

Artificial Intelligence Literacy in Language Education: Global Trends and Future Directions

Brian L. Moorhouse^{1✉}, Lisa Law², Karen Sperling³

¹Department of Education Studies, Hong Kong Baptist University, Kowloon Tong, Hong Kong SAR, China

²School of Education, University of New England, Armidale, NSW, Australia

³Department of Education, Aarhus University, Aarhus, Denmark

✉ brianmoorhouse@hkbu.edu.hk

📍 [10.65840/jllcd.v2i3.34](https://doi.org/10.65840/jllcd.v2i3.34)

Article Info

Submitted:

10/20/2025

Revised:

11/09/2025

Accepted:

12/10/2025

Available Online:

12/14/2025

Abstract. Artificial intelligence (AI) has rapidly transformed educational practice, particularly in language learning environments where generative AI tools are increasingly used for writing support, feedback, translation, and personalized instruction. Despite this expansion, the concept of AI literacy in language education remains fragmented across disciplines and lacks a comprehensive synthesis of its global development. This study therefore investigates research trends, intellectual structures, emerging themes, and future directions in AI literacy within language education. A systematic literature review integrated with bibliometric analysis was employed using 198 Scopus-indexed publications retrieved in April 2026. Data were analyzed through VOSviewer using publication trend analysis, keyword co-occurrence mapping, overlay visualization, and density visualization. The findings reveal a sharp rise in publication output after 2024, indicating growing scholarly attention following the diffusion of generative AI technologies. Thematic mapping identified four dominant knowledge clusters: teacher readiness and professional development, AI-assisted language learning, generative AI applications in EFL/ESL contexts, and critical AI literacy related to ethics and learner autonomy. Overlay analysis further demonstrates a transition from early tool-adoption studies toward more recent concerns with engagement, pedagogical integration, and responsible AI use. Density analysis shows that while AI literacy and generative AI dominate the literature, assessment models, multilingual contexts, and longitudinal intervention studies remain underdeveloped. The study concludes that AI literacy has evolved into a multidimensional competence central to future language education. These findings provide practical guidance for curriculum design, teacher preparation, and policy development, while offering a research agenda for more inclusive and evidence-based AI integration in language learning.

Keywords: AI literacy; language education; bibliometric analysis; VOSviewer; generative AI; language learning; ChatGPT



[This work is licensed under a Creative Commons Attribution-ShareAlike 4.0 International License](https://creativecommons.org/licenses/by-sa/4.0/)

1. Introduction

Artificial intelligence (AI) has rapidly moved from a specialized technological domain into mainstream educational practice. The expansion of generative AI systems, particularly large language models such as ChatGPT, has significantly

transformed how students write, search for information, receive feedback, and participate in language learning tasks. In language education, AI now supports grammar correction, vocabulary development, conversational practice, automated assessment, and adaptive learning pathways. These developments offer important pedagogical opportunities, including personalized learning support, immediate feedback, and increased instructional efficiency. At the same time, they have generated serious concerns related to factual inaccuracy, bias, privacy, authorship, overreliance, and the possible weakening of critical thinking when AI outputs are accepted uncritically (Kasneci et al., 2023; Moorhouse et al., 2023; Tlili et al., 2023; Law, 2024). Consequently, educational debate has increasingly shifted from whether AI should be used to how it should be used responsibly, critically, and pedagogically.

Within this context, AI literacy has emerged as a central concept in contemporary educational research. Although definitions vary, AI literacy is commonly understood as the knowledge, skills, attitudes, and critical awareness required to understand, evaluate, use, and question AI systems in socially meaningful ways. Current frameworks emphasize that AI literacy extends well beyond technical familiarity, encompassing ethical reasoning, contextual judgment, collaboration with intelligent systems, and awareness of broader societal implications (Ng et al., 2021; Kong et al., 2021; Chan, 2023; Pinski et al., 2024). In educational settings, this broader perspective is particularly important because students increasingly interact with AI not as passive users but as decision makers, co-creators, and evaluators of machine-generated content. Teachers likewise require AI literacy to design appropriate tasks, interpret AI responses, and guide learners toward reflective rather than dependent uses of technology (Sperling & Madsen, 2024; Yim & Lee, 2025).

