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AI and Digital Literacy in Language Education: A Systematic Review on Critical Thinking Development

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Abstract

Rapid advances in artificial intelligence (AI) have reshaped language education and raised new questions about how AI interacts with digital literacy and critical thinking development. This study presents a Systematic Literature Review (SLR) following PRISMA 2020, examining Scopus-indexed articles published between 2015–2025. A total of 58 records were identified, 44 were screened, and 14 full-text studies were included for qualitative thematic synthesis. The findings reveal that AI literacy, digital literacy, and critical thinking operate as an interdependent cognitive ecosystem in language learning: AI functions as a cognitive mediator that can stimulate analytical reasoning; digital literacy equips learners to navigate and evaluate multimodal information; and critical thinking serves as an epistemic and ethical filter for responsible meaning-making. Effective pedagogical strategies identified include AI-supported inquiry, reflective scaffolding, and project-based digital literacy tasks, with teachers and virtual communities of practice serving as ethical mediators and collaborative support structures. Key challenges—cognitive offloading, algorithmic bias, and digital divides—pose risks to learner autonomy and equitable learning outcomes. To bridge these issues, this review proposes the AI-Enhanced Critical Literacy Pedagogy (AICLP) model, offering an integrative framework that connects cognitive, reflective, and ethical dimensions for strengthening critical thinking in AI-mediated language education. The model provides theoretical grounding and practical guidance for curriculum design, teacher development, and education policy in the digital era.

Keywords: Artificial intelligence; Digital literacy; Critical thinking; Language education; Pedagogy

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INTRODUCTION

The rapid advancement of artificial intelligence has transformed the landscape of modern language education and influenced the ways learners interact with information, build meaning, and develop higher order thinking skills (Andreucci-Annunziata dkk., 2023). Amid these changes, three key domains, namely artificial intelligence literacy, digital literacy, and critical thinking, have emerged as essential competencies for learners in the twenty first century (Walter, 2024; Zhai, 2024). Although these domains are widely discussed in current research, they are often examined separately, which limits understanding of how they function as a unified framework to strengthen critical

thinking in language learning. Addressing this gap represents the main novelty of the present study.

AI literacy is increasingly understood as the knowledge and skills needed to comprehend, use, and critically assess artificial intelligence systems in ethical and meaningful ways (Chiu dkk., 2024; Yim & Su, 2025). This form of literacy goes beyond technical familiarity and includes an epistemic awareness of how artificial intelligence generates, filters, and organizes information (Yoshija Walter, 2024). Digital literacy, in a similar manner, prepares learners to navigate multimodal resources, judge credibility, and communicate effectively within digital settings (Ilomäki dkk., 2016; Ng, 2012). Together, these two forms of literacy create a strong foundation for the development of critical thinking, a vital ability that enables learners to examine arguments, assess evidence, and reflect on the ethical and social consequences of digital information (Melisa & Walter, 2025; Yang & Liu, 2025).

Recent studies show that AI tools, including large language models (LLMs), can enhance inquiry-based learning, expand access to information, and support the development of analytical reasoning (Liu, 2025; Yang & Liu, 2025). Teachers also benefit from AI-supported feedback systems and resource development, which facilitate more personalized and reflective learning (Yan, 2024). However, scholarship also highlights persistent risks, including cognitive offloading, over-reliance on AI-generated outputs, algorithmic bias, and widening digital divides (Darwin & Tan, 2024; Walter, 2024). These challenges indicate that the integration of AI into language education requires not only technological adaptation but also a pedagogical framework that foregrounds ethical awareness, critical reflection, and learner autonomy.

Although interest in learning supported by artificial intelligence continues to grow, previous research often examines artificial intelligence literacy, digital literacy, and critical thinking separately. Many studies concentrate on the technical use of artificial intelligence tools, such as grammar correction, vocabulary assistance, or automated feedback, while giving limited attention to the ways artificial intelligence influences students' reasoning, reflective judgment, and epistemic engagement (Liu, 2025; Moundridou dkk., 2024). Research on digital literacy also rarely overlaps with artificial intelligence literacy, even though both are essential for navigating the rapidly evolving technological environment of language classrooms (Wieczorek dkk., 2025; Yang & Liu, 2025). In addition, scholarly discussions about the role of teachers and virtual communities of practice in guiding ethical and critical use of artificial intelligence remain limited (Darwin & Tan, 2024; Walter, 2024).

