



# AI in English Language Learning: Balancing Innovation, Opportunity, and Human Connection

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Siti Annisa Dahlan\*

## Abstract:

**Background:** Artificial Intelligence (AI) has transformed English language learning through personalized instruction and real-time feedback. However, current literature shows a critical gap: studies focus either on technological capabilities or pedagogical problems in isolation, lacking frameworks that balance innovation with humanistic teaching principles.

**Aims:** In order to investigate AI integration in English language learning, this systematic review will: (1) identify opportunities that AI presents; (2) analyze challenges and constraints; (3) develop a conceptual framework that strikes a balance between technological innovation and humanistic pedagogy; and (4) offer evidence-based recommendations for educators and policymakers.

**Methods:** Thirty peer-reviewed publications from Web of Science, Scopus, ERIC, and Google Scholar were systematically reviewed between January 2023 and August 2025 in accordance with PRISMA principles. A modified CASP checklist was utilized for quality assessment. Humanistic Learning Theory and TPACK frameworks served as the basis for the analysis.

**Results:** 73% of studies (n=22) found that accessibility and personalization improved writing accuracy and student motivation. But 50% (n=15) expressed worries about emotional engagement and ethical integrity. Problems included decreased personal connection, especially in collectivist societies (27%, n=8), algorithmic prejudice (17%, n=5), and plagiarism facilitation (30%, n=9). The four guiding concepts of the Innovation-Empathy Balance Model are educational intentionality, professional capacity building, ethical vigilance, and strategic complementarity.

**Conclusion:** AI-enhanced English language instruction has a number of prospects, but it necessitates striking a balance between humanistic pedagogy and technology innovation. The Innovation-Empathy Balance Model emphasizes intentional deployment, teacher preparation, and preserving human connection in education, positioning AI as a strategic supplement to human-centered teaching.

**Keywords:** Artificial Intelligence, English Language Learning, Humanistic Pedagogy, Empathy-Centered Teaching, TPACK Framework

## 1. INTRODUCTION

Artificial Intelligence (AI) refers to computational systems capable of performing tasks traditionally requiring human intelligence, including language processing, pattern recognition, and adaptive decision-making. Conversational agents, automated assessment tools, intelligent tutoring systems, and personalized learning platforms are examples of how AI is used in

education. By providing real-time grammar correction, pronunciation feedback, vocabulary acquisition support, and interactive speaking practice, AI technologies have transformed English language learning (ELL), making high-quality language instruction more accessible (AI) refers to computational systems capable of performing tasks traditionally requiring human intelligence, including language processing, pattern recognition, and adaptive decision-making. Conversational agents, automated assessment tools, intelligent tutoring systems, and personalized learning platforms are examples of how AI is used in education. By providing real-time grammar correction, pronunciation feedback, vocabulary acquisition support, and interactive speaking practice, AI technologies have transformed English language learning (ELL), making high-quality language instruction more accessible outside traditional classrooms (Chen, 2024; Kristiawan et al., 2024).

The need for English proficiency has increased significantly due to globalization, yet traditional educational systems often struggle to meet the diverse needs of students due to limited teacher resources and standardized curricula (Yuli Rohmiyati, 2025). AI fills

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these gaps by offering individualized learning experiences, immediate feedback, and flexible access to practice opportunities (Abimanto & Mahendro, 2023; Lesmana & Fitriani, 2023; Sargsyan, 2025). Empirical studies have demonstrated measurable improvements in reading comprehension, writing accuracy, and student motivation through the use of technologies such as Grammarly, Duolingo, and ChatGPT (Alberth, 2023; Wei, 2023; Nurazizah, 2025; Alvarado & Andrade, 2025). AI technologies have also been shown to enhance all four communication skills speaking, listening, reading, and writing through personalized and interactive learning experiences (Rusmiyanto et al., 2023).