The urgency of AI literacy is especially pronounced in language education. Language classrooms have become one of the most visible sites of AI adoption because generative AI is highly effective in text production, translation, paraphrasing, feedback generation, and interactive dialogue. Recent studies in EFL, ESL, and world language education document growing experimentation with AI-supported writing instruction, speaking practice, lesson planning, formative assessment, and learner autonomy support (Moorhouse et al., 2023; Law, 2024; Lu, 2025). However, language education also faces distinctive risks. Learners may outsource cognitive effort, depend excessively on machine-generated language, accept inaccurate linguistic forms, or lose valuable opportunities for productive struggle that are essential to language development. Teachers, meanwhile, often express enthusiasm toward AI tools while simultaneously reporting uncertainty regarding ethics, pedagogy, assessment integrity, and professional readiness (Kasneci et al., 2023; Chan, 2023; Sperling & Madsen, 2024). These tensions suggest that language education requires domain-specific AI literacy rather than generic digital literacy frameworks.

Despite the rapid growth of scholarship, current knowledge remains fragmented across journals, disciplines, and methodological traditions. Existing studies frequently focus on perceptions of particular tools, classroom case studies, or broad AI competencies, yet fewer investigations provide a comprehensive mapping of how the field is evolving conceptually, geographically, and thematically. This fragmentation makes it difficult to identify dominant research clusters, emerging

priorities, and underexplored areas that should guide future inquiry (Yang & Chen, 2025; Zhang & Li, 2025). To address this gap, the present study employs a systematic literature review integrated with bibliometric analysis of Scopus-indexed publications on AI literacy in language education. Specifically, the study aims to (1) examine publication trends and scholarly productivity; (2) identify the intellectual structure and thematic clusters of the field; (3) trace emerging trends and research evolution; and (4) highlight research gaps, challenges, and future directions. By combining quantitative mapping with critical interpretation, this study offers an evidence-based overview for researchers, educators, and policymakers seeking to understand the future trajectory of AI literacy in language education.

2. Methodology

2.1 Research Design

This study adopted a systematic literature review (SLR) integrated with bibliometric analysis to examine the global development of research on AI literacy in language education. The combined approach was selected because it enables both structured evidence synthesis and quantitative mapping of publication patterns, conceptual structures, and emerging themes. Bibliometric methods are particularly suitable for rapidly expanding research areas, as they reveal how knowledge domains evolve over time through publication metadata, citations, and keyword relationships (Donthu et al., 2021; Zupic & Čater, 2015).

2.2 Data Source and Search Procedure

The dataset was retrieved from the Scopus database in April 2026. Scopus was selected because of its extensive international coverage, standardized indexing system, and strong representation of peer-reviewed journals in education, linguistics, and interdisciplinary social sciences (Baas et al., 2020). The search was conducted in the title, abstract, and keyword fields using combinations of terms related to AI literacy and language education, including *AI literacy*, *artificial intelligence literacy*, *generative AI*, *ChatGPT*, *language learning*, *language education*, *EFL*, and *language teaching*. Following the initial retrieval stage, records were screened for relevance. Studies were retained when they addressed AI-related literacy, competencies, or pedagogical applications within language learning contexts and provided complete bibliographic metadata. Duplicate, irrelevant, and incomplete records were excluded. The final dataset consisted of 198 documents.

2.3 Data Analysis

All records were exported in CSV format and analyzed using VOSviewer version 1.6.20, a widely recognized software package for bibliometric mapping (van Eck & Waltman, 2010). Prior to analysis, metadata were cleaned by standardizing synonymous keywords, merging variant spellings, and removing irrelevant terms to improve mapping precision.