To address these gaps, this study synthesizes a decade of Scopus-indexed research through a Systematic Literature Review (SLR) guided by PRISMA 2020. The review integrates findings from AI literacy, digital literacy, and critical thinking within language education to generate a comprehensive conceptual understanding of how these domains interact. The study is guided by the following research questions: How do AI literacy, digital literacy, and critical thinking relate to one another in the context of language education?; What pedagogical strategies support the integration of AI and digital literacy to promote critical thinking?; What roles do teachers and virtual communities of practice play in supporting ethical and critical AI use?; What key challenges affect the development of critical thinking in AI-mediated language learning?; And How can an integrative conceptual model be formulated to connect AI literacy, digital literacy, and critical thinking development?

This study offers a key contribution by proposing an integrative framework, the AI-Enhanced Critical Literacy Pedagogy (AICLP) model, which synthesizes cognitive, reflective, and ethical dimensions of AI-mediated learning. Unlike prior studies that examine each construct separately, this research positions AI literacy and digital literacy

as interconnected foundations for critical thinking development in language learning across educational levels. The findings aim to inform curriculum design, teacher preparation, and educational policy, particularly in ensuring that AI enhances rather than diminishes students' analytical capacity, ethical awareness, and intellectual autonomy in the digital era.

RESEARCH METHOD

Research Design

This study employed a Systematic Literature Review (SLR) using the PRISMA 2020 protocol to identify, select, evaluate, and synthesize research on the intersection of AI literacy, digital literacy, and critical thinking in language education. The SLR was designed as a qualitative thematic synthesis, allowing for in-depth interpretation across diverse study contexts and methodological approaches (Moher dkk., 2009; Page dkk., 2021). This design supports the development of an integrative conceptual understanding that goes beyond summary toward analytical interpretation.

Following PRISMA, the review consisted of four stages (identification, screening, eligibility, and inclusion) each documented transparently to ensure replicability and methodological rigor.

Search Strategy

Scopus was used as the sole database due to its broad interdisciplinary coverage and rigorous indexing standards. The search was conducted using the Boolean expression: ("Artificial Intelligence" AND "Language Teaching") with the publication window limited to 2015–2025 to capture the decade marking the rise of AI-assisted and generative AI tools in education.

The initial query produced 58 records, which were exported as RIS files and processed for screening. Duplicate detection indicated no duplicates (n = 0). Titles, abstracts, and indexing details were checked to ensure completeness and consistency.

Additional steps taken to locate relevant literature included backward citation tracking of included articles and forward citation tracking using Scopus citation tools to find recent work that cited key papers. We also performed targeted searches for conference proceedings and book chapters when these were referenced by multiple journal articles, and we recorded provenance for each retrieved item to maintain traceability.

To determine appropriate search terms and to reduce retrieval bias we conducted a pilot search phase where different keyword combinations and controlled vocabulary from Scopus were tested and refined. This pilot phase included testing synonyms for key constructs such as AI literacy artificial intelligence literacy machine intelligence digital competence and information literacy to ensure broad coverage.

Article Selection Procedures (PRISMA Mapping)

The study selection followed the four PRISMA phases: **Identification (n = 58)** All records were retrieved from Scopus. No duplicates identified. **Screening (n = 44)** After removing: Low-quality outlets (not Scopus Q1–Q4) (n = 12); articles without abstracts (n = 2) 44 articles remained for title–abstract screening. During this step, 3 articles were excluded for irrelevance to AI-based language learning.

To screen titles and abstracts we developed a two stage screening rubric. Stage one established broad relevance to AI or digital technologies in language learning. Stage two assessed alignment with one or more of the core constructs AI literacy digital literacy or critical thinking. Each item was rated by two independent reviewers using a three point scale relevant possibly relevant not relevant. Interrater agreement was calculated using Cohen s kappa and disagreements were resolved through discussion or by a third

reviewer. Screening decisions and reasons for exclusion were logged in a study management spreadsheet.