Despite increasing research on AI in language instruction, current literature shows a major gap: studies either focus only on technological capabilities (Kristiawan et al., 2024) or pedagogical problems (Nurazizah, 2025) in isolation. There is no complete framework that unifies both perspectives while balancing innovation and humanistic ideals. Educators worldwide face obstacles when integrating AI tools without explicit guidance on maintaining pedagogical integrity (Crompton et al., 2024). Recent research highlights the need to balance innovation and equality in AI implementation (Khawaja & Karimi, 2024) and represent a transformative force reshaping English language education in the 21st century (Kumari, 2025). This means addressing access gaps and inclusive design principles alongside technological advances.

This paper argues that AI can improve English learning outcomes most effectively when integrated with empathy-centered teaching (Jamaluddin & Mokhtar, 2025). While AI excels at efficiency and scalability, effective language instruction requires emotional support, cultural sensitivity, and the development of human relationships that promote deep learning and personal development (Qassrawi & Al Karasneh, 2025). This systematic review synthesizes current research to offer a comprehensive framework for integrating AI in ELL that leverages technical capabilities while preserving humanistic principles necessary for transformational education.

The objectives of the research are to: (1) systematically identify and synthesize the opportunities that AI presents for English language learning; (2) critically analyze the difficulties and constraints of AI-enhanced language pedagogy (Badri et al., 2024); (3) create a novel conceptual framework that strikes a balance between technological innovation and humanistic pedagogy; and (4) offer evidence-based recommendations for educators and policymakers. The methodology, prospects, difficulties, theoretical underpinnings, the Innovation-Empathy Balance Model, practical implications with limitations, and future research directions comprise the sections of the article.

## 2. MATERIAL AND METHOD

This study employed a systematic literature review (SLR) methodology to investigate the integration of Artificial Intelligence (AI) in English Language Learning (ELL), with an emphasis on balancing technological innovation and humanistic pedagogy. SLRs adhere to clear, reproducible procedures intended to reduce bias and increase thoroughness, enabling rigorous synthesis across multiple studies.

The sample of this research consisted of 30 peer-reviewed scholarly articles selected through systematic screening procedures. A purposive sampling method was employed, utilizing predefined inclusion and exclusion criteria to identify relevant studies published between January 2023 and August 2025. The initial database search identified 187 articles, which were systematically reduced to 30 articles through a multi-stage selection process following Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.

The research was conducted from September 2025 to November 2025. The literature search and data extraction were performed remotely using online academic databases including Web of Science, Scopus, Education Resources Information Center (ERIC), and Google Scholar. The entire review process, including quality assessment and thematic analysis, was completed over a three-month period.

The research procedures involved five distinct phases following PRISMA methodology. First, a comprehensive literature search was conducted across multiple databases using Boolean search operators. Second, duplicate removal was performed, eliminating 43 duplicate entries from the initial 187 articles, resulting in 144 unique articles. Third, title and abstract screening was conducted to assess relevance, reducing to 62 articles for full-text review. Fourth, full-text assessment evaluated all 62 articles against established inclusion and exclusion criteria. Fifth, final selection resulted in 30 articles meeting all criteria for inclusion in the systematic review.

Data collection techniques employed Boolean operators combining specific keywords: ("artificial intelligence" OR "AI" OR "machine learning") AND ("English language learning" OR "ELL" OR "language education" OR "TESOL" OR "EFL") AND ("pedagogy" OR "teaching" OR "learning outcomes"). The inclusion criteria were: (1) peer-reviewed journal articles, systematic reviews, and empirical studies; (2) published between 2023 and 2025; (3) focus on AI applications in English language learning contexts; (4) coverage of various educational levels including elementary, secondary, and higher education; and (5) English-

language publications. The exclusion criteria were: (1) non-peer-reviewed sources; (2) studies focusing exclusively on languages other than English; (3) purely technical papers without pedagogical context; (4) studies published before 2023; and (5) duplicate publications. Figure 1 presents the PRISMA flow diagram illustrating the systematic selection process from initial identification through final inclusion.

