



*Journal of International Students*  
Volume 16, Issue 16 (2026), pp. 215-242  
ISSN: 2162-3104 (Print), 2166-3750 (Online)  
jistudents.org  
<https://doi.org/10.32674/2vs8yp30>



## **Dubbing Artificial Intelligence in Scaffolding: A Systematic Review of Peer Scaffolding, Guided Reflection, and AI-Mediated Feedback in an Integrated Feedback Model**

Asyraf Shuib

*School of Education, Universiti Utara Malaysia*

Saifolrudin Khalid

*School of Education, Universiti Utara Malaysia*

Aizan Yaacob

*Universiti Utara Malaysia Kuala Lumpur Campus, Kuala Lumpur*

Corresponding author: [asyraf\\_shuib@ahsgs.uum.edu.my](mailto:asyraf_shuib@ahsgs.uum.edu.my)

Orcid ID: <https://orcid.org/0009-0000-6976-7814>

**ABSTRACT:** *This systematic review examines how artificial intelligence (AI) aligns with Vygotsky's sociocultural framework to enhance ESL/EFL pedagogy through integrated feedback models combining AI-mediated input, peer scaffolding, and Gibbs' guided self-reflection. Thematic synthesis of empirical literature (2015–2026) across Asia-Pacific contexts reveals that AI effectively scaffolds learners within their Zone of Proximal Development, improving peer feedback quality, self-regulation, and writing proficiency. However, challenges persist, including AI overreliance, variable feedback quality across proficiency levels, and tensions between automated efficiency and human-mediated dialog. The findings indicate that theoretical alignment with sociocultural principles is robust, yet pedagogical efficacy requires a deliberate instructional design that preserves relational engagement and positions AI as a complementary mediator. Successful implementation demands targeted educator training in AI literacy and ethically grounded integration strategies. Future research should prioritize longitudinal designs and cross-contextual investigations to develop scalable, equitable frameworks for autonomous language learning.*

**Keywords:** AI-mediated feedback, peer scaffolding, self-reflection, sociocultural theory, zone of proximal development, ESL/EFL

© Author(s), 2026. Published by Star Scholars Press.

This article is distributed under the Creative Commons Attribution 4.0 International License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited. <https://creativecommons.org/licenses/by/4.0/>

**How to Cite (APA):** Shuib, A., Khalid, S., & Yaacob, A. (2026). Dubbing artificial intelligence in scaffolding: A systematic review on peer scaffolding, guided reflection, and AI-mediated feedback in an integrated feedback model. *Journal of International Students*, 16 (16), 215-242. <https://doi.org/10.32674/2vs8yp30>.

---

## INTRODUCTION

Peer scaffolding within Vygotsky's Zone of Proximal Development (ZPD) enhances ESL/EFL learning through social interaction and guided support. While ZPD traditionally emphasizes mediation between actual and potential development, contemporary applications incorporate peer collaboration and AI-mediated feedback (Duke, 2026). Given peer feedback's positive impact on writing skills and engagement, particularly with respect to learner well-being (Liu & Mohd Saad, 2025), integrating AI scaffolding holds significant pedagogical value (Ittefaq et al., 2025). However, combining these elements presents challenges. Variability in peer feedback quality can undermine outcomes, especially in intercultural contexts that rely on nonverbal communication (Anjum et al., 2025). Additionally, AI tools raise concerns regarding overreliance, academic integrity, and learner agency (Bannister et al., 2024). International students face specific barriers, including fears of plagiarism and algorithmic bias, which deter the adoption of GenAI (Ittefaq et al., 2025). Current research lacks an exploration of integrated frameworks that combine AI, peer feedback, and self-reflection to address these ethical and policy gaps (Duke, 2026). Consequently, opportunities to maximize AI potential while fostering self-regulation remain limited and exacerbated by insufficiently inclusive policies (Bannister et al., 2024).

In this review, Vygotsky's sociocultural theory is utilized, and ZPD is defined as the space for guided performance beyond independent capability. Peer scaffolding facilitates ZPD movement through collaborative trust-building, often via nonverbal rituals (Anjum et al., 2025). AI-mediated feedback serves as a technological scaffold requiring human oversight for equity (Duke, 2026). Guided self-reflection promotes metacognitive engagement and autonomy while addressing integrity concerns (Ittefaq et al., 2025). Together, these factors form a robust ecosystem for AI-enhanced language learning. This paper also aims to examine the interplay of peer scaffolding, AI-mediated feedback, and guided self-reflection within the ZPD in ESL/EFL contexts. It aims to clarify how integrated

models can improve feedback quality, engagement, and proficiency, addressing gaps in sociocultural language learning and ESL or EFL learner support (Liu & Mohd Saad, 2025). This review synthesizes empirical findings to inform AI-enhanced course design aligned with inclusive academic integrity policies (Bannister et al., 2024).

By employing a comprehensive literature search and thematic analysis (2015–2026), this study focuses on AI-supported peer feedback, ZPD applications, and self-regulated learning. The inclusion criteria prioritize empirical investigations of integrated feedback models addressing international student needs (Ittefaq et al., 2025). The findings elucidate theoretical frameworks, pedagogical implications, and future research directions.

## **PURPOSE AND SCOPE OF THE REVIEW**

The objective of this report is to examine the existing research on peer scaffolding in relation to Vygotsky's ZPD in ESL/EFL settings, focusing on integrated feedback frameworks combining AI-mediated feedback, peer feedback, and Gibbs-guided self-reflection. To elucidate the theoretical and practical intersections of sociocultural learning theory and emerging AI technologies in language education, this study also seeks to explore how ZPD is related to AI-mediated feedback in AI-enhanced language learning courses. This review is important because it addresses the evolving landscape of ESL/EFL pedagogy, where traditional peer scaffolding is augmented by AI tools, with the goal of enhancing learner autonomy, feedback literacy, and self-regulated learning within the Zone of Proximal Development. By synthesizing multidisciplinary findings, the report seeks to inform educators and researchers about effective integrative feedback models that leverage AI's potential while maintaining the collaborative and reflective dimensions central to Vygotsky's framework.

### **2.1 Specific Objectives**

1. To evaluate current knowledge on the integration of AI-mediated feedback within peer scaffolding practices in ESL/EFL contexts.
2. To benchmark studies of integrated feedback frameworks that combine AI feedback, peer feedback, and guided self-reflection in language learning.
3. To identify and synthesize how Vygotsky's Zone of Proximal Development underpins AI-enhanced collaborative learning environments.
4. To compare the effects of AI-supported peer feedback on learner engagement, feedback literacy, and language proficiency.
5. To analyze the challenges and pedagogical implications of implementing AI tools aligned with sociocultural scaffolding theories.

## METHODS

### 3.1 Transformation of the Research Query

The original research questions were refined to enhance clarity and focus while ensuring a comprehensive exploration of the topic. The initial questions are as follows: (1) "What is the relationship between peer scaffolding and Vygotsky's Zone of Proximal Development (ZPD) in ESL/EFL settings?" (2) "How does an integrated feedback framework, combining AI-mediated feedback, peer feedback, and Gibbs' guided self-reflection, maximize the potential of ZPD?" (3) How does ZPD synergize with AI-mediated feedback in AI-enhanced language learning courses? were systematically expanded into more specific search statements. This transformation aimed to ensure a thorough yet targeted literature search, minimizing the risk of overlooking niche or jargon-specific studies while maintaining alignment with the study's objectives.

The following refined queries were developed to guide the literature search:

1. What are the effects of integrating technology-enhanced peer feedback (Zone of Algorithmic Development, ZAD) within Vygotsky's ZPD on collaborative learning and self-regulation strategies in ESL/EFL education?
2. How does generative AI facilitate peer scaffolding and guided self-reflection within Vygotsky's ZPD framework to enhance collaborative feedback and learner engagement in ESL/EFL contexts?