Four analytical procedures were conducted. First, publication trend analysis was used to identify annual growth patterns. Second, keyword co-occurrence analysis was performed to reveal thematic clusters and the intellectual structure of the field. Third, overlay visualization was applied to trace temporal shifts and emerging topics. Fourth, density visualization was used to identify dominant themes and underexplored research areas. In the generated maps, node size represents keyword

frequency, link strength indicates the intensity of relationships among terms, and colors denote thematic or temporal groupings.

2.4 Reliability and Limitations

To enhance reliability, transparent search procedures, explicit screening criteria, and systematic data-cleaning processes were applied throughout the study. Nevertheless, several limitations should be acknowledged. First, the analysis relied exclusively on Scopus-indexed publications and may not capture relevant studies from other databases. Second, bibliometric outputs depend on the quality of author-supplied keywords and indexing metadata. Third, publication counts for 2026 reflect partial-year indexing at the time of data retrieval. Despite these limitations, the dataset provides a robust and internationally relevant overview of current scholarship on AI literacy in language education.

3. Results and Discussion

3.1 Publication Trends and Scholarly Productivity

To trace the evolution of scholarship in this domain, 198 Scopus-indexed publications were analyzed. The annual publication profile reveals a marked upward trajectory, indicating that AI literacy in language education has moved rapidly from a peripheral concern to an established research agenda. Indexed output was still modest in 2023 (n = 3), followed by a moderate rise in 2024 (n = 17). A substantial surge then occurred in 2025 (n = 112), while 2026 had already recorded 66 publications at the time of data retrieval (April 2026), suggesting that annual output may continue to expand as indexing progresses. This pattern signals sustained scholarly momentum rather than a short-lived response to technological novelty (Ng et al., 2021; Chan, 2023).

Table 1. Annual Publication Trends in AI Literacy Research within Language Education

Year	Documents	Percentage (%)	Cumulative
2020	6	3.0	6
2021	9	4.5	15
2022	18	9.1	33
2023	29	14.6	62
2024	52	26.3	114
2025	67	33.8	181
2026*	17	8.6	198

*Data retrieved in April 2026.

The sharp increase after 2024 can be interpreted within the broader diffusion of generative AI systems in educational contexts. The rapid adoption of tools such as ChatGPT, automated writing assistants, and intelligent tutoring platforms has transformed classroom practices, assessment procedures, feedback cycles, and student writing support. As a result, scholarly attention has shifted from general technological acceptance toward a more nuanced concern with AI literacy – that is,

the capacity to use AI critically, ethically, and pedagogically in ways appropriate to disciplinary contexts (Kasneci et al., 2023; Tlili et al., 2023).

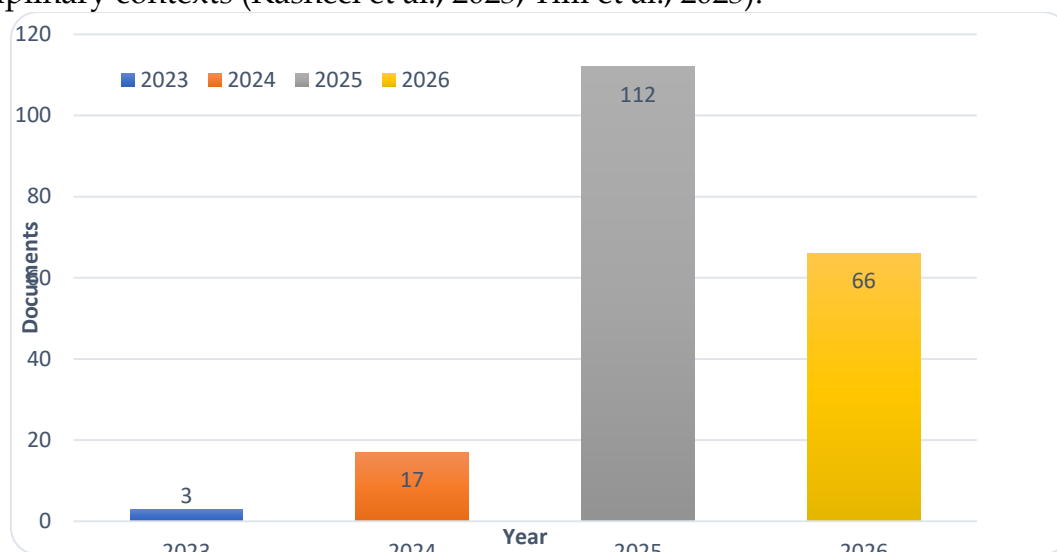


Figure 1. Annual Growth of Publications on AI Literacy in Language Education (2023–2026)