Eligibility *(n = 41)*

Full texts were sought for all 41 eligible records. However, 27 full texts were unavailable due to access restrictions.

Thus, **14 full-text articles** were obtained and assessed for methodological and topical relevance.

For unavailable full texts we documented access attempts including institutional subscriptions author contact and interlibrary loan requests. When an article could not be accessed we recorded its bibliographic metadata and assessed whether its abstract provided sufficient information to include it in a sensitivity analysis. We also used publisher platforms and author repositories to verify whether open access versions existed.

Inclusion (n = 14)

All 14 articles met the inclusion criteria and were included in the thematic synthesis.

No additional studies were added from external sources. The PRISMA flowchart (Figure 1) illustrates this process.

Inclusion and exclusion criteria were pre registered and piloted. Key inclusion criteria included empirical or conceptual relevance to at least one of the focal constructs AI literacy digital literacy or critical thinking application to language education peer reviewed status publication within the date range and availability of sufficient methodological detail for appraisal. Exclusion criteria included studies focused solely on technical development of AI algorithms with no educational evaluation, studies outside language education contexts, and non peer reviewed opinion pieces unless they provided substantial theoretical contributions. Each included study was documented with a justification that linked the study to the review research questions.

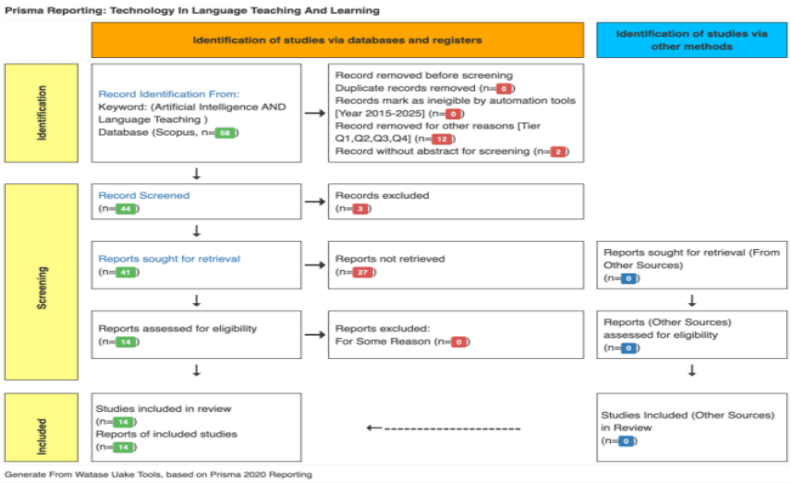

Figure 1 Visualization of The Article Selection Process

Study Quality Assessment

To ensure analytical robustness, all included studies were appraised using four criteria adapted from Kolaski et al. (2023): (a) research design appropriateness (qualitative, quantitative, mixed methods), (b) validity and reliability of findings, (c) suitability of instruments and data sources, and (d) relevance to AI integration, digital literacy, and critical thinking. Conceptual papers were included only if they made strong theoretical contributions to AI literacy or critical pedagogy (Snyder, 2019), ensuring a balanced and

high-quality evidence base. Quality appraisal was conducted using a structured scoring sheet with explicit indicators for sampling strategy, data analysis transparency, and ethical considerations. Each domain was scored, and an overall quality rating—high, moderate, or low—was assigned. Two reviewers conducted independent appraisals, and a third reviewer adjudicated discrepancies. Studies rated low in methodological rigor were retained only for conceptual mapping and were flagged in the synthesis, so empirical claims were weighted according to study quality.

Descriptive Profile of Included Studies

To contextualize the synthesis, the 14 included studies were profiled based on several categories. First, the educational level was considered, with studies distributed across primary (n = 3), secondary (n = 4), higher education (n = 5), and mixed/general contexts (n = 2).

Second, the geographical distribution of the studies was noted: Asia (n = 6), Europe (n = 4), North America (n = 2), the Middle East (n = 1), and Oceania (n = 1).

Third, the research design was categorized as follows: qualitative (n = 6), quantitative (n = 4), mixed methods (n = 2), and conceptual (n = 2).

Finally, language education contexts were considered, with the studies focusing on EFL/ESL (n = 9), bilingual/multilingual education (n = 3), and general language literacy (n = 2).