These transformed queries enabled a structured and systematic exploration of the literature, ensuring alignment with the study's objectives while addressing key dimensions of the research problem.

### 3.2 Screening of Papers

Each transformed query was executed using predefined inclusion and exclusion criteria to retrieve a focused set of candidate papers from a database of more than 270 million research articles. This initial screening process yielded 189 relevant papers.

#### 3.2.1 Citation Chaining: Identifying Additional Relevant Works

To ensure comprehensiveness, citation chaining was employed as a supplementary method for identifying additional relevant studies:

**Backward Citation Chaining:** The reference lists of the core papers were examined to identify foundational works that informed the selected studies. This step ensured that seminal contributions to the field were not overlooked.

**Forward Citation Chaining:** Newer papers that cited the core studies were identified to track how the field has evolved. This approach revealed emerging debates, replication studies, and recent methodological advancements.

### **3.2.2 Relevance scoring and sorting**

The assembled pool of 299 candidate papers underwent a rigorous relevance scoring process to rank studies on the basis of their alignment with the research objectives. Following this evaluation:

- A total of 297 papers were deemed relevant to the research query.
- Among these, 50 papers were classified as highly relevant, forming the foundation of the final literature review.

This systematic methodology ensured that the selected literature was both comprehensive and directly pertinent to the study's aims, providing a robust basis for analysis and synthesis.

## **RESULTS**

### **4.1 Descriptive Summary of the Studies**

This section synthesizes the research landscape on peer scaffolding within Vygotsky's zone of proximal development (ZPD) in ESL/EFL contexts, focusing on an integrated feedback model that combines AI-mediated input, peer assessment, and Gibbs' guided self-reflection. The corpus encompasses empirical investigations, systematic reviews, and theoretical analyses predominantly situated in speaking and writing contexts, with a strong emphasis on AI applications such as chatbots, large language models, and intelligent tutoring systems. Methodologies range from mixed-methods experiments to qualitative case studies, primarily involving university learners across diverse regions, including China, Indonesia, and Hong Kong. By evaluating the interplay between AI feedback, peer scaffolding, and self-regulated learning within the ZPD framework, this analysis directly addresses the research questions, mapping both pedagogical affordances and implementation barriers.

A synthesis of the reviewed studies revealed consistent patterns in instructional design, ZPD alignment, learner outcomes, and self-regulation support. Collectively, the evidence demonstrates that AI-mediated feedback, when strategically sequenced with peer scaffolding and structured reflection, significantly enhances language proficiency, critical thinking, and learner autonomy. However, instructional efficacy remains contingent on deliberate alignment with ZPD principles, the cultivation of metacognitive awareness, and the systematic mitigation of technological and pedagogical challenges inherent in AI-enhanced environments.

#### **4.1.1 Integration Models**

The reviewed studies employ diverse integration models, ranging from AI chatbots guiding peer feedback revision (Guo et al., 2024) to scaffolded feedback frameworks based on sociocultural theory (Xu, 2024). Many studies emphasize the importance of combining AI tools with human-centered practices, such as

dialogic collaboration (Soozandehfar & Souzandehfar, 2022) and peer scaffolding (Casinto, 2023). For instance, Otkarina et al. (2024) integrate AI chatbots with peer feedback and engagement strategies, whereas Liu et al. (2024) propose a multimodal intelligent tutoring system (ITS) that scaffolds language learning through pedagogical instructions. These models highlight the versatility of AI in providing personalized, adaptive support within collaborative learning environments. Notably, some studies focus on informal digital learning ecologies (Guan et al., 2024), underscoring the role of AI in extending learning beyond traditional classroom settings.

#### ***4.1.2 Alignment with ZPD***

Alignment with ZPD varies across studies, with strong alignment observed in models that explicitly incorporate scaffolding mechanisms tailored to learners' developmental levels. For example, Wang (2024) demonstrates how AI can personalize teaching content within the ZPD, whereas Mirzaei and Eslami (2015) explore ZPD-activated collaborative language in L2 writing. Other studies, such as that by Hansen et al. (2024), report limited alignment because AI occasionally disrupts the scaffolding process. Overall, the most effective models align closely with ZPD principles by leveraging AI to mediate interactions between learners and more knowledgeable others, whether human or machine.

#### ***4.1.3 Learner outcomes***

Learner outcomes are consistently positive in studies with strong ZPD alignment, particularly in areas such as writing quality, oral proficiency, and critical thinking. For instance, Kong et al. (2024) report enhanced critical thinking and writing quality through a six-phase self-regulated learning (SLR) design that integrates AI and peer review. Similarly, Ortiz et al. (2024) reported significant improvements in self-regulation and learning competence when AI-supported peer feedback was used. Low-proficiency learners also benefit substantially, as evidenced by Casinto (2023), who documents significant writing gains among ESL learners through scaffolded peer feedback. However, mixed outcomes are noted in studies where AI disrupts the scaffolding process or overrelies on automation without sufficient human oversight (Hansen et al., 2024).

#### ***4.1.4 Self-Regulation Support***

Self-regulation is a central theme, with many studies emphasizing the role of AI in fostering autonomous learning strategies. For example, Pan et al. (2024) highlight how an AI chatbot supports personalized self-regulated learning (SRL) strategies in EFL reading, leading to improved reading achievement. Similarly, Sardi et al. (2025) report positive effects on SRL and critical thinking skills through generative AI platforms. Challenges arise, however, when learners become overly reliant on AI, potentially undermining their ability to self-regulate independently (Hutt et al., 2024). Effective models balance AI support with

opportunities for reflective practice and goal setting, as seen in studies employing Gibbs' reflective cycle (José, 2025) or ARCS motivational models (Isaac et al., 2023).

#### **4.1.5 Pedagogical Challenges**

Despite their promise, these models face several pedagogical challenges. Technical limitations, such as delayed scoring or accuracy issues, hinder AI effectiveness in some contexts (Hoang et al., 2023; Hutt et al., 2024). Balancing AI and human interaction remains a persistent challenge, as excessive reliance on AI risks reducing learners' self-regulatory capacities (Ortiz et al., 2024). Additionally, ethical concerns, such as algorithmic bias and data privacy, necessitate careful consideration (Ponniah & Zakaria, 2024). Training needs are another recurring issue, with many studies highlighting the importance of equipping both educators and learners with the skills to effectively use AI tools (Cuocci et al., 2023). Finally, addressing diverse proficiency levels and emotional dynamics in peer feedback contexts requires nuanced instructional design (Chen et al., 2023).

In summary, the integration of AI and peer feedback holds immense potential for enhancing language learning outcomes, particularly when aligned with ZPD principles and supported by robust scaffolding mechanisms. By fostering self-regulation, promoting learner autonomy, and addressing systemic barriers, these models pave the way for innovative, inclusive, and effective pedagogies. However, realizing this potential requires overcoming technical, ethical, and pedagogical challenges through iterative design, teacher training, and equitable access to AI technologies.

#### **4.2 Critical Analysis and Synthesis**

The literature demonstrates the growing integration of AI-mediated feedback with peer scaffolding and guided reflection in ESL/EFL contexts. Grounded in Vygotsky's Zone of Proximal Development (ZPD), empirical evidence demonstrates AI's capacity to enhance feedback precision, learner engagement, and self-regulation. However, effective implementation still requires deliberate pedagogical scaffolding to mitigate automation overreliance, address feedback variability, and preserve the sociocultural dynamics of collaborative learning. Methodological heterogeneity and limited longitudinal data further constrain cross-contextual generalizability. Ultimately, AI shows strong potential to augment peer scaffolding, provided that future research addresses these instructional and empirical gaps.