Research instruments utilized in this study included bibliographic management software (Mendeley) for organizing and tracking retrieved articles, Microsoft Excel for creating and maintaining the data extraction spreadsheet, and qualitative analysis software for systematic coding and thematic organization. A standardized data extraction form was developed to systematically record study characteristics including

author, publication year, country of study, educational setting, research design, AI technologies assessed, principal findings, and pedagogical implications. Quality assessment was conducted using a modified Critical Appraisal Skills Program (CASP) checklist specifically adapted for educational technology research. Each included study was evaluated across five key dimensions: clarity of research objectives, methodological appropriateness, transparency in data collection, rigor in data analysis, and clarity of findings. Each criterion was scored on a scale of 0 to 2, with total scores ranging from 0 to 10. During the screening process, 5 low-quality articles were eliminated for failing to meet the minimum threshold of 5 points. All 30 articles included in the final analysis scored in the medium-to-high range (5 to 10 points), as summarized in Table 1.

**Table 1.** Quality Assessment of Included Studies

Quality Category	Score Range	Number of Articles	Percentage %
High Quality	8-10	12	40%
Medium Quality	5-7	18	60%
Low Quality	0-4	0 (5 Excluded)	0%
Total Included		30	100%

The analysis plan consisted of two primary components: quality assessment and thematic synthesis. Each included study was evaluated using the modified CASP checklist, which assessed five key dimensions: (1) clarity of research objectives, (2) methodological appropriateness, (3) transparency in data collection procedures, (4) rigor in data analysis, and (5) clarity of findings and conclusions. Each criterion was scored on a scale of 0 to 2, with total scores ranging from 0 to 10. Studies scoring 8 to 10 were classified as high quality, 5 review, several quality control measures were implemented including pre-registered inclusion and exclusion criteria, standardized data extraction forms, validated quality assessment tools, and maintenance of a reflexive research diary documenting methodological decisions throughout the review process. The analysis was guided by two complementary theoretical frameworks: Technological Pedagogical Content Knowledge (TPACK) framework and Humanistic Learning Theory. TPACK foregrounds the interactions between pedagogy, technology, and content knowledge necessary for effective teaching practice, while Humanistic Learning Theory emphasizes learner autonomy, emotional engagement, and self-

actualization, underscoring the importance of human connection in education.

The scope of this systematic review was deliberately limited to studies examining AI applications in English language learning contexts, specifically focusing on peer-reviewed empirical research and systematic reviews published between 2023 and 2025. The review encompassed various educational levels including primary, secondary, and tertiary education, as well as diverse AI technologies such as chatbots, natural language processing applications, virtual tutors, adaptive learning platforms, and automated assessment tools. Several limitations should be acknowledged. First, the restriction to a recent three-year publication window (2023 to 2025) provides current insights but limits historical perspective on the evolution of AI integration in language learning. Second, limiting the review to 7 as medium quality, and 0 to 4 as low quality. Low-quality studies were eliminated from the review. All 30 articles included in the final analysis scored in the medium-to-high range (5 to 10 points). Following quality assessment, a five-stage thematic analysis was conducted: initial coding of study findings, development of preliminary themes, refinement and reorganization of

themes, interpretation of patterns across studies, and synthesis of findings into coherent narratives. To enhance methodological rigor in this single-author. English-language publications may have excluded relevant studies published in other languages, potentially introducing language bias. Third, the exclusive focus on peer-reviewed literature means that potentially valuable grey literature, conference proceedings, and unpublished studies were not included in the analysis. Fourth, as a single-author review, despite rigorous quality control measures, potential bias in study selection, data extraction, and interpretation cannot be entirely eliminated. Fifth, the predominance of studies conducted in higher education contexts (approximately 50 percent of reviewed studies) limits generalizability of findings to primary and secondary educational settings. Sixth, most empirical interventions reviewed were

short-term studies (4 to 12 weeks duration), limiting understanding of long-term effects of AI integration on language learning outcomes. Seventh, geographical imbalances exist in the available literature, with studies predominantly conducted in specific regions, potentially limiting the cross-cultural applicability of findings.

### 2.1 Figures and Tables

This analysis was guided by two complementary frameworks: Technological Pedagogical Content Knowledge (TPACK) and Humanistic Learning Theory (Rogers, Maslow). TPACK foregrounds the interactions between pedagogy, technology, and content knowledge for effective teaching practice. Humanistic Learning Theory emphasizes learner autonomy, emotional engagement, and self-actualization, underscoring the importance of human connection in education.