This diversity strengthens the generalizability and interpretive depth of the synthesis. In addition to these descriptive categories, we also extracted metadata such as journal name, journal quartile, citation counts, and funding sources to examine potential publication bias. We further recorded whether the studies reported ethical approval and described participant consent, which informed our interpretation of study transparency.

Data Extraction

Data were extracted systematically from each article using a coding matrix that covered several key aspects: (a) authors, year, and country; (b) research aims; (c) educational level and language context; (d) AI tools or frameworks examined; (e) findings related to AI literacy, digital literacy, and critical thinking; and (f) reported pedagogical strategies, challenges, and implications. This approach ensured standardization and comparability across studies. Additionally, the coding matrix included fields for the theoretical frameworks used by authors, methods of data collection, sample size, and limitations reported by the authors. To calibrate the matrix, two researchers independently coded a subset of articles, and inter-coder reliability was measured. All codes and supporting quotations were stored in a secure repository to ensure auditability.

Data Analysis: Thematic Synthesis

Thematic analysis was conducted following Braun and Clarke's (2021) six-phase framework. The first phase involved familiarization with the 14 full-text articles through repeated reading. In the second phase, initial coding was performed manually, focusing on recurring concepts such as AI-mediated inquiry, cognitive risks, digital navigation, and teacher mediation. The third phase involved searching for themes by grouping codes into higher-order categories. In the fourth phase, themes were reviewed by comparing them against raw extracts and the full study contexts. The fifth phase consisted of defining and naming the themes, resulting in five overarching analytical themes that were aligned with the research questions. Finally, in the sixth phase, the synthesis was produced by integrating conceptual patterns with empirical evidence.

Trustworthiness Measures

To strengthen credibility and reflexivity, several strategies were employed. These included peer debriefing, where coding assumptions were compared with two external researchers; reflexive memoing, which involved tracking interpretive decisions throughout the analysis; iterative checking, where themes were re-evaluated against raw data to ensure fidelity; and maintaining an audit trail, which documented the search, coding, and synthesis procedures. These steps ensured analytical transparency and helped reduce interpretive bias. Furthermore, sensitivity analyses were applied to test how the inclusion or exclusion of lower-quality studies affected the themes. We distinguished between themes strongly supported by multiple high-quality empirical studies and themes that were primarily speculative or based on conceptual arguments. Negative or contradictory cases were also documented to avoid overstating consensus.

Synthesis and Contribution

The thematic synthesis informed the development of the AI-Enhanced Critical Literacy Pedagogy (AICLP) model, which integrates findings across AI literacy, digital literacy, and critical thinking. This model bridges empirical insights and theoretical perspectives to provide a stronger conceptual grounding of the relations between AI, digital literacy, and critical thinking; practical guidelines for reflective AI-mediated pedagogy; and policy-oriented implications for ethical and equitable implementation. To support transferability, we provided clear mapping from each theme to the original studies with citations and quality ratings. Practical steps for curriculum designers and teacher educators to operationalize the AICLP model were described, along with suggestions for measurable indicators for future empirical testing. Finally, we outlined how researchers can adapt the search strategy and screening rubric to extend the review by including additional databases, languages, or grey literature, all while maintaining methodological transparency.

RESULTS AND DISCUSSION

RESULT

Relationship between AI Literacy, Digital Literacy, and Critical Thinking

Across the 14 studies, a clear pattern emerges: AI literacy, digital literacy, and critical thinking function as a mutually reinforcing cognitive ecosystem, where each construct strengthens the others in AI-mediated language learning. AI literacy consistently appears as a cognitive gateway, enabling learners to understand how AI processes information, how algorithmic outputs are generated, and how human judgment differs from machine-driven reasoning (C. Chen, 2025; Q. Chen dkk., 2023). This awareness supports the development of epistemic cognition, helping students evaluate AI-generated content rather than accepting it uncritically.

Digital literacy complements these capabilities by enabling learners to navigate multimodal resources, distinguish credible sources, and construct arguments grounded in evidence (Ilomäki et al., 2016; Ng, 2012). The reviewed studies show that learners with higher digital literacy demonstrate stronger skills in identifying bias and evaluating the quality of AI outputs. Critical thinking functions as the epistemic and ethical filter that regulates how AI and digital tools are interpreted. When these literacies interact, learners exhibit stronger skills in analysis, evaluation, and reflective reasoning (Melisa & Walter, 2025; Walter, 2024).