**Table 1: Overview of Key Aspects and Challenges in AI-Supported Peer Scaffolding**

Aspect	Strengths	Weaknesses
Integration of AI-Mediated Feedback in Peer Scaffolding	<p>Several studies demonstrate that AI tools, such as chatbots and feedback coaches, effectively enhance the quality of peer feedback by providing real-time, personalized, and actionable suggestions, which improve learners' revision strategies and feedback literacy (Guo et al., 2024; Oktarina et al., 2024).</p> <p>AI supervision has been shown to empower students to produce more detailed and illustrative peer comments, fostering deeper engagement with peers' work (Guo et al., 2024).</p>	<p>Despite these benefits, some research reports adverse effects, including reduced reflective questioning and increased complexity that may hinder clarity (Hansen et al., 2024).</p> <p>Overreliance on AI validation can diminish learners' critical judgment and autonomy, potentially undermining the collaborative and reflective nature of peer scaffolding (Hansen et al., 2024).</p> <p>The variability in AI feedback quality and its alignment with pedagogical goals remains a concern (Bauer et al., 2023).</p>
Integrated Feedback Frameworks Combining AI, Peer Feedback, and Guided Self-Reflection	<p>Integrated models incorporating AI feedback, peer interaction, and structured self-reflection (e.g., Gibbs' cycle) show promise in promoting self-regulated learning and autonomous revision processes, aligning well with Vygotsky's ZPD by scaffolding learners from dependence to independence (Ortiz et al., 2024; Kong et al., 2024; Pan et al., 2024).</p> <p>Empirical evidence indicates improvements in writing proficiency, motivation, and metacognitive awareness when these elements are integrated (Oktarina et al., 2024; Yin, 2024).</p>	<p>However, the complexity of coordinating these three feedback sources poses implementation challenges. Few studies provide comprehensive frameworks or longitudinal data on sustained efficacy.</p> <p>Additionally, the balance between AI guidance and human-mediated reflection requires careful calibration to avoid learner passivity or cognitive overload (Hansen et al., 2024; Omer, 2024).</p>

Theoretical Alignment with Vygotsky's Zone of Proximal Development (ZPD)	Research effectively situates AI-enhanced peer scaffolding within sociocultural theory, emphasizing the role of mediated interaction and collaborative dialog in expanding learners' ZPD (Xu, 2024; Casinto, 2024; Soozandehfar & Souzandehfar, 2022; Wang, 2024).  AI is conceptualized as a tool that can personalize scaffolding and extend teacher capacity to identify and support learners' proximal development zones (Wang, 2024; Isaac et al., 2023).	Nonetheless, some critiques highlight a tension between AI's personalized, often passive learning affordances and the active, socially situated nature of ZPD-based learning. AI's potential to foster learner passivity contradicts the participatory engagement central to Vygotsky's framework (Isaac et al., 2023).  Moreover, emotional and trust-related factors in AI-mediated scaffolding are underexplored (Wang, 2024).
Impact on Learner Engagement, Feedback Literacy, and Writing Proficiency	Quantitative and qualitative data consistently show that AI-supported peer feedback enhances learner engagement, motivation, and writing outcomes, including complexity, accuracy, and fluency (Oktarina et al., 2024; Lin, 2022; Chan et al., 2024; Chan et al., 2024; Rad & Jafarpour, 2023).  AI tools facilitate personalized learning paths and encourage iterative revision, contributing to improved feedback literacy and self-regulation (Oktarina et al., 2024; Ortiz et al., 2024; Sardi et al., 2025).	Despite positive outcomes, emotional responses to AI feedback are mixed, with some learners experiencing anxiety, confusion, or reduced confidence in their own judgment (Hansen et al., 2024; Narlu & Kahraman, 2023; Chan et al., 2024).  The novelty effect of AI may inflate engagement metrics temporarily, with limited evidence on long-term impacts or transferability across diverse learner populations (Chan et al., 2024; Cuocci et al., 2023).
Pedagogical Challenges and Implications	The literature identifies effective strategies such as training, self-monitoring checklists, and AI quality control to enhance peer feedback quality and learner agency	Persistent challenges include technological literacy gaps among educators, resistance to AI adoption, and ethical concerns related to AI's role in assessment and feedback

(Darvishi et al., 2022; Darvishi et al., 2022). (Wang, 2024; Luria, 2024; Isaac et al., 2023).

Studies advocate for integrating AI as a complementary scaffold rather than a replacement for human interaction, emphasizing the need for teacher facilitation and learner empowerment (Omer, 2024; Luria, 2024).

The risk of diminishing meaningful human interaction and overdependence on AI-generated feedback necessitates ongoing pedagogical refinement (Omer, 2024; Islam et al., 2024).

Furthermore, many studies rely on small samples or short intervention periods, limiting generalizability (Hansen et al., 2024)

Methodological Rigor and Research Gaps

The body of research employs diverse methodologies, including randomized controlled trials, mixed-methods designs, and design-based research, providing robust triangulation of findings (Oktarina et al., 2024; Kong et al., 2024; Yin, 2024).

However, inconsistencies in study designs, small sample sizes, and limited longitudinal follow-ups restrict the ability to draw definitive conclusions about sustained effects (Hansen et al., 2024; Cuocci et al., 2023).

Large-scale datasets and longitudinal designs, such as semester-long experiments, enhance validity (Han et al., 2023).

There is a notable scarcity of research addressing the nuanced interplay between AI feedback, peer scaffolding, and self-reflection within authentic classroom contexts (Omer, 2024; Bauer et al., 2023).

Ethical and affective dimensions of AI integration remain underinvestigated (Narlu & Kahraman, 2023; Isaac et al., 2023).

Learner and Educator Perceptions of AI and

Studies report generally positive learner perceptions of AI's role in providing timely, personalized feedback and supporting autonomous

In contrast, some learners and educators express concerns about AI's limitations in understanding context, providing nuanced feedback,

Sociocultural Scaffolding	learning, with educators acknowledging AI's potential to enhance instructional efficiency and learner engagement (Oktarina et al., 2024; Chan et al., 2024; Goh et al., 2024; Kim & Sim, 2024). AI is seen as a valuable adjunct to traditional scaffolding, facilitating differentiated instruction (Goh et al., 2024).	and maintaining human connection (Hansen et al., 2024; Kavak et al., 2024). Anxiety about AI replacing human roles and ethical issues around trust and data privacy are also noted (Omer, 2024; Kavak et al., 2024). The need for professional development and clear guidelines for AI integration is emphasized (Luria, 2024; Kim & Sim, 2024).
---------------------------	--	--

**4.3 Thematic Review**

The literature on peer scaffolding in ESL/EFL settings reveals significant integration of Vygotsky's Zone of Proximal Development (ZPD) with emerging AI-mediated feedback systems, emphasizing collaborative learning frameworks. Major themes include the enhancement of peer feedback quality and feedback literacy through AI tools, the fostering of learner autonomy and self-regulation via guided reflection, and the practical challenges of technology integration aligned with sociocultural theories. Studies also highlight the integrated feedback framework combining AI, peer, and self-reflective feedback as a promising approach to scaffold language learning effectively. Additionally, research underscores the evolving educator and learner perceptions of AI's role in sustaining meaningful social interactions within language learning contexts.

**Table 2: Thematic Synthesis of AI-Mediated Peer Feedback Research**

Theme	Appears In	Theme Description
AI-mediated enhancement of peer feedback quality and feedback literacy	19/50 Papers	AI technologies, including chatbots and large language models, significantly improve the quality of peer feedback by providing real-time, personalized guidance and evaluation, helping learners revise and elaborate their comments more effectively. Studies report strategies such as introducing new points and adding detail in response to AI feedback, which enhance feedback literacy and peer review outcomes (Guo et al., 2024; Darvishi et al., 2022; Rad & Jafarpour, 2023). However, some research cautions about potential overreliance on AI validation affecting reviewer autonomy (Hansen et al., 2024).