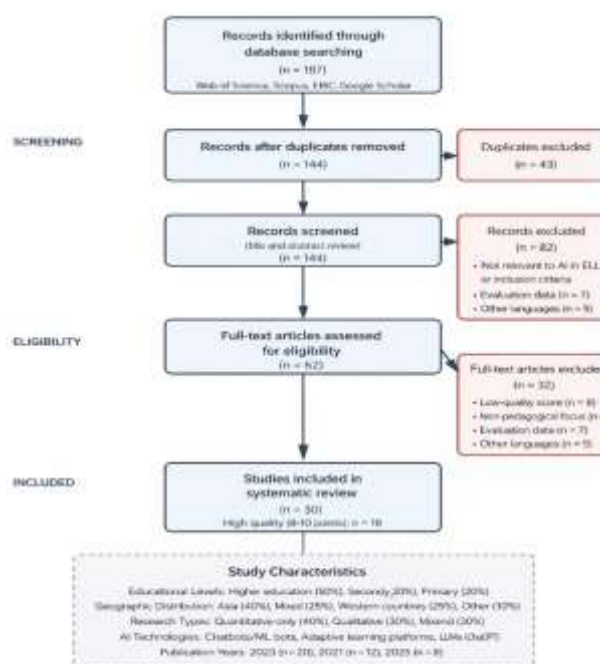


Figure 1. PRISMA flow diagram illustrating the systematic selection process.

### 2.2 Abbreviations and Acronyms

The following abbreviations and acronyms are used throughout this paper: AI (Artificial Intelligence), ELL (English Language Learning), SLR (Systematic Literature Review), PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses), CASP (Critical Appraisal Skills Programme), TPACK (Technological Pedagogical Content Knowledge), TESOL (Teaching English to Speakers of Other Languages), EFL (English as a Foreign Language), ERIC (Education Resources Information Center), NLP (Natural Language Processing).

## 3. RESULT AND DISCUSSION

### 3.1 Result

The results of a systematic review of thirty peer-reviewed articles on the integration of AI in English language learning are presented in this section. Thirty peer-reviewed articles published between January 2023 and August 2025 were chosen for in-depth examination after the systematic review procedure. The integration of AI into English language learning situations across various educational levels and geographical locations was the focus of these papers.

### 3.1.1 Descriptive Characteristics of Included Studies

The 30 papers that were analyzed were distributed geographically as follows: Asia (n = 18, 60%), Europe (n = 5, 17%), the Middle East (n = 4, 13%), and North America (n = 3, 10%). Due to significant institutional and governmental investments in educational technology infrastructure, this distribution shows concentrated research activity in Asian contexts.

Higher education (n = 15, 50%), secondary education (n = 8, 27%), primary education (n = 4, 13%) and mixed or indeterminate levels (n = 3, 10%) were all included in the studies. Studies at the primary level have explored AI's impact on young learners' speaking skills development (Hartati et al., 2025).

Positive opinions of AI in English learning were found in a qualitative study of Indonesian university students. Participants acknowledged how AI improves academic learning while increasing involvement and providing personalized educational experiences

### 3.1.2 Opportunities: Innovation and Accessibility

According to the analysis, the two biggest advantages of integrating AI were accessibility and personalization, according to 73% of the studies (n=22) that were looked at. Through self-regulated learning chances, (Wei, 2023) experimental study showed that AI instruction greatly improved L2 motivation and English learning achievement ( $p < 0.05$ ). AI technology produced more flexible learning settings than conventional methods, according to Abimanto & Mahendro (2023). According to studies, using interactive modules and real-time feedback, AI-powered tools improve vocabulary acquisition, pronunciation accuracy, and contextual understanding (Thayib Pido et al., 2025). Studies consistently demonstrate AI's positive impact on English learning experiences through enhanced accessibility and personalization (Lesmana & Fitriani, 2023).