Confirmed across studies:

AI literacy enhances analytical reasoning when paired with digital evaluation skills, while digital literacy enables critical questioning of AI outputs. Critical thinking develops most effectively when AI use is framed reflectively within pedagogical

practices. However, uncertainty remains regarding how much AI literacy alone can predict critical thinking gains. Additionally, the long-term effects of generative AI on students' reasoning autonomy are still unclear. This ongoing inquiry highlights the need to explore the full impact of AI integration in education and its potential to foster or hinder students' independent analytical abilities over time.

Pedagogical Strategies Integrating AI and Digital Literacy for Critical Thinking

Studies converge on the finding that inquiry-based, reflective, and project-based approaches are the most effective strategies for integrating AI and digital literacy to promote critical thinking.

Inquiry tasks assisted by artificial intelligence, including prompt design, artificial intelligence supported argument reconstruction, and comparisons of multiple perspectives guided by large language models, have been shown to encourage cognitive engagement and metacognitive reflection (Li & Wilson, 2025). Reflective scaffolding is particularly effective when teachers prompt students to: interrogate the logic of AI-generated explanations; evaluate reliability across sources; and identify potential algorithmic bias.

Project-based digital literacy approaches (e.g., AI-supported writing portfolios, multimodal text production, collaborative revision using AI) encourage learners to reason independently, monitor their thought processes, and reflect on the quality of AI contributions (Arqam & Asrifan, 2024; Chiu et al., 2024).

Key advantage across studies: AI is most beneficial when used as a thinking partner, not as an answer generator. What remains contested: Whether frequent AI feedback improves or undermines student autonomy. The extent to which metacognitive prompts reduce overreliance on AI.

Role of Teachers and Virtual Communities of Practice (VCoPs)

Evidence across studies shows that teachers remain the central ethical and pedagogical mediators, while Virtual Communities of Practice (VCoPs) extend professional support beyond classroom boundaries. Teachers act as ethical mediators, guiding learners to identify bias, question AI outputs, and uphold responsible use (Fu & Weng, 2024). They also serve as AI literacy facilitators, modeling critical questioning strategies and illustrating the limitations of algorithms (Walter, 2024). Additionally, teachers act as reflective mentors, directing students to compare machine-generated reasoning with human reasoning. VCoPs strengthen teachers' capacity by providing digital spaces for sharing AI teaching practices, collaboratively analyzing ethical dilemmas, and co-developing AI literacy materials (Dickson et al., 2024; Floris, 2025). The implication of these findings is that critical AI literacy in language education requires human-machine collaboration shaped by teacher judgment and supported by professional communities. However, an unresolved issue remains regarding the sustainability of VCoPs without institutional support or incentives.

Key Challenges to Critical Thinking in AI-Based Language Learning

Three major challenges consistently appear across studies: cognitive offloading, algorithmic bias, and digital inequities. Cognitive offloading emerges when students rely excessively on AI to generate ideas or structure arguments, resulting in reduced analytical effort and weakened reasoning autonomy (Zhai, 2024). Algorithmic bias appears in AI-generated texts, feedback, and monitoring systems, potentially reinforcing unequal learning experiences across gender, linguistic, or cultural groups (Baker & Hawn, 2022; Rouabhia, 2025). Digital divides remain a critical barrier, as students with weaker digital literacy or limited access to stable technology benefit far less from AI-assisted learning environments (Liu, 2025; Van De Werfhorst et al., 2022). A confirmed

pattern across the studies is that AI can strengthen critical thinking only when aligned with strong digital literacy and teacher mediation. However, an uncertain issue remains regarding how to design AI systems that minimize cognitive offloading without limiting meaningful assistance.

Integrative Conceptual Model: AI-Enhanced Critical Literacy Pedagogy (AICLP)

Synthesizing the five themes resulted in the development of the AI-Enhanced Critical Literacy Pedagogy (AICLP) model, which integrates AI literacy as cognitive mediation, digital literacy as informational navigation, and critical thinking as ethical–epistemic regulation. The model positions AI as a partner in inquiry, digital literacy as a reflective navigational tool, and critical thinking as the moral compass guiding learning. Below is the revised synthesis table that directly answers each research question.