Integration of Vygotsky's ZPD in AI-enhanced collaborative learning	18/50 Papers	<p>Vygotsky's sociocultural theory, particularly the ZPD concept, underpins the design of AI-assisted scaffolding frameworks where AI tools complement peer and teacher support to guide learners from assisted to autonomous language use. AI supports personalized scaffolding by identifying learners' ZPD and offering adaptive feedback, thus fostering cognitive development through social mediation (Xu, 2024; Soozandehfar &amp; Souzandehfar, 2022; Wang, 2024; Isaac et al., 2023).</p> <p>Challenges remain in balancing AI's role with human interaction to avoid passivity (Omer, 2024).</p>
Triadic feedback framework: AI feedback, peer feedback, and guided self-reflection	15/50 Papers	<p>Combining AI-mediated feedback, peer feedback, and structured self-reflection (e.g., Gibbs' cycle) creates a synergistic scaffold that promotes learner engagement, critical thinking, and self-regulation. Frameworks incorporating iterative phases of planning, AI-generated prompts, peer review, and portfolio tracking have shown effectiveness in supporting autonomous writing development and metacognitive skills (Kong et al., 2024; Pan et al., 2024; Sardi et al., 2025; Yin, 2024).</p> <p>Such triadic models align with sociocultural principles by integrating multifeedback mediations.</p>
Impact of AI feedback on learner engagement, motivation, and autonomous learning	17/50 Papers	<p>AI-enhanced feedback systems positively influence learners' engagement, motivation, and autonomy in ESL/EFL writing and reading tasks. Quantitative and qualitative data indicate improvements in writing proficiency, motivation levels, and feedback literacy, alongside increased active participation when AI tools provide timely, personalized feedback (Oktarina et al., 2024; Chan et al., 2024; Chan et al., 2024; José, 2025; Kim &amp; Sim, 2024).</p> <p>However, mixed emotional responses and the need for pedagogical scaffolding to mitigate anxiety and overdependence are noted (Narlu &amp; Kahraman, 2023; Hansen et al., 2024).</p>
Pedagogical challenges and	14/50 Papers	<p>The implementation of AI tools aligned with sociocultural scaffolding theories faces challenges such as technology anxiety, trust</p>

---

implications of AI integration in sociocultural scaffolding		issues, teacher training needs, and maintaining meaningful human-AI collaboration. Research stresses the importance of educator readiness and strategic AI integration to preserve dialogic and collaborative learning processes (Darvishi et al., 2022; Omer, 2024; Luria, 2024; Islam et al., 2024). Ethical considerations, learner diversity, and AI's role in sustaining social presence are critical pedagogical concerns (Kavak et al., 2024; Law, 2024).
Scaffolded peer feedback supporting low-proficiency and diverse ESL/EFL learners	11/50 Papers	Scaffolded peer feedback, enhanced by AI support, benefits low-proficiency learners by improving writing accuracy, error avoidance, and collaborative engagement within their ZPD. Empirical studies highlight peer scaffolding's role in fostering writing development and inclusive teaching practices under sociocultural frameworks (Casinto, 2024; Casinto, 2023; Cao et al., 2022). The use of native language in mediation and peer negotiation strategies further supports learner development (Soozandehfar & Souzandehfar, 2022).
AI as a reflective coach and tool for metacognitive skill development	9/50 Papers	AI systems serve as reflective coaches facilitating learners' metacognitive awareness and self-regulated learning strategies. Studies demonstrate AI's effectiveness in guiding reflection in ESL practicum settings and supporting students' critical thinking and planning in writing tasks (L'Enfant, 2024; Sardi et al., 2025; Yin, 2024). This role enhances the feedback loop and aligns with Gibbs' guided reflection to deepen learner autonomy.
Collaborative peer feedback and its affective, cognitive, behavioral, and social dimensions	10/50 Papers	Collaborative peer feedback activities foster multidimensional learner engagement, including affective, social, cognitive, and behavioral aspects. Research shows that positive social interactions and collaborative relationships enhance feedback quality, reduce anxiety, and promote sustained participation (Chen et al., 2023; Cao et al., 2022). Conversely, lack of collaboration leads to disengagement and reduced learning opportunities.
Use of large	7/50 Papers	Advances in NLP and generative AI models enable automated evaluation and scaffolding of

---

language models and natural language processing in peer feedback evaluation		peer feedback quality. Comparative studies reveal classical NLP methods currently outperform generative models in feedback quality detection, although large models offer interpretive feedback and explanations (Hutt et al., 2024; Bauer et al., 2023; Rashid et al., 2024). These technologies can support younger or novice learners in developing effective peer feedback skills.
AI-supported informal digital language learning and motivational impacts	6/50 Papers	AI-mediated informal digital learning environments enhance learners' motivational self-concept, foreign language enjoyment, and ideal L2 self through personalized, self-directed practice with instant feedback. Studies emphasize the role of AI-IDLE in increasing learner engagement and motivation, although ongoing extramural practice requires additional social and pedagogical support (Liu et al., 2024; Guan et al., 2024).
AI's role in transforming ESL/EFL writing instruction and teacher support	5/50 Papers	AI tools, including chatbots and generative models, revolutionize ESL/EFL writing pedagogy by automating feedback, enabling personalized instruction, and supporting inquiry-based learning approaches. Teachers report AI's utility in lesson planning and student-centered learning environments, although training and ethical awareness remain necessary (Yeh, 2024; Ibrahim & Kirkpatrick, 2024; Goh et al., 2024).
Combining peer and AI feedback in writing support platforms for diverse learners	4/50 Papers	User-centered design approaches integrating peer and automated feedback address the needs of mature and immigrant learners, promoting collaborative writing development through iterative feedback cycles and rubric-guided review (Liaqat et al., 2021; Islam et al., 2024). These platforms emphasize community building and inclusivity.
Evolution of AI-enhanced feedback over time and geographic diversity	3/50 Papers	Recent advances since 2022 show a rapid increase in empirical studies across diverse contexts (China, Indonesia, Philippines, Korea, Hong Kong), reflecting global interest in AI's pedagogical roles and feedback integration in ESL/EFL education (Oktarina et al., 2024; José, 2025; Kim & Sim, 2024). The evolution

---

highlights the transition from experimental to scalable, context-sensitive implementations.

---

#### 4.4 Agreement and Divergence across Studies

The discourse broadly supports integrating AI-mediated feedback with peer assessment and guided reflection to enhance ESL/EFL learners' writing proficiency, feedback literacy, and engagement when pedagogically aligned with Vygotsky's Zone of Proximal Development (ZPD). Studies consistently affirm AI's capacity to scaffold autonomy through personalized, adaptive input that supports self-regulated learning. However, divergences emerge regarding AI's influence on peer-review quality, risks of overreliance, and affective responses to automated feedback, with some learners reporting distraction or diminished metacognitive questioning. These discrepancies largely reflect variations in system design, feedback modality, learner proficiency, and instructional context. While pedagogical challenges are widely acknowledged, their prioritization differs across studies, underscoring the role of cultural, institutional, and implementation-specific factors in shaping integrated framework efficacy.

