

Beyond Technical Competencies: A Critical Analysis of Global Research on Language Teacher AI Literacy

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Introduction

Teacher AI literacy is a critical enabler of educational transformation, influencing how technology is interpreted, adapted, and evaluated through human judgment in the classroom. As defined in the UNESCO AI Competency Framework for Teachers (Miao & Cukurova, 2024), teacher AI literacy refers to the knowledge, skills, attitudes, and values that allow educators to critically understand, use ethically, and integrate AI in ways that strengthen human agency and support inclusive education. In recent years, there has been a surge in AI literacy frameworks and guidelines issued by educational organisations worldwide (Zhang et al., 2025). Yet, these initiatives often frame teacher AI literacy primarily in technical competencies, underemphasising its pedagogical, ethical, and societal dimensions.

China's ambitious national policies to embed AI throughout its education system (Roberts et al., 2021), from primary schools to universities, are already reshaping pedagogical models, digital platforms, and language proficiency standards. These changes carry global implications for the teaching of Chinese as a Foreign Language (CFL). For CFL teachers teaching Chinese outside of China, comprehensive AI literacy is increasingly essential to align with evolving policy priorities and innovation agendas set in the home country (Yang et al., 2023). Yet research assessing teachers' readiness and capabilities remains limited (Li & Liang, 2025). The gap between rapid, policy-driven adoption and the absence of robust evaluative frameworks underscores the urgent need for deeper investigation.

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Method

To address these gaps, this study presents a systematic review of 79 peer-reviewed articles published between January 2020 and December 2024. It offers a critical analysis of current research focuses and suggests new directions for reconceptualising teacher AI literacy.

Two major academic databases, Scopus and Web of Science, were used for the search. The search terms were “artificial intelligence literacy” OR “AI literacy” AND “teacher” OR “AI readiness”. Articles containing these keywords in their title or abstract were initially screened. To minimise selection bias, a defined set of inclusion and exclusion criteria was applied. The inclusion criteria were as follows: (1) written in English; (2) open access; (3) full-text availability; (4) classified as research articles; and (5) published between 2020 and 2024. The exclusion criteria are: (1) systematic reviews; (2) brief publications such as commentaries, editorials, or workshop papers, which often lack sufficient detail or represent subjective viewpoints; and (3) articles that mentioned AI literacy but did not specifically address teachers’ AI literacy, such as those focusing on other forms of literacy (e.g., data or digital literacy) or on students’ AI literacy. A thematic analysis was then conducted to identify key research trends, conceptual gaps, and implications for teacher AI literacy in the context of language education.

Findings

Four major findings emerged from this review, highlighting the need for a more critical and context-sensitive understanding of teacher AI literacy, particularly for language educators.

First, most studies remain narrowly focused on why, what, and how to use AI tools ($n = 21$). The reviewed literature is concentrated in East Asia (51%), particularly China, followed by North America (15%) and Europe (8%), with large-scale quantitative surveys (64%) dominating the field. These surveys often measure general teacher acceptance of AI or assess digital competencies, even though many studies describe AI literacy as a holistic concept ($n = 12$). Across the reviewed work, AI knowledge, AI use, and AI ethics emerge as three recurring dimensions in AI literacy frameworks. While this body of research contributes to foundational understanding, it frequently overlooks subject-specific needs, especially the pedagogical and epistemological complexities unique to language education.

Secondly, existing AI literacy research is often confined to single cases in university contexts ($n = 19$) or short-term online programmes ($n = 6$). Influencing

factors identified include age, educational background, training experience, and personal attitudes toward technology. These studies are generally limited in duration and broad in scope, most often functioning as one-off tool-driven experiments in a particular type of language classes such as writing (Li et al., 2025). Although language teachers often express positive attitudes toward AI, their ability to integrate it meaningfully and sustainably into classroom practice remains limited, as effective integration requires more than digital skills and an open mindset.

Thirdly, although conceptualisations of AI literacy are plentiful, few studies are supported by reliable, validated assessment tools. Most rely on self-reported Likert-scale instruments ($n = 40$), which lack cross-cultural robustness and long-term applicability (Younis, 2025). Many are further constrained by small sample sizes, limited theoretical grounding, and minimal consideration of ethical or cultural adaptability. As a result, we found that existing body of research on teacher AI literacy remains largely exploratory.

Finally, within the set review period, no studies ($n = 0$) were found that specifically address CFL teaching, with most instead focusing on English language teaching. Tools and frameworks tailored for CFL teachers remain scarce (Li & Liang, 2025). AI is often treated as a generic technological innovation, with little recognition of the linguistic and cultural specificities essential to CFL instruction, such as character recognition, tonal pronunciation, and culturally sensitive content generation. While calls to strengthen CFL teacher AI literacy are increasing, practical and contextually grounded strategies remain underdeveloped.

Taken together, these findings indicate that while global research has laid some groundwork for understanding teacher AI literacy, there is a pressing need to move beyond its current boundaries.

Discussion

The findings of this review reveal persistent challenges in advancing AI literacy among language teachers, particularly within Chinese language education. Theoretical frameworks remain underdeveloped, existing assessment tools lack subject specificity, and classroom practices continue to lag behind technological developments. Moreover, current approaches frequently overlook the sociocultural and linguistic dimensions essential to meaningful language teaching both within and outside of China.

One methodological limitation of this review is that the search was conducted using only English-language terms, which have excluded relevant studies published in Chinese or other languages. Addressing this limitation

in future research would provide a more complete and representative picture of the field.

Going forward, there is a pressing need to develop AI literacy frameworks that are both linguistically and culturally grounded. Such frameworks must recognise teachers' complex pedagogical work, respond to their specific teaching realities, and go beyond surface-level engagement with tools. They should be embedded in a broader, more nuanced understanding of teacher AI literacy, one that foregrounds human agency, critical pedagogy, and the safeguarding of high-quality, personally meaningful, community-oriented language teaching in the age of AI.

Conclusion

As AI becomes embedded in education systems worldwide, there is growing consensus that teacher AI literacy must be reconceptualised. It cannot be reduced to mastering tools or passively accepting technological change. Instead, it must centre on critical understanding, pedagogical agency, and ethical responsibility, with the broader aim of driving transformative and sustainable change in education. For language teachers, this means developing AI literacies that are as nuanced, adaptive, and human as the work they undertake. Without such a shift, AI risks being absorbed as yet another digital tool, rather than fulfilling its potential as a catalyst for profound, lasting educational transformation.

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