Table 1 Synthesis of Findings by Research Question

RQ	Focus of Analysis	Cross-Study Findings	Implications	Key Sources
RQ1	Relationship between AI literacy, digital literacy, and critical thinking	The three operate as a mutually reinforcing cognitive system; AI mediates reasoning, digital literacy filters information, critical thinking regulates interpretation	Language curriculum must integrate all three in balanced form	(Liu, 2025; Walter, 2024; Yang & Liu, 2025)
RQ2	Pedagogical strategies	Inquiry-based, reflective scaffolding, and project-based digital literacy tasks effectively promote critical reasoning	Learning should position AI as a thinking partner, not an answer generator	(Darwin & Tan, 2024; Joseph, 2023)
RQ3	Teacher & VCoPs roles	Teachers act as ethical mediators; VCoPs strengthen collaborative capacity	Institutions must support teacher AI literacy and professional networks	(Eyal, 2025; Floris, 2025)
RQ4	Challenges	Cognitive offloading, bias, and digital divides threaten autonomy and equity	Pedagogy should emphasize metacognition and ethical digital literacy	(Baker & Hawn, 2022; Zhai, 2024)
RQ5	Integrative model	AICLP integrates cognitive, reflective, and ethical dimensions	Framework for curriculum and AI literacy development	(X. Chen dkk., 2022; Yang & Liu, 2025)

Discussion

The findings of this review highlight that AI literacy, digital literacy, and critical thinking operate as an interconnected system that shapes learners' cognitive, reflective, and ethical engagement in AI-mediated language education. This section situates the thematic results within existing theories and prior empirical work, clarifying the study's contribution and outlining implications for practice and policy.

Integrating AI Literacy, Digital Literacy, and Critical Thinking: A Triadic Framework

The synthesis confirms that the three competencies form a triadic cognitive ecosystem, supporting and reinforcing one another. This aligns with prior theoretical work which conceptualizes digital literacy as a multidimensional competence involving information evaluation, multimodal navigation, and ethical discourse (Ilomäki dkk., 2016; Ng, 2012). Meanwhile, recent frameworks on AI literacy emphasize the importance of understanding algorithmic processes, biases, and human–machine interaction (Chiu dkk., 2024; Eyal, 2025).

However, the present review extends these studies by integrating AI literacy and digital literacy as co-requisites for critical thinking, a relationship that prior scholarship treated largely in isolation. In synthesizing evidence across 14 studies, the review shows that critical thinking development depends on both technological understanding (AI literacy) and evaluative navigation (digital literacy), confirming theoretical predictions by (Walter, 2024; Yang & Liu, 2025), but offering stronger empirical grounding.

Pedagogical Strategies that Position AI as a Thinking Partner

The reviewed studies converge on the effectiveness of AI-supported inquiry, reflective scaffolding, and project-based digital literacy in building critical thinking. This finding is consistent with constructivist and inquiry-based learning theories, which argue that knowledge develops through reasoning, reflection, and dialogic engagement (Darwin & Tan, 2024; Li & Wilson, 2025).

The added contribution of this review is the identification of AI's role as a thinking partner, rather than a knowledge provider. This complements (Joseph, 2023) view that AI should act as a cognitive collaborator in reflective learning, and it aligns with (Ardern et al., 2022; Gholiagha et al., 2025), who demonstrate that participatory AI use can enhance students' metacognitive awareness.

By synthesizing pedagogical patterns across contexts, the review offers a refined understanding that critical thinking emerges most strongly when AI is embedded in tasks requiring justification, comparison, argument evaluation, and iterative reflection rather than passive consumption of AI-generated answers.

Teachers and VCoPs as Ethical and Reflective Mediators

The findings reinforce the central role of teachers as ethical mediators and cognitive facilitators. This echoes earlier work on teacher agency in AI-mediated instruction (Felix, 2020; Nguyen et al., 2023). Yet, this review extends the literature by clarifying how teachers mediate AI use: through modeling evaluative questioning, highlighting algorithmic limitations, and guiding reflective deliberation on AI outputs.