AI's ability to deliver immediate, comprehensive response was emphasized in seventeen investigations (57%, n=17). According to Nurazizah (2025) and Alberth (2023), writing accuracy was greatly improved by automated writing assessment systems like Grammarly and ChatGPT. Alberth (2023) cautioned that if pupils became overly reliant on this technology, they could turn into "a curse in disguise."

The democratizing potential of AI was highlighted in thirteen papers (43%, n=13). According to Bibi & Shahzad (2025), AI solves the "accessibility problem" by offering personalized input regardless of financial or geographical limitations. Illananingtyas (2025) described how learning chances in circumstances with limited resources were made possible by AI technologies. Crucially, 18 out of 22 research (82%) that reported favorable results also recognized contextual constraints. According to Yuli Rohmiyati (2025), the

democratizing potential of AI was limited by infrastructure constraints in developing countries.

### 3.1.3 Challenges: Pedagogical Ethics and Emotional Engagement

Issues about ethical issues (n = 9, 30%) and emotional engagement deficits (n = 6, 20%) were expressed in fifteen investigations (50%, n = 15). When integrating AI into learning management systems for EFL instruction, teachers have noted both affordances and major obstacles (Yawan et al., 2025).

Ethical issues were found in nine studies (30%, n=9). AI affordances and risks to academic rigor were thoroughly categorized by Crompton et al. (2024). 60% of challenge-focused studies had plagiarism facilitation issues, according to the research. Algorithmic bias was the subject of five investigations (17%, n=5). These were described as existential "threats" to educational integrity by Rukiati et al. (2023). No examined study offered all-encompassing answers.

Concerns about emotional engagement were reported in six trials (20%, n=6). Almutairi (2025) cautioned that an excessive dependence on AI reduced the possibility of real conversation. Eight studies (27%, n=8) from collectivist societies exhibited more anxiety about the loss of interpersonal connections than seven studies (23%, n=7) from individualist contexts, according to cross-study analysis. According to Bibi & Shahzad (2025) study of Pakistani EFL teachers, emotional intelligence deficiencies continue to be a major barrier to AI.

### 3.1.4 Framework Development: Integrating TPACK and Humanism

A theoretical gap was identified by the synthesis: no framework currently in use effectively integrated AI automation with empathy-based instruction. While seven (23%, n=7) used humanistic ideas, twelve (40%, n=12) used TPACK concepts; nevertheless, none combined the two viewpoints.

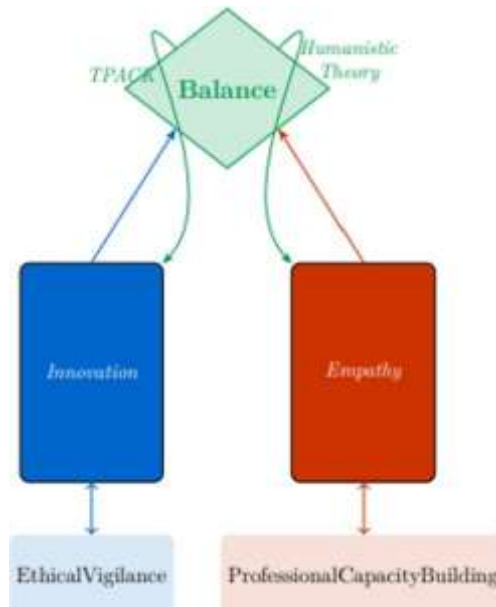
The fundamental TPACK structure was provided by Mishra & Koehler (2006). Teaching empathy and soft skills is crucial in the AI era, according to Jamaluddin & Mokhtar (2025). Human-centric abilities should be redefined, according to Qassrawi & Al Karasneh (2025). According to Khawaja & Karimi (2024), frameworks need to take equality issues into account. Balanced techniques were advocated by Kussin et al. (2023).