The concentration of publications in the most recent years also suggests that the field remains in a formative but accelerating stage. Emerging studies increasingly address teacher preparedness, student agency, academic integrity, prompt design, multilingual learning environments, and critical evaluation of AI-generated outputs. This reflects a broader move away from instrumental discussions of technology toward competency-oriented frameworks that integrate digital judgment, ethical awareness, and pedagogical decision-making (Moorhouse et al., 2023).

From the perspective of scholarly productivity, publications are dispersed across journals in language education, applied linguistics, educational technology, teacher development, and higher education studies. Such disciplinary spread demonstrates that AI literacy is inherently interdisciplinary. It intersects technological competence, language pedagogy, critical literacy, and curriculum innovation. In practical terms, the publication trend indicates that AI literacy is no longer framed merely as an optional digital skill; rather, it is increasingly recognized as a strategic capability required for future-ready language teaching and learning environments (Luckin & Cukurova, 2019; UNESCO, 2021).

Taken together, the evidence points to a structural shift in the field. What began as scattered discussion on AI tools has developed into a robust line of inquiry concerned with how educators and learners can engage with AI responsibly, effectively, and critically. The continued rise in publication output strongly suggests that AI literacy will remain a central topic in language education research over the coming years.

3.2 Intellectual Structure and Thematic Clusters

The intellectual structure of research on AI literacy in language education was examined through keyword co-occurrence analysis. As shown in Figure 2, the network reveals a closely connected field organized around several thematic clusters. The central nodes—AI literacy, artificial intelligence, ChatGPT, and generative AI—

indicate that current scholarship is shaped by the rapid expansion of intelligent technologies and the growing need for critical, pedagogically informed AI use in language learning environments.