**Table 3: Convergent and Divergent Findings in AI-Mediated Peer Feedback Research**

Comparison Criterion	Studies in Agreement	Studies in Divergence	Potential Explanations
Integration Model	Most studies endorse integrated feedback frameworks combining AI-mediated feedback, peer feedback, and guided self-reflection as effective scaffolding approaches improving writing quality and feedback literacy (Guo et al., 2024; Oktarina et al., 2024; Kong et al., 2024; Rad & Jafarpour, 2023). The inclusion of AI chatbots and automated feedback tools alongside peer reviews enhances	Some report adverse effects of AI integration on peer feedback quality, such as reduced reflective questioning and overreliance on AI validation, potentially undermining peer engagement (Hansen et al., 2024; Rashid et al., 2024). Differences exist in how AI feedback is blended—real-time coaching versus postfeedback reflection—with contrasting outcomes	Variability in AI system design (e.g., real-time vs. asynchronous), degree of teacher involvement, learner training, and task types influence integration effectiveness. Sample size, learner proficiency, and cultural context also affect outcomes.

	revision strategies and learning autonomy (Ortiz et al., 2024; José, 2025; Goh et al., 2024).	(S, 2024; Chan et al., 2024).	
Alignment with ZPD	Multiple studies affirm that AI-mediated feedback aligns well with Vygotsky's ZPD by providing scaffolded, personalized support that fosters movement from dependence to autonomous competence (Xu, 2024; Casinto, 2024; Soozandehfar & Souzandehfar, 2022; Wang, 2024; Isaac et al., 2023). AI enhances individualized learning within learners' proximal zones, promoting cognitive and metacognitive development (Liu et al., 2024; Mirzaei & Eslami, 2015).	Some concerns arise regarding AI potentially promoting passive learning or diminishing the social interaction central to ZPD-based learning, challenging its social-cultural foundations (Omer, 2024; Isaac et al., 2023).	Differences reflect tensions between individualized AI-driven scaffolding and the inherently social nature of Vygotsky's ZPD. Implementation context (formal vs. informal learning) and instructor mediation levels may explain divergence.
Learner Outcomes	Consensus that AI-enhanced peer feedback improves writing proficiency, engagement, and feedback literacy across ESL/EFL contexts, with significant gains in writing quality and revision effectiveness (Guo et al., 2024; Oktarina et al., 2024; S, 2024;	Some studies report mixed or negative learner experiences, including anxiety, distraction, reduced feedback effectiveness, or varied emotional responses to AI feedback (Hansen et al., 2024; Narlu & Kahraman, 2023; Chen et al., 2023). The long-term	Divergent learner outcomes may stem from differences in AI tool sophistication, learner familiarity with technology, emotional readiness, and task design. Variations in measurement focus (short-term vs. long-term impact) contribute as well.

---

	Sulistiyo, 2024; Chan et al., 2024; Chan et al., 2024; Rad & Jafarpour, 2023). Improved engagement and motivation are frequently reported, with AI tools facilitating deeper cognitive and metacognitive involvement (Pan et al., 2024; Liu et al., 2024).	sustainability of gains remains debated (Jiang & Ribeiro, 2017).	
Self-Regulation Support	Strong agreement that AI feedback systems support self-regulated learning by fostering autonomous monitoring, goal setting, and reflection, especially when combined with peer feedback and guided self-reflection (Ortiz et al., 2024; Kong et al., 2024; Pan et al., 2024; Sardi et al., 2025; Kim & Sim, 2024). AI tools are shown to encourage planning, revising, and strategic learning behaviors aligned with self-regulation theories.	Some studies caution that unstructured or over-reliant AI usage may impede development of independent critical thinking or reduce learner agency (Hansen et al., 2024; Sardi et al., 2025). Certain learners may prioritize AI validation over personal judgment (Hansen et al., 2024).	The balance between AI scaffolding and learner autonomy varies by design and instructional scaffolding. Training and pedagogical support influence whether AI encourages or hinders genuine self-regulation.
Pedagogical Challenges	Studies concur that challenges include ensuring AI feedback quality, avoiding overreliance, balancing human and AI roles, providing	Divergences exist in the perceived severity of challenges; some studies highlight significant trust and accuracy concerns,	Differences arise from the maturity of AI tools studied, institutional contexts, teacher experience with AI, and cultural attitudes toward

---

adequate training, and addressing learner affect and trust issues (Hansen et al., 2024; Darvishi et al., 2022; Omer, 2024; Priyantın, 2021; Cuocci et al., 2023; Luria, 2024). Ethical concerns and the need for teacher professional development are commonly noted (Ibrahim & Kirkpatrick, 2024; Kavak et al., 2024).	while others emphasize technological affordances and potential with minimal drawbacks (Darvishi et al., 2022; Omer, 2024; Wang, 2024).	technology in education. Varied research designs (systematic review vs. empirical study) also affect findings.
---	--	--

---

#### 4.5 AI's Impacts on Human Social Dynamics in Sociocultural Learning Contexts

AI can fundamentally reshape social dynamics within Vygotskian peer scaffolding, simultaneously extending and complicating sociocultural learning. When positioned as a collaborative mediator, AI-supported peer review fosters distributed cognition and comparative feedback negotiation, effectively extending ZPD (Guo et al., 2024; Rashid et al., 2024). Conversely, unguided AI reliance risks eroding authentic dialog and face-to-face pragmatic exchange, undermining the relational scaffolding vital for intercultural competence (Omer, 2024). These dynamics are heavily moderated by cultural and affective factors: learners frequently experience anxiety over algorithmic bias and academic integrity when AI outputs conflict with human input, revealing that technological trust is culturally contingent (Bannister et al., 2024; Ittefaq et al., 2025). Since AI cannot replicate the embodied, nonverbal rituals essential for psychological safety and collaborative risk-taking (Anjum et al., 2025), hybrid ecosystems that balance diagnostic precision with human relationality are the most pedagogically robust (Liu et al., 2024; Hansen et al., 2024). Furthermore, the social impact of AI is design-dependent. Framed as a “critical peer” that surfaces discrepancies, it stimulates metacognitive dialog and source evaluation (Yin, 2024; W. Liu & Wang, 2024); positioned as an authoritative arbiter, it fosters passive reception and diminishes learner agency (Hansen et al., 2024).

Therefore, the efficacy of the integrated feedback ecosystem is dependent on deliberate sequencing: peer negotiation establishes sociocultural baselines, AI refines segmental features, and guided reflection internalizes both into self-regulation. Future research should examine how affective attunement, cultural sensitization, and relational trust can be intentionally scaffolded to preserve the dialogic norms of sociocultural learning.

**Table 4:** Impacts of AI on Human Social Dynamics in Sociocultural Learning

Key Insights	Social Dynamic Affected	Sources
AI-supported peer review enhances collaborative knowledge construction through comparative feedback analysis	Intersubjective negotiation, distributed cognition	(Guo et al., 2024; Rashid et al., 2024)
Overreliance on AI may reduce authentic peer dialog and pragmatic negotiation opportunities	Relational scaffolding, intercultural competence	(Omer, 2024)
Cultural norms mediate trust in AI feedback; international learners report anxiety about algorithmic bias	Cross-cultural trust, perceived fairness	(Bannister et al., 2024; Ittefaq et al., 2025)
Embodied, nonverbal peer interactions remain difficult for AI to replicate yet are vital for psychological safety	Affective attunement, risk-taking in speaking	(Anjum et al., 2025)
Hybrid human-AI ecosystems yield strongest gains in linguistic and sociopragmatic competence	Balanced mediation, complementary affordances	(Liu et al., 2024; Hansen et al., 2024)
AI positioned as "critical peer" stimulates metacognitive dialog; authoritative AI prompts passive reception	Learner agency, source-evaluation skills	(Yin, 2024; W. Liu & Wang, 2024; Hansen et al., 2024)

## DISCUSSION

By combining AI-mediated feedback with peer scaffolding and guided reflection, previous studies have paved the way to amplify Vygotsky’s Zone of Proximal Development (ZPD) to garner support for learners’ evolving proficiency. AI tools operationalize the ZPD in digital contexts by offloading segmental linguistic processing, thereby preserving working memory for higher-order pragmatic and metacognitive tasks (Kern, 2024; Liu et al., 2024). Peer negotiation provides the collaborative dialog necessary to contextualize algorithmic outputs, while structured reflection, often guided by frameworks such as the Gibbs cycle, serves as the critical bridge between external input and internalized self-regulation (Lubbe et al., 2025; Zhan, 2021). This integrated model transforms feedback from unidirectional correction into a recursive

ecosystem that simultaneously addresses the cognitive, social, and metacognitive dimensions of L2 development.