### 3.1.5 The Innovation-Empathy Balance Model

This review suggests the Innovation-Empathy Balance Model, which views human empathy and technical innovation as complementing factors, based on gaps found. Through four implementation principles, the paradigm combines Humanistic Learning Theory with TPACK:

1. Strategic complementarity: Use AI for repetitive activities while keeping human assistance for complex cognitive and emotional processes (Wei, 2023).
2. Ethical vigilance: Create structures for fair access, privacy protection, and bias mitigation (Sargsyan, 2025).
3. Pedagogical intentionality: Make sure that the use of technology advances certain educational goals (Mishra & Koehler, 2006).
4. Investing in teacher training for critical AI adoption and evaluation is one way to enhance professional competence (Badri et al., 2024).

This model advances scholarly understanding by shifting the debate from technology versus humanity to technology through humanity integration, providing concrete evidence-based principles that practitioners can apply, and recognizing that optimal integration necessitates contextual adaptation.



**Figure 2.** Innovation-Empathy Balance Model: AI as strategic complement to human-centered pedagogy

### 3.2 Discussion

#### 3.2.1 Implications

The conclusions of this analysis have important ramifications for educators, administrators, curriculum designers, and legislators.

**For Teachers in the Classroom:** According to the strategic complementarity principle, educators should concentrate on high-value human interactions while leveraging AI for mundane activities like vocabulary drills and grammatical checks. According to (Alberth, 2023) caution against over-reliance, educators need to help students acquire crucial AI literacy. Implementation should be culturally sensitive, according to the cultural variance finding, with collectivist situations emphasizing that AI enhances rather than replaces teacher-student connections.

**For School Leaders:** According to Badri et al. (2024) & Thayib Pido et al., (2025) administrators should invest in ongoing professional development to address capacity requirements. Leaders need to set ethical

standards that address issues of bias, privacy, and plagiarism (30% of studies). Planning for professional development and successful implementation of AI-integrated learning platforms require an understanding of teachers' viewpoints (Yawan et al., 2025). According to Yuli Rohmiyati (2025) research on infrastructure constraints, equal access to devices, connection, and technical assistance is necessary.

Curriculum designers ought to include AI literacy as a learning goal. While utilizing AI for formative feedback, assessment design must withstand plagiarism enabled by AI. Given that 20% of studies expressed worries about emotional connection, it is necessary to strike a balance between AI-supported and AI-resistant abilities that necessitate human interaction.

**For Policymakers:** While taking into account local realities, policy frameworks should offer guidelines for implementation. One-size-fits-all regulations run the danger of being out of step with local values, according to the cultural variance found. Concerns about the digital

divide brought up in 43% of studies must be addressed by infrastructure investment.

### 3.2.2 Research Contribution

This systematic review makes several distinct contributions:

**Empirical Contribution:** Current evidence throughout the rapid growth of AI is provided by the synthesis of thirty recent investigations (2023–2025). A balanced conversation that goes beyond divisive viewpoints is made possible by systematic quantification (73% reported customization benefits; 50% expressed concerns).

**Theoretical Contribution:** By combining TPACK with Humanistic Learning Theory, the Innovation-Empathy Balance Model is a novel synthesis. The paradigm goes beyond frameworks that treat socioemotional aspects as secondary by placing empathy on par with technological, pedagogical, and topic expertise.

**Methodological Contribution:** Transparent, repeatable documentation is produced via a strict PRISMA-guided methodology with clear quality evaluation. A road map for raising the caliber of research is provided by identifying methodological constraints (short-term durations, concentration in higher education, geographic imbalances).

**Cultural Contribution:** discovery cultural differences in emotional engagement concerns (collectivist 27% vs. individualist 23%) is a novel discovery that emphasizes the need for frameworks that are culturally sensitive rather than universal.

**Practical Contribution:** Four implementation principles offer practitioners practical advice. This offers a helpful foundation for ethical AI integration, as contrast to reviews that only concentrate on description or criticism.

**Contribution to Gap Identification:** An agenda for future research is created by methodically documenting research gaps, such as underrepresentation in primary education, short-term studies, geographic imbalances, and the lack of proven ethical remedies.

### 3.2.3 Limitation

It is important to recognize a few limitations:

**The size of the sample Restrictions** Despite being carefully chosen, the 30-study sample restricts generalizability. Modest absolute numbers provide the basis of statistical patterns (73% benefits, 30% ethical problems).