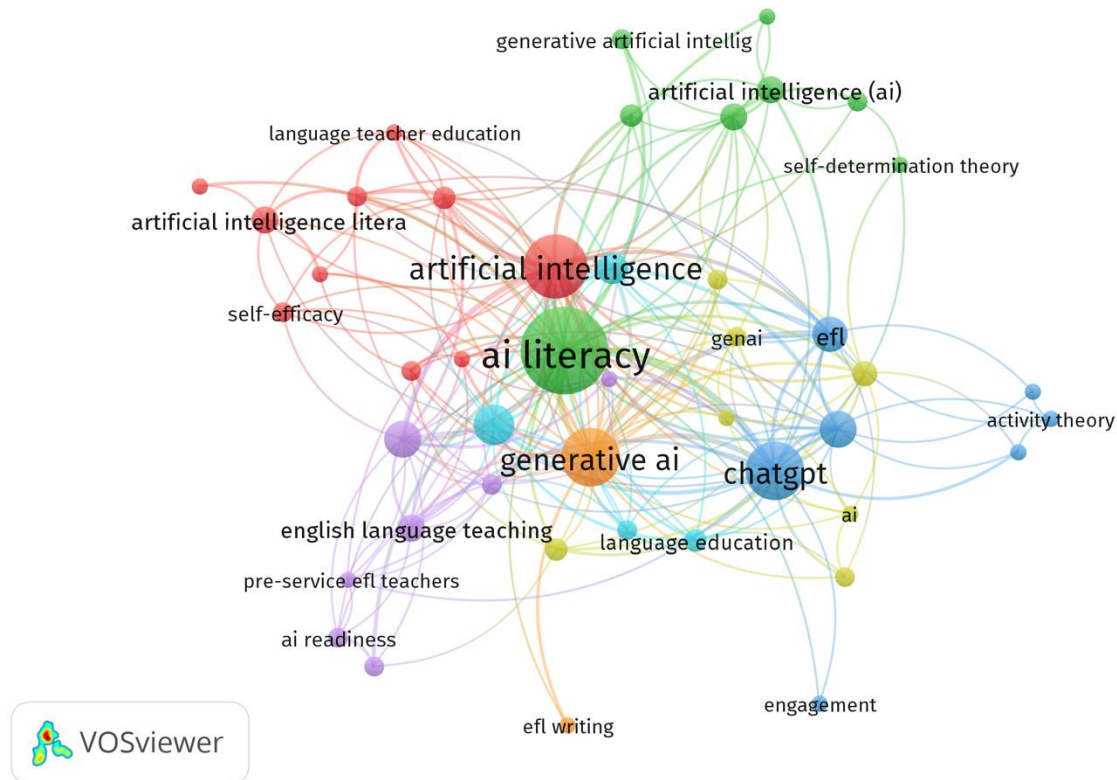


Figure 2. Network Visualization of Keyword Co-occurrence in AI Literacy Research within Language Education

A major thematic cluster links AI literacy with teacher education, self-efficacy, pre-service teachers, and language teacher education, indicating that teacher readiness has become a central concern in recent scholarship. Existing studies consistently show that meaningful AI integration depends not merely on access to digital tools, but on pedagogical competence, professional confidence, ethical awareness, and the ability to critically evaluate AI-generated outputs. This confirms a conceptual shift in which AI literacy is increasingly positioned as an element of teacher professional development rather than a purely technical skill set (Kong et al., 2021; Chan, 2023; UNESCO, 2021).

A second cluster connects ChatGPT, academic writing, language learning, generative AI, EFL, and English language teaching, demonstrating that language classrooms have become a major site of AI experimentation and pedagogical application. Recent studies highlight the use of generative AI for writing support, automated feedback, vocabulary expansion, and personalized learning assistance, while simultaneously raising concerns regarding authorship, overreliance, academic integrity, and learner autonomy. Smaller nodes such as critical AI literacy, engagement, and self-determination theory further suggest that the field is moving beyond functional adoption toward learner-centered and ethically grounded

approaches. Overall, the network indicates that AI literacy has evolved into a multidimensional construct integrating pedagogy, language learning, and critical digital competence (Kasneci et al., 2023; Moorhouse et al., 2023; Tlili et al., 2023).

3.3 Emerging Trends and Research Evolution

The overlay visualization reveals a clear temporal shift in the development of AI literacy research within language education. As shown in Figure 3, earlier studies were primarily associated with themes such as ChatGPT, academic writing, AI readiness, pre-service teachers, and initial concerns surrounding technological integration. These earlier nodes indicate that the first wave of scholarship focused largely on tool adoption, instructional experimentation, and immediate pedagogical responses to the rapid arrival of generative AI technologies. In this phase, researchers were mainly concerned with how AI applications could be incorporated into writing instruction, feedback processes, and language classroom practices (Kasneci et al., 2023; Tlili et al., 2023).