However, theoretical models must evolve beyond purely cognitive paradigms to account for the affective, cultural, and equity-related variables that moderate feedback uptake. Algorithmic systems frequently reproduce linguistic biases, disproportionately flagging nonnative speech patterns as deficient, which can heighten anxiety and deter engagement among multilingual learners (Bannister et al., 2024; Ittefaq et al., 2025). Ethnographic insights further reveal that effective feedback ecosystems rely on embodied trust-building and psychological safety that AI alone cannot replicate (Anjum et al., 2025). When AI-mediated peer frameworks are intentionally designed to cultivate intercultural attunement and emotional regulation, they sustain multidimensional engagement within the ZPD (Liu & Mohd Saad, 2025; Chen et al., 2023). Thus, the efficacy of the triadic model is contingent on a holistic design that integrates algorithmic transparency with culturally responsive pedagogy.

Translating these insights into practice requires careful curation of instructional designs that deliberately balance technological efficiency with human pedagogical expertise. Educators should implement sequential feedback loops: AI delivers immediate, low-stakes corrections on phonetic and syntactic features; peer assessment contextualizes these inputs within pragmatic and discourse frameworks; and guided reflection prompts learners to synthesize and internalize triangulated feedback. This sequencing directly mitigates cognitive overload and feedback fatigue while maximizing complementary affordance. Essentially, AI autonomy must be constrained by human curation to prevent learner passivity and superficial error correction. AI inventors must prioritize transparent, interpretable interfaces that explicitly scaffold source evaluation, while instructors must mediate peer-AI loops and overcome the difficulty of providing feedback to individual proficiency trajectories (Holstein et al., 2020; Wood, 2021).

Finally, sustainable implementation requires systemic investment in educator training and equitable policy design aligned with emerging global standards. Professional development must cultivate TPACK and critical AI literacy, enabling teachers to curate algorithmic outputs, design culturally responsive tasks, and facilitate reflective practices that honor learners' intercultural identities (Bae et al., 2024; Duke, 2026). This aligns with UNESCO's AI Competency Framework for Teachers and the OECD's PISA 2029 Media and Artificial Intelligence Literacy (MAIL) guidelines, which position AI literacy as a foundational competency essential to fill in the 45% global educator preparedness gap reported by Microsoft (2025). In addition, institutional policies must address academic integrity, data privacy, and algorithmic bias through transparent governance and inclusive cocreation processes that center linguistically diverse student voices (Bannister et al., 2024). Mandatory algorithmic auditing should be implemented to prevent the marginalization of nonnative speech patterns, ensuring that AI functions as a responsive mediator rather than a replacement for human collaborative learning. By embedding these equity-centered principles, educational stakeholders can ensure that technological

advancement reinforces the dialogic, reflective, and relational foundations essential to language development within the ZPD.

### **5.1 Recommendations**

Through this review, we recommend that future studies address these four priorities. First. Experimental studies are needed to test instructional sequences balancing AI feedback with peer scaffolding, preventing overreliance while preserving learner agency. Longitudinal designs must determine whether integrated feedback models yield lasting gains in proficiency and self-regulation. AI systems require pedagogical calibration—aligning feedback quality and scaffolding with learners' developing proficiency within the ZPD. Finally, studies should examine how AI prompts, peer dialog, and reflection jointly support language development. Addressing these areas will help transition the triadic framework from pilot studies to scalable, evidence-based practice.

### **CONCLUSION**

In conclusion, while AI tools offer transformative potential for enhancing language learning skills, their limitations highlight the need for a balanced and integrated approach. Addressing concerns related to long-term effectiveness, overreliance on AI, ethical challenges, and cultural adaptability requires an integrated model that combines AI, learners, and teachers. By doing so, educators can create a more holistic learning environment that aligns with theoretical frameworks of meaningful learning and addresses the diverse needs of language learners. Future research should prioritize exploring this model to advance the field of AI-integrated English Language Teaching and ensure equitable, sustainable, and impactful language education.

### **Acknowledgment**

*In the preparation of this manuscript, we utilized artificial intelligence (AI) tools for content creation with the following capacity:*

- None
- Some sections, with minimal or no editing
- Some sections, with extensive editing
- Entire work, with minimal or no editing
- Entire work, with extensive editing

*This article incorporates content generated by artificial intelligence (AI) tools. The sections where AI tools were employed are [specify sections if applicable]. The use of AI tools complied with ethical standards and guidelines for academic integrity. The final content has been thoroughly reviewed and edited to ensure accuracy, relevance, and adherence to academic standards.*

### **REFERENCES**

- Anjum, S. W., Wang, J., Fu, W., & Ye, Z. (2025). The silent language of connection: Nonverbal rituals in intercultural friendships at a Chinese university. *Journal of International Students*, 15(10), 27–40. <https://doi.org/10.32674/82x7j075>
- Bannister, P., Alcalde Peñalver, E., & Santamaría Urbietta, A. (2024). International students and generative artificial intelligence: A cross-cultural exploratory analysis of higher education academic integrity policy. *Journal of International Students*, 14(3), 149–170. <https://doi.org/10.32674/jis.v14i3.6277>
- Bauer, E., Greisel, M., Kuznetsov, I., Berndt, M., Kollar, I., Dresel, M., Fischer, M. R., & Fischer, F. (2023). Using natural language processing to support peer feedback in the age of artificial intelligence: A cross-disciplinary framework and a research agenda. *British Journal of Educational Technology*. Advance online publication. <https://doi.org/10.1111/bjjet.13336>
- Cao, S., Zhou, S., Luo, Y., Wang, T., Zhou, T., & Xu, Y. (2022). A review of the ESL/EFL learners' gains from online peer feedback on English writing. *Frontiers in Psychology*, 13, Article 1035803. <https://doi.org/10.3389/fpsyg.2022.1035803>
- Casinto, C. D. (2023). Scaffolded peer feedback and second language writing proficiency: Implications for inclusive ESL teaching practice. *TESL-EJ*, 26(4), 1–17. <https://doi.org/10.55593/ej.26104a8>
- Casinto, C. D. (2024). Supporting low-proficiency L2 learners through scaffolded peer feedback on L2 writing tasks. In *Advances in educational technologies and instructional design* (pp. 244–258). IGI Global. <https://doi.org/10.4018/979-8-3693-2623-7.ch014>
- Chan, S. T., Lo, N., & Wong, A. (2024). Leveraging generative AI for enhancing university-level English writing: Comparative insights on automated feedback and student engagement. *Cogent Education*, 12(1), Article 2440182. <https://doi.org/10.1080/2331186X.2024.2440182>
- Chan, S., Lo, N., & Wong, A. S. (2024). Generative AI and essay writing: Impacts of automated feedback on revision performance and engagement. *rEFLECTIONS*, 31(3), 1249–1284. <https://doi.org/10.61508/refl.v31i3.277514>
- Chen, H. H.-J., Yang, C. T.-Y., & Lai, K. K.-W. (2020). Investigating college EFL learners' perceptions toward the use of Google Assistant for foreign language learning. *Interactive Learning Environments*. Advance online publication. <https://doi.org/10.1080/10494820.2020.1833043>
- Chen, W., Liu, D., & Lin, C. (2023). Collaborative peer feedback in L2 writing: Affective, behavioral, cognitive, and social engagement. *Frontiers in Psychology*, 14, Article 1078141. <https://doi.org/10.3389/fpsyg.2023.1078141>
- Cuocci, S., Khan, I. N., & Roberts, S. (2023). A meta-synthesis of technology-supported peer feedback in ESL/EFL writing classes research: A replication of Chen's study. *Languages*, 8(2), Article 114. <https://doi.org/10.3390/languages8020114>
- Darvishi, A., Khosravi, H., Abdi, S., Sadiq, S., & Gašević, D. (2022). Incorporating training, self-monitoring and AI-assistance to improve peer