Similarly, the role of Virtual Communities of Practice (VCoPs) in supporting AI literacy development among teachers expands on Floris (2025) and Dickson (2024). The present review shows that VCoPs contribute not only professional support but also ethical deliberation, helping teachers contextualize AI dilemmas, share practices, and co-construct frameworks for responsible AI use. This insight responds directly to the research gap that previous SLRs in the field had not explored.

Challenges: Cognitive Offloading, Bias, and Digital Inequities

The three principal challenges identified, namely cognitive offloading, algorithmic bias, and digital divides, reflect concerns raised by Zhai (2024), Baker & Hawn (2022), and Van De Werfhorst (2022). However, the present review brings these challenges together within a single framework and demonstrates how they collectively influence the development of critical thinking.

A central contribution of this review is its explanation of how cognitive offloading disrupts the epistemic and metacognitive processes required for critical thinking, especially when learners depend on artificial intelligence tools without sufficient guidance to support reasoning or self monitoring. The analysis also emphasizes that

algorithmic bias carries significant pedagogical implications, as it affects the fairness of feedback and shapes the development of students' interpretive habits. By integrating these risks, the review clarifies that AI-based language education requires deliberate pedagogical and policy safeguards, especially for marginalized learners disproportionately affected by digital inequities.

Contribution of the AICLP Model: A Synthesis of Cognitive, Reflective, and Ethical Dimensions

The AI-Enhanced Critical Literacy Pedagogy (AICLP) model proposed in this review represents a major theoretical contribution. Whereas prior models discussed AI literacy, digital literacy, and critical pedagogy separately (Joseph, 2023; Zawacki-Richter dkk., 2019), AICLP integrates these dimensions into a unified framework.

AICLP advances the field in three ways: Cognitively: positioning AI literacy as a mediator of reasoning and analytical inquiry. Reflectively: embedding digital literacy as a navigational and interpretive competence. Ethically: situating critical thinking as the guiding filter to assess AI's epistemic and moral implications. This synthesis supports curriculum designers and policymakers in framing AI-mediated language learning not merely as a technical intervention but as a human-centered, ethically grounded pedagogical paradigm.

CONCLUSION

This review concludes that the integration of artificial intelligence (AI), digital literacy, and critical thinking forms an interdependent ecosystem that reshapes language education in the digital era. Synthesizing findings from fourteen Scopus-indexed studies, the review provides a consolidated understanding of how these competencies interact and what pedagogical, ethical, and structural conditions are required for their effective implementation.

First, regarding RQ1, the review finds that AI literacy, digital literacy, and critical thinking mutually reinforce one another, with AI serving as a cognitive mediator, digital literacy enabling evaluative navigation, and critical thinking acting as an epistemic and ethical regulator. Second, in response to RQ2, the review shows that inquiry-based learning, reflective scaffolding, and project-based digital literacy are the most effective pedagogical strategies for fostering critical thinking in AI-mediated language learning.

Third, addressing RQ3, evidence demonstrates that teachers function as ethical mediators and cognitive facilitators, while virtual communities of practice strengthen collaborative professional reflection and responsible AI use. Fourth, for RQ4, the review identifies cognitive offloading, algorithmic bias, and digital divides as the main challenges that threaten learner autonomy, reasoning depth, and equitable access. Fifth, answering RQ5, the review proposes the AI-Enhanced Critical Literacy Pedagogy (AICLP) model, which integrates cognitive, reflective, and ethical dimensions to support critical thinking development in language education.

The study emphasizes that the integration of artificial intelligence must be rooted in reflective, human-centered, and ethical pedagogical practices to ensure that technology enhances rather than weakens students' analytical abilities and intellectual autonomy. Limitations of this review include the use of a single database (Scopus), limited access to full texts, which reduced the final corpus to fourteen studies, and the predominance of short-term or small-scale research within the included literature. These constraints may limit the generalizability of the findings. Implications of this review highlight the need for robust teacher preparation in AI ethics and AI literacy, curriculum designs that explicitly link digital literacy with critical thinking outcomes, and institutional policies that address digital inequalities to ensure fair participation in AI-rich learning environments.

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