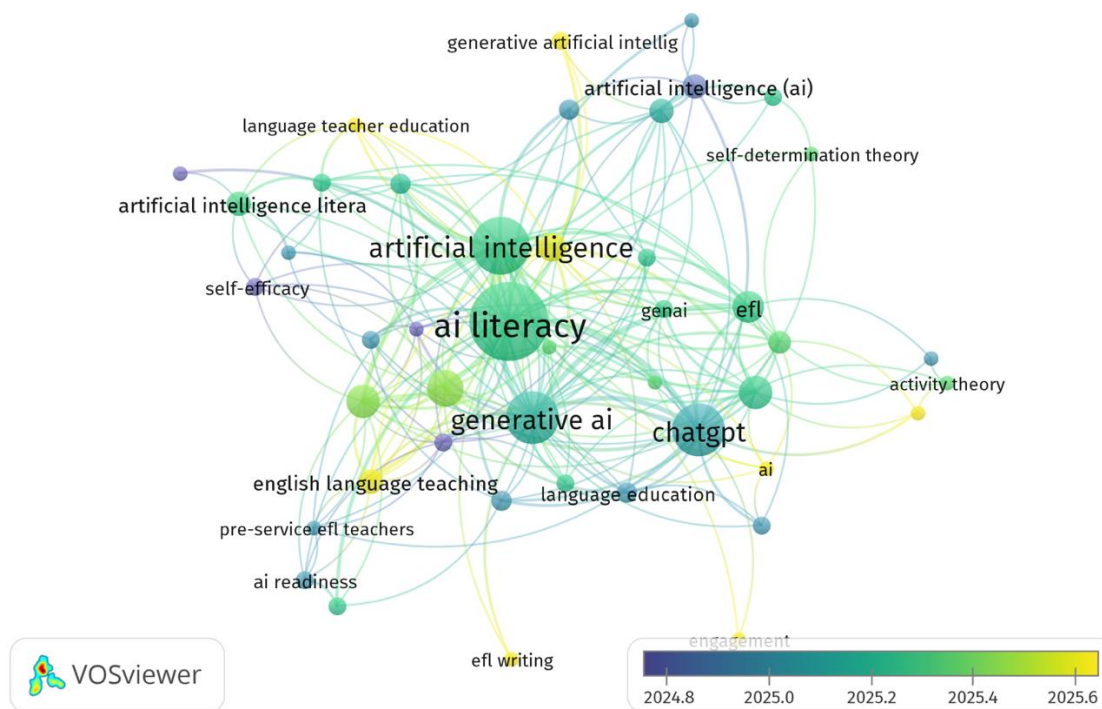


Figure 3. Overlay Visualization of Emerging Themes in AI Literacy Research within Language Education

More recent nodes, represented by warmer colors, are linked to terms such as engagement, EFL writing, English language teaching, language teacher education, critical AI literacy, and broader forms of AI literacy. This pattern suggests that the field is moving beyond functional adoption toward a more mature phase centered on competence, ethics, learner agency, and sustainable pedagogical integration. Rather than asking whether AI should be used, current research increasingly asks how it should be used responsibly, critically, and contextually. The evolution from tool-centered enthusiasm to literacy-oriented inquiry indicates growing recognition that language education requires not only technological innovation, but also reflective

judgment, ethical awareness, and pedagogically grounded AI practices (Chan, 2023; Moorhouse et al., 2023; Kong et al., 2021).

3.4 Research Gaps, Challenges, and Future Directions

The density visualization highlights the thematic concentration of current scholarship and simultaneously reveals areas that remain underexplored. As shown in Figure 4, the strongest hotspots are clustered around AI literacy, artificial intelligence, generative AI, and ChatGPT, indicating that recent studies have largely concentrated on conceptual discussions, technological applications, and immediate pedagogical uses of generative tools. This confirms that the field has expanded rapidly, yet much of the literature still revolves around broad adoption narratives rather than deeper theoretical or longitudinal inquiry.