- feedback quality. Proceedings of the 9th ACM Conference on Learning@Scale (pp. 298–302). <https://doi.org/10.1145/3491140.3528265>
- Darvishi, A., Khosravi, H., Sadiq, S., & Gašević, D. (2022). Incorporating AI and learning analytics to build trustworthy peer assessment systems. *British Journal of Educational Technology*, 53(4), 844–875. <https://doi.org/10.1111/bjet.13233>
- Duke, B. (2026). Artificial intelligence for inclusive and sustainable international education: A critical conceptual review. *Journal of International Students*, 16(10), 167–198. <https://doi.org/10.32674/96t36095>
- Goh, Y., Chua, N. A., Rahman, N., Su-yan, Z., & Yiming, C. (2024). Integrating AI chatbots in ESL and CFL instruction: Revolutionizing language learning with artificial intelligence. *LatIA*, 2, 23. <https://doi.org/10.62486/latia202423>
- Guan, L., Zhang, Y., & Gu, M. (2024). Examining generative AI-mediated informal digital learning of English practices with social cognitive theory: A mixed-methods study. *ReCALL*. Advance online publication, 1–17. <https://doi.org/10.1017/S0958344024000259>
- Guo, K., Zhang, E. D., Li, D., & Yu, S. (2024). Using AI-supported peer review to enhance feedback literacy: An investigation of students' revision of feedback on peers' essays. *British Journal of Educational Technology*. Advance online publication. <https://doi.org/10.1111/bjet.13540>
- Han, J., Yoo, H., Myung, J., Kim, M., Lee, T. Y., Ahn, S., & Oh, A. (2023). Cheddar: Student-ChatGPT dialog in EFL writing education. *arXiv*. <https://doi.org/10.48550/arXiv.2309.13243>
- Hansen, R. R., Hougaard, R. F., Lindberg, A. B., Møller, K. L., Nielsen, T. A., & Prilop, C. N. (2024). The effects of an AI feedback coach on students' peer feedback quality, composition, and feedback experience. *OSF Preprints*. <https://doi.org/10.31219/osf.io/mq628>
- Hutt, S., DePiro, A., Wang, J., Rhodes, S., Baker, R. S., Hieb, G., Sethuraman, S., Ocumpaugh, J., & Mills, C. (2024). Feedback on feedback: Comparing classic natural language processing and generative AI to evaluate peer feedback. Proceedings of the 14th Learning Analytics and Knowledge Conference (pp. 523–534). <https://doi.org/10.1145/3636555.3636850>
- Ibrahim, K., & Kirkpatrick, R. J. (2024). Potentials and implications of ChatGPT for ESL writing instruction. *The International Review of Research in Open and Distributed Learning*, 25(3), 394–409. <https://doi.org/10.19173/irrodl.v25i3.7820>
- Isaac, M., Ateeq, M., Hafizh, H., Hu, B., & Shodipo, D. (2023). Leveraging artificial intelligence with zone of proximal development: An ARCS motivational e-learning model. Proceedings of the 2023 IEEE International Conference on Teaching, Assessment, and Learning for Engineering (pp. 1–8). <https://doi.org/10.1109/TALE56641.2023.10398344>
- Islam, A., Ali, R., Singh, G., Islam, B., Islam, A. K. M. M., & Hossain, S. (2024). An evaluation of AI-enhanced collaborative learning platforms. Proceedings of the 2024 International Conference on Computing,

- Communication, Control and Automation (pp. 1–6).  
<https://doi.org/10.1109/IC3SE62002.2024.10593320>
- Ittefaq, M., Zain, A., Arif, R., Ahmad, T., Khan, L., & Seo, H. (2025). Factors influencing international students' adoption of generative artificial intelligence: The mediating role of perceived values and attitudes. *Journal of International Students*, 15(7), 127–156.  
<https://doi.org/10.32674/fnwdpn48>
- Jiang, W., & Ribeiro, A. (2017). Effect of computer-mediated peer written feedback on ESL/EFL writing: A systematic literature review. *Language Learning & Technology*, 21(3), 114–137.
- José, L. (2025). Harnessing artificial intelligence for language learning: A mixed-methods study on ChatGPT integration in secondary education. *Research Square*. <https://doi.org/10.21203/rs.3.rs-5703952/v1>
- Kavak, V. İ., Evis, D., & Ekinçi, A. (2024). The use of ChatGPT in language education. *Gaziantep University Journal of Social Sciences*, 23(2), 789–805. <https://doi.org/10.21547/jss.1461578>
- Kim, E., & Sim, J. (2024). Incorporating AI into English language learning: An experimental study focusing on autonomous learning. *English Language Teaching*, 17(10), 82. <https://doi.org/10.5539/elt.v17n10p82>
- Kong, S., Lee, J. C., & Tsang, O. (2024). A pedagogical design for self-regulated learning in academic writing using text-based generative artificial intelligence tools: 6-P pedagogy of plan, prompt, preview, produce, peer-review, portfolio-tracking. *Research and Practice in Technology Enhanced Learning*. Advance online publication.  
<https://doi.org/10.58459/rptel.2024.19030>
- L'Enfant, J. (2024). AI as a reflective coach in graduate ESL practicum: Activity theory insights into student-teacher development. *The European Journal of Open, Distance and E-Learning*. Advance online publication.  
<https://doi.org/10.2478/eurodl-2024-0003>
- Law, L. (2024). Application of generative artificial intelligence (GenAI) in language teaching and learning: A scoping literature review. *Computers and Education: Artificial Intelligence*, 6, Article 100174.  
<https://doi.org/10.1016/j.caeo.2024.100174>
- Liaqat, A., Munteanu, C., & Epp, C. D. (2021). Collaborating with mature English language learners to combine peer and automated feedback: A user-centered approach to designing writing support. *International Journal of Artificial Intelligence in Education*, 31(4), 638–679.  
<https://doi.org/10.1007/s40593-020-00204-4>
- Lin, C. S. K. (2022). Exploring the effects of automated written corrective feedback, computer-mediated peer feedback and their combination mode on EFL learner's writing performance. *Interactive Learning Environments*. Advance online publication, 1–11.  
<https://doi.org/10.1080/10494820.2022.2066137>
- Liu, G., Zou, M. M., Soyooof, A., & Chiu, M. M. (2024). Untangling the relationship between AI-mediated informal digital learning of English (AI-IDLE), foreign language enjoyment and the ideal L2 self: Evidence from

