of generative AI to produce coherent texts, summaries, and responses raises questions concerning authorship, originality, plagiarism, and the appropriate boundaries of technological assistance in academic work. In EFL education, these concerns are particularly relevant to writing assignments and language assessments. Teachers and institutions therefore need to establish clear guidelines regarding acceptable AI use, disclosure of AI assistance, and the assessment of students' independent contributions.

Data privacy and algorithmic bias also require attention. AI applications may process personal information, written assignments, spoken responses, and other learner-generated data. The collection and use of such information raise questions concerning data protection, consent, and the responsible management of educational information. Furthermore, AI systems may reproduce linguistic or cultural biases that affect the relevance and fairness of their responses. These concerns suggest that AI integration should involve consideration of not only instructional effectiveness but also the rights and interests of learners.

Teacher readiness and professional competence constitute additional factors influencing effective implementation. The integration of AI requires teachers to develop technological knowledge, understand the pedagogical functions of different AI applications, and critically evaluate generated outputs (An *et al*., 2023 [6].; Alshammari & Singh, 2025 [3].; Arslan, 2025 [7].). Teachers also need to determine when AI can support instructional objectives and when direct human intervention is more appropriate. Without adequate preparation and professional development, AI may be used primarily for convenience rather than as part of a coherent pedagogical strategy. Research examining teachers' perceptions, technological readiness, and behavioral intentions, such as An *et al*. (2023) [6]., Babanoğlu *et al*. (2025) [9]., Alshammari and Singh (2025) [3]., and Zhou and Hou (2025) [22]., provides relevant perspectives on the human factors involved in AI adoption and implementation.

Contextual conditions further influence the accessibility and effectiveness of AI integration. Differences in internet connectivity, access to digital devices, institutional resources, subscription costs, and technological infrastructure may create unequal opportunities for learners and teachers. These challenges may be particularly significant in educational environments where access to digital resources is limited. In addition, differences in learners' digital competence and AI literacy may influence their ability to use AI applications effectively and responsibly.

These challenges indicate that effective AI integration requires a balanced approach involving technological innovation, pedagogical judgment, ethical awareness, and institutional support. AI should function as a complementary resource that strengthens teaching and learning rather than replacing teachers' professional expertise or learners' responsibility for their own intellectual development. Consequently, responsible AI integration requires clear institutional policies, teacher professional development, learner education in AI literacy, and assessment practices that recognize the importance of independent thinking and authentic language production.

e. Research Gaps and Future Directions for Human-Centered and Responsible AI Integration in EFL Education

The growing body of research on AI integration in EFL education demonstrates expanding interest in technological applications, pedagogical innovation, and language learning outcomes. Nevertheless, several areas require further investigation to develop a more comprehensive understanding of how AI can be integrated effectively, equitably, and responsibly into English language teaching and learning.

First, further research is needed to examine the relationship between AI adoption and meaningful pedagogical integration. Existing research has increasingly documented the use of AI applications in language learning activities, but the presence of technology does not necessarily indicate substantial pedagogical transformation. Future studies should investigate how AI is connected to learning objectives, instructional strategies, curriculum development, classroom interaction, and assessment. Greater attention should also be given to how teachers make pedagogical decisions when selecting and incorporating AI applications into their instructional practices.

Second, additional research is needed across different language skills and educational contexts. Although AI applications have been investigated in writing, speaking, reading, and vocabulary development, the available literature requires further synthesis concerning the specific mechanisms through which different technologies support language learning. Comparative research could examine whether particular AI applications are more appropriate for specific language skills, proficiency levels, or instructional objectives. Longitudinal investigations would also help establish whether the benefits of AI-supported learning are sustained over time rather than limited to short-term improvements or positive user perceptions.

Third, the development of learners' critical AI literacy requires greater attention. Effective AI integration involves more than knowing how to operate technological applications. Learners need to understand the capabilities and limitations of AI, evaluate the accuracy of generated outputs, identify potential bias, and make informed decisions about when and how to use AI assistance. Future research should therefore investigate how critical AI literacy can be integrated into EFL curricula and how it influences learners' critical thinking, language development, academic integrity, and independent learning.

Fourth, the professional development of EFL teachers represents an important direction for future research. Teachers require more than technical familiarity with AI applications; they also need pedagogical knowledge and ethical awareness to integrate AI meaningfully into instruction. Future studies could investigate professional development models that combine AI literacy, pedagogical competence, assessment literacy, and responsible AI use. The relationship between teachers' AI competencies, pedagogical beliefs, institutional support, and actual classroom implementation also warrants further examination.

Fifth, human–AI collaboration requires more systematic investigation. Future research should examine how AI can complement teacher expertise and learner agency without reducing opportunities for human interaction, creativity, critical reflection, and communicative development. Rather

than positioning AI as a replacement for teachers or an independent source of knowledge, research should explore collaborative models in which AI provides supplementary assistance while teachers maintain responsibility for pedagogical decisions and learners remain actively involved in constructing knowledge.