**Temporal Restrictions:** While the 2023–2025 window offers up-to-date information it restricts historical perspective on the development of AI integration.

**Language and Publication Bias:** Relevant non-English research may be overlooked if only English-language publications are included. By concentrating just on peer-

reviewed papers, grey literature that may reveal implementation issues that are not adequately disclosed in peer-reviewed venues is left out.

**Single-Author Limitations:** Without several independent reviewers, potential bias in research selection, extraction, and interpretation cannot be completely removed despite quality controls.

**Contextual Generalizability Limitations:** Generalizability to other levels and locations is limited by the prevalence of higher education (50%) and the concentration of Asian contexts (60%).

**Methodological heterogeneity:** hampered the ability to make strong causal assertions and hindered meta-analytic synthesis because to the variety of approaches, outcome measures, and AI technology.

**Study Duration Restrictions:** Understanding long-term impacts was hampered by the majority of therapies' short duration (4–12 weeks).

### 3.2.4 Suggestion

**For Upcoming Studies:** Larger, more varied samples with increased regional representation should be used in future studies. Large-scale quantitative and longitudinal studies evaluating long-term effects should be the focus of methodological expansion. Thirty percent of studies found ethical issues, which intervention research should address and test. Research on cultural comparisons should methodically investigate whether AI integration tendencies are mediated by collectivist-individualist features. The efficacy of the Innovation-Empathy Balance Model should be empirically tested in framework validation study.

**For Practice:** Educators should be trained in efficient AI integration through professional development programs (Badri et al., 2024). Particularly in environments with limited resources, policymakers should guarantee fair access to AI resources. In order to promote genuine communication and learner autonomy, implementation must strike a balance so that AI enhances rather than replaces teacher engagement (Qassrawi & Al Karasneh, 2025).

**For Policy:** Educational agencies should develop frameworks addressing both innovation and equity. Investment in infrastructure must address access disparities. Research funding should prioritize identified gaps including primary education contexts, longitudinal studies, and ethical solution development.

## 4. CONCLUSION

This systematic literature review demonstrates AI's transformative potential for English language learning through personalized instruction, real-time feedback, enhanced accessibility, and measurable gains across language domains. Thirty peer-reviewed articles from

2023 to 2025 were analyzed, and the results showed that while 50% of the research expressed concerns about ethical integrity and emotional engagement, 73% of the studies identified benefits related to customisation and accessibility.

Benefits must be weighed against serious threats to equality, critical thinking, teacher-student relationship, and emotional engagement. Reduced human connection, especially in collectivist educational systems (27%), algorithmic prejudice (17%), and plagiarism facilitation (30%) were the main issues.

A practical framework that emphasizes four principles strategic complementarity, ethical vigilance, pedagogical intentionality, and professional capacity building the Innovation-Empathy Balance Model combines TPACK with Humanistic Learning Theory. By using technology for regular chores and maintaining teacher-led facilitation for emotional and relational work, this approach presents AI as a strategic supplement to human-centered teaching.

AI can be a potent supplement to teacher-led language instruction with careful planning, sufficient training for teachers, ethical awareness, and dedication to humanistic principles. Sustained professional development, equitable access policies, and ongoing research into long-term impacts and culturally sensitive methods are all need for future implementation to address identified problems.

## 5. ACKNOWLEDGEMENT

Not applicable.

## 6. AUTHOR CONTRIBUTION STATEMENT

SD was responsible for the conceptualization and design of the study, the systematic literature search across academic databases, and the quality assessment of the selected articles. SD performed the thematic synthesis, drafted the manuscript, and developed the Innovation-Empathy Balance Model proposed in this review.

## AUTHOR INFORMATION

### Corresponding Authors

Siti Annisa Dahlan, Halu Oleo University, Indonesia

 <https://orcid.org/0009-0003-1193-0334>

Email: [Sitiannisadahlan50@gmail.com](mailto:Sitiannisadahlan50@gmail.com)

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