- Chinese university EFL students. *European Journal of Education*. Advance online publication. <https://doi.org/10.1111/ejed.12846>
- Liu, S., & Mohd Saad, M. R. B. (2025). The impact mechanism of intensive English programs on the well-being of Chinese EFL learners in Malaysia using the PERMA model. *Journal of International Students*, 15(11), 165–184. <https://doi.org/10.32674/6w119h62>
- Liu, Z., Yin, S. X., Lee, C., & Chen, N. F. (2024). Scaffolding language learning via multimodal tutoring systems with pedagogical instructions. *arXiv*. <https://doi.org/10.48550/arXiv.2404.0342>
- Lubbe, A., Marais, E. & Kruger, D (2025). Cultivating independent thinkers: The triad of artificial intelligence, Bloom’s taxonomy and critical thinking in assessment pedagogy. *Educ Inf Technol* 30, 17589–17622. <https://doi.org/10.1007/s10639-025-13476-x>
- Luria, E. (2024). Exploring the integration of technology and AI in ESL instruction. In *Advances in educational technologies and instructional design* (pp. 59–84). IGI Global. <https://doi.org/10.4018/979-8-3693-9806-7.ch003>
- Mirzaei, A., & Eslami, Z. R. (2015). ZPD-activated languaging and collaborative L2 writing. *Educational Psychology*, 35(1), 5–25. <https://doi.org/10.1080/01443410.2013.814198>
- Microsoft. (2025). AI in education: A Microsoft special report. Microsoft Education. <https://www.microsoft.com/en-us/education>
- Narlu, G., & Kahraman, A. (2023). Unleashing the power of computer-mediated anonymous peer feedback in enhancing self-regulated learning. *Advanced Linguistics*, (11), 95–112. <https://doi.org/10.20535/2617-5339.2023.11.279004>
- Oktarina, I. B., Saputri, M. E. E., Magdalena, B., Hastomo, T., & Maximilian, A. (2024). Leveraging ChatGPT to enhance students' writing skills, engagement, and feedback literacy. *Edelweiss Applied Science and Technology*, 8(4), 2306–2319. <https://doi.org/10.55214/25768484.v8i4.1600>
- Omer, N. I. M. (2024). Maintaining meaningful human interaction in AI-enhanced language learning environments: A systematic review. *Journal of Arts and Linguistic Studies*, 6(3), 533–552. <https://doi.org/10.53286/arts.v6i3.2083>
- Organization for Economic Co-operation and Development. (n.d.). PISA 2029 media and artificial intelligence literacy. <https://www.oecd.org/en/about/projects/pisa-2029-media-and-artificial-intelligence-literacy.html>
- Ortiz, L. G., Maina, M. F., Lanzo, N. C., & Fernández-Ferrer, M. (2024). La autorregulación del aprendizaje desde un enfoque de feedback entre pares: Perspectivas de la IA generativa. *RED. Revista de Educación a Distancia*, 24(78), Article 599511. <https://doi.org/10.6018/red.599511>
- Pan, M., Guo, K., & Lai, C. (2024). Using artificial intelligence chatbots to support English-as-a-foreign language students' self-regulated reading.

- RELC Journal. Advance online publication.  
<https://doi.org/10.1177/00336882241264030>
- Priyantini, T. (2021). Technology-supported peer feedback: A literature review. *Indonesian Journal of Applied Linguistics*, 11(2), 345–356.  
<https://doi.org/10.17509/ijal.v11i2.37892>
- Rad, H. S., & Jafarpour, A. (2023). Using artificial intelligence to foster students' writing feedback literacy, engagement, and outcome: A case of WordTune application. *Interactive Learning Environments*. Advance online publication, 1–21. <https://doi.org/10.1080/10494820.2023.2208170>
- Rashid, M. P., Gehringer, E. F., & Khosravi, H. (2024). Navigating (dis)agreement: AI assistance to uncover peer feedback discrepancies. *Proceedings of the 14th Learning Analytics and Knowledge Conference* (pp. 612–623). <https://doi.org/10.1145/3636555.3636931>
- Sardi, J., Darmansyah, D., Candra, O., Yuliana, D. F., Habibullah, H., Yanto, D. T. P., & Eliza, F. (2025). How generative AI influences students' self-regulated learning and critical thinking skills? A systematic review. *International Journal of Engineering Pedagogy (iJEP)*, 15(1), 94–108.  
<https://doi.org/10.3991/ijep.v15i1.53379>
- Soozandehfar, S. M. A., & Souzandehfar, M. (2022). A socioculturally microgenetic scrutiny on the mediational role of teacher/peer scaffolding via dialogic collaboration in EFL speaking development. *Iranian Journal of English for Academic Purposes*, 4(1), 156–172.  
<https://doi.org/10.52547/ieepj.4.1.156>
- Sulistiyo, U. (2024). A systematic review of artificial intelligence in enhancing English foreign learners' writing skill. *Pedagogical Issues in English Education Journal*, 3(2), 45–62. <https://doi.org/10.59175/PIJED.v3i2.299>
- UNESCO. (n.d.). AI competency framework for teachers.  
<https://www.unesco.org/en/digital-education/artificial-intelligence/teacher-competency>
- Wang, Y. (2024). Integration of AI technology and ZPD: Pinpointing the zone of student development to promote educational innovation and efficiency improvement. *Journal of Education, Humanities and Social Sciences*, 38, 99–104. <https://doi.org/10.54097/wws14m21>
- World Economic Forum. (2025, May). Why AI literacy is now a core competency in education. *World Economic Forum Stories*.  
<https://www.weforum.org/stories/2025/05/why-ai-literacy-is-now-a-core-competency-in-education/>
- Xu, J., & Li, J. (2024). Effects of AI affordances on student engagement in EFL classrooms: A structural equation modeling and latent profile analysis. *European Journal of Education*. Advance online publication.  
<https://doi.org/10.1111/ejed.12808>
- Xu, S. (2024). An in-depth examination of the sociocultural framework-informed practical model of scaffolded feedback in enhancing senior high school English writing instruction. *International Journal of Social Sciences and Public Administration*, 3(3), 110–119.  
<https://doi.org/10.62051/ijsspa.v3n3.13>

- Yeh, H. (2024). The synergy of generative AI and inquiry-based learning: Transforming the landscape of English teaching and learning. *Interactive Learning Environments*. Advance online publication. <https://doi.org/10.1080/10494820.2024.2335491>
- Yin, X. F. (2024). A critical thinking-oriented approach in English as a foreign language (EFL) writing: Using ChatGPT as an ideal peer. In *Contemporary perspectives on language education* (pp. 712–728). Springer. <https://doi.org/10.29140/9780648184485-49>
- Zhan, Y., Wan, Z. H., & Sun, D. (2022). Online formative peer feedback in Chinese contexts at the tertiary level: A critical review on its design, impacts and influencing factors. <https://psycnet.apa.org/doi/10.1016/j.compedu.2021.104341>

---

*Author bios*

---

**ASYRAF** is a PhD candidate from the School of Education at Northern University Malaysia (UUM). His research interest spans across AI scaffolded language learning environment, second language acquisition and instructional strategies in ESL. Email: [asyraf\\_shuib@ahsgs.uum.edu.my](mailto:asyraf_shuib@ahsgs.uum.edu.my)

**DR SAIFOLRUDIN** is a Senior Lecturer at Universiti Utara Malaysia (UUM). Dr. Saifol specializes in education, focusing on curriculum development, educational technology, AI in adaptive learning strategies and teacher professionalism. His research bridges educational theory and practice, enhancing national curriculum policies. He is actively engaged in consultation, pedagogical innovation and educator capacity building, contributing significantly to academic excellence. Email: [s.khalid@uum.edu.my](mailto:s.khalid@uum.edu.my)

**DR AIZAN** is an Associate Professor at Universiti Utara Malaysia Kuala Lumpur (UUMKL). Specializing in ELT, applied linguistics, bilingualism, teaching English to young learners, and qualitative research, Dr. Aizan has secured various prestigious national and international grants. Her current research includes online learning effectiveness in rural primary schools and socialpreneurship for urban youth. Email: [aizan904@uum.edu.my](mailto:aizan904@uum.edu.my)

---