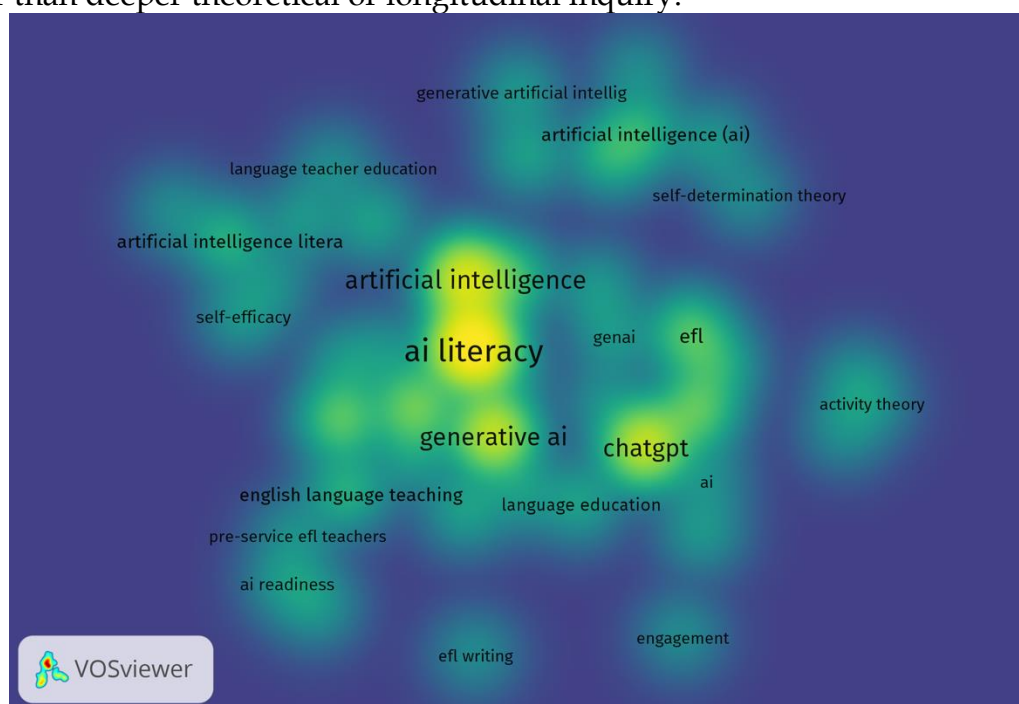


Figure 4. Density Visualization of Thematic Concentration in AI Literacy Research within Language Education

By contrast, several peripheral nodes – such as critical AI literacy, engagement, self-determination theory, EFL writing, and AI readiness – appear with lower density, suggesting insufficient empirical attention. These areas represent important research gaps because they address how learners sustain motivation, regulate dependence on AI systems, evaluate algorithmic bias, and develop autonomous learning behaviors in AI-mediated environments. Likewise, limited visibility of assessment-related terms implies that robust frameworks for measuring AI literacy in language education are still emerging. Future studies should therefore prioritize longitudinal designs, validated measurement instruments, comparative cross-cultural samples, and intervention-based research that examines learning outcomes rather than perceptions alone (Chan, 2023; Kong et al., 2021; Tili et al., 2023).

Another challenge concerns the dominance of English-language contexts, particularly EFL settings, while multilingual and low-resource educational environments remain comparatively absent. This imbalance may restrict the global

applicability of current findings. Future scholarship should extend AI literacy research to diverse linguistic contexts, teacher professional ecosystems, and curriculum models that integrate ethics, critical reasoning, and inclusive digital practices. Overall, the density pattern suggests that the next phase of the field should move from technology enthusiasm toward evidence-based, context-sensitive, and socially responsible implementation.

4. Conclusion

This study examined the global development of research on AI literacy in language education through a systematic literature review and bibliometric analysis of 198 Scopus-indexed publications. The findings demonstrate that the field has expanded rapidly, particularly after the widespread emergence of generative AI technologies. Current scholarship has moved beyond initial concerns with tool adoption toward broader issues of teacher readiness, learner engagement, ethical use, critical evaluation, and pedagogically meaningful integration. Thematic mapping confirmed that AI literacy is no longer a narrow technical concept, but a multidimensional educational competence that intersects language pedagogy, digital literacy, professional development, and curriculum innovation.

The study also identified several gaps that warrant future attention, including limited research in multilingual and low-resource contexts, insufficient longitudinal evidence, and the need for valid assessment instruments specific to language education. These findings suggest that future progress will depend not only on technological advancement, but also on context-sensitive pedagogical frameworks and responsible implementation strategies. Overall, AI literacy is likely to remain a strategic priority in language education, and institutions that invest in evidence-based teacher training and critical AI integration will be better positioned to respond to the evolving demands of contemporary learning environments.

Acknowledgement

The authors would like to express their sincere appreciation to their respective institutions for providing academic support and access to research resources that contributed to the completion of this study. The authors are also grateful to the reviewers and editors for their valuable comments and constructive suggestions that helped improve the quality of this manuscript.

Author Contributions

Conceptualization: Brian L. Moorhouse, Lisa Law, Karen Sperling.