Finally, ethical and contextual dimensions should receive greater attention in future research. Issues concerning data privacy, algorithmic bias, academic integrity, accessibility, and unequal technological opportunities require investigation across diverse EFL settings. Research conducted in different geographical, institutional, and socioeconomic contexts could provide a more comprehensive understanding of the conditions influencing equitable AI integration. In addition, future studies should examine institutional policies and assessment frameworks that support transparent, accountable, and responsible AI use in language education.

Overall, the future development of AI integration in EFL education requires a shift from an application-oriented perspective toward a human-centered and pedagogically grounded approach. This perspective recognizes that the educational value of AI is determined not simply by technological sophistication but by how effectively AI supports meaningful learning, strengthens teacher expertise, promotes learner agency, and safeguards ethical educational practices. Accordingly, future research should investigate the interconnected relationships among technological capabilities, pedagogical decision-making, critical AI literacy, human–AI collaboration, and responsible implementation. Such investigations may contribute to a more sustainable and educationally meaningful integration of artificial intelligence in English language teaching and learning.

Conclusion

This systematic literature review examined the integration of artificial intelligence in English as a Foreign Language (EFL) teaching and learning, focusing on technological applications, pedagogical practices, language learning processes, reported contributions, and emerging challenges. The review highlights that AI integration in EFL education extends beyond the adoption of individual technological applications toward a broader transformation of instructional practices, learning experiences, and teacher–learner interactions.

The reviewed literature indicates that AI technologies encompass diverse applications, including generative artificial intelligence, conversational agents, automated writing evaluation systems, speech recognition technologies, natural language processing, intelligent tutoring systems, and adaptive learning platforms. These technologies serve different educational purposes, ranging from providing language feedback and facilitating communicative practice to supporting instructional material development, personalized learning, and assessment. Their applications across writing, speaking, reading, and listening demonstrate the potential of AI to support multiple dimensions of English language development.

In terms of pedagogical integration, AI provides opportunities to enrich instructional design, facilitate interactive learning activities, support differentiated instruction, and expand access to individualized feedback. AI applications can also encourage autonomous learning by enabling learners to access explanations, practice language skills, and monitor aspects of their learning independently. Nevertheless, the educational value of these technologies depends on their alignment with instructional objectives, learners' needs, and teachers' pedagogical decisions. The integration of AI should therefore be understood as a pedagogical process rather than simply the introduction of technological tools into language classrooms.

The review also highlights several potential contributions of AI to EFL education, particularly in facilitating immediate feedback, increasing opportunities for language practice, supporting learner engagement, and improving instructional flexibility. However, these contributions should not be interpreted as automatic or universal improvements in learning outcomes. Their effectiveness depends on the quality of implementation, learners' ability to critically evaluate AI-generated information, and teachers' capacity to incorporate technological assistance into meaningful learning experiences.

Despite these opportunities, several challenges remain significant. Concerns regarding the accuracy and reliability of AI-generated outputs, academic integrity, plagiarism, data privacy, algorithmic bias, and learners' overdependence on AI may undermine the quality of educational implementation. Differences in technological infrastructure, digital competence, AI literacy, and teacher readiness may further influence the accessibility and effectiveness of AI integration across educational contexts. These challenges emphasize the importance of establishing institutional guidelines, strengthening teacher professional development, and developing learners' critical and responsible AI literacy.

The findings suggest three important directions for the future development of AI-integrated EFL education. First, educational practices need to move beyond AI adoption toward meaningful pedagogical integration, in which technological applications are selected and implemented according to clearly defined instructional purposes. Second, greater emphasis should be placed on human–AI collaboration, ensuring that AI complements teachers' professional expertise and learners' active participation rather than replacing essential human and cognitive processes. Third, AI integration should be guided by critical and responsible engagement, enabling teachers and learners to evaluate AI-generated outputs, recognize technological limitations, and make ethical decisions concerning its educational use.

This review contributes to the understanding of AI integration in EFL education by connecting technological applications with pedagogical practices, language learning processes, stakeholder competencies, and ethical considerations. It also highlights the need for future empirical research to examine the long-term effects of AI-supported instruction, the development of critical AI literacy, teacher professional development, and the effectiveness of human-centered AI integration across diverse EFL contexts. Comparative and longitudinal studies would be particularly valuable in understanding how contextual conditions, learner characteristics, and instructional approaches influence the outcomes of AI-supported language education (Qin & Chuaychoowong, 2025) [17].

Several limitations should also be acknowledged. The review was based on literature retrieved from a single database, Scopus, and was restricted to English-language

journal articles published between 2021 and 2026. Consequently, relevant studies indexed in other databases or published in other languages may not have been represented. Furthermore, the synthesis was limited to the information reported in the selected publications and should not be interpreted as establishing causal relationships between AI integration and language learning outcomes. Future reviews could incorporate multiple databases, broader publication coverage, and more detailed assessments of methodological quality to provide a more comprehensive understanding of this evolving research area. Ultimately, the successful integration of artificial intelligence in EFL education should not be measured solely by the sophistication or availability of technological applications. Rather, its value lies in how effectively AI supports meaningful language learning, strengthens pedagogical decision-making, promotes learner agency, and maintains ethical and human-centered educational practices. AI should function as a complementary educational resource that enhances, rather than replaces, the essential roles of teachers and learners in the language learning process.

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