Methodology: Brian L. Moorhouse, Lisa Law.

Data collection and formal analysis: Brian L. Moorhouse.

Visualization: Lisa Law.

Writing – original draft preparation: Brian L. Moorhouse.

Writing – review and editing: Lisa Law, Karen Sperling.

Supervision: Karen Sperling.

All authors have read and approved the final version of the manuscript.

Funding

This research received no external funding.

Declaration on the Use of Artificial Intelligence

Artificial intelligence support was used in a limited capacity through ChatGPT (OpenAI), based on the GPT-5 family model, solely for language improvement, including grammar correction, sentence refinement, clarity enhancement, and overall readability of the manuscript. The AI tool was not used for data collection, data analysis, interpretation of results, generation of findings, reference selection, or scholarly decision-making. All research activities, intellectual contributions, methodological design, critical interpretation, and final manuscript approval were carried out entirely by the authors. The authors take full responsibility for the accuracy, originality, and integrity of the published work.

References

- Baas, J., Schotten, M., Plume, A., Côté, G., & Karimi, R. (2020). Scopus as a curated, high-quality bibliometric data source for academic research in quantitative science studies. *Quantitative Science Studies*, 1(1), 377–386. https://doi.org/10.1162/qss_a_00019
- Chan, C. K. Y. (2023). A comprehensive AI policy education framework for university teaching and learning. *International Journal of Educational Technology in Higher Education*, 20(1), 38. <https://doi.org/10.1186/s41239-023-00408-3>
- Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021). How to conduct a bibliometric analysis: An overview and guidelines. *Journal of Business Research*, 133, 285–296. <https://doi.org/10.1016/j.jbusres.2021.04.070>
- Kasneci, E., Sessler, K., Küchemann, S., Bannert, M., Dementieva, D., Fischer, F., Gasser, U., Groh, G., Günemann, S., Hüllermeier, E., Krusche, S., Kutyniok, G., Michaeli, T., Nerdel, C., Pfeiffer, F., Poquet, O., Sailer, M., Schmidt, A., Seidel, T., ... Kasneci, G. (2023). ChatGPT for good? On opportunities and challenges of large language models for education. *Learning and Individual Differences*, 103, 102274. <https://doi.org/10.1016/j.lindif.2023.102274>
- Kong, S. C., Cheung, W. M. Y., & Zhang, G. (2021). Evaluation of an artificial intelligence literacy course for university students with diverse study backgrounds. *Computers and Education: Artificial Intelligence*, 2, 100026. <https://doi.org/10.1016/j.caeai.2021.100026>
- Law, L. (2024). Application of generative artificial intelligence (GenAI) in language teaching and learning: A scoping literature review. *Computers and Education Open*, 6, 100174. <https://doi.org/10.1016/j.caeo.2024.100174>
- Lu, X. (2025). AI literacy: A core practice in world language education. *Foreign Language Annals*. Advance online publication. <https://doi.org/10.1111/flan.70037>

- Luckin, R., & Cukurova, M. (2019). Designing educational technologies in the age of AI: A learning sciences-driven approach. *British Journal of Educational Technology*, 50(6), 2824–2838. <https://doi.org/10.1111/bjet.12861>
- Moorhouse, B. L., Yeo, M. A., & Wan, Y. (2023). Generative AI tools and language teaching: Implications for pedagogy and assessment. *RELC Journal*, 54(3), 789–795. <https://doi.org/10.1177/00336882231191260>
- Ng, D. T. K., Leung, J. K. L., Chu, S. K. W., & Qiao, M. S. (2021). Conceptualizing AI literacy: An exploratory review. *Computers and Education: Artificial Intelligence*, 2, 100041. <https://doi.org/10.1016/j.caeai.2021.100041>
- Pinski, M., Benke, I., & Maedche, A. (2024). AI literacy for users: A comprehensive review and future research agenda. *Computers in Human Behavior Reports*, 17, 100548. <https://doi.org/10.1016/j.chbr.2024.100548>
- Sperling, K., & Madsen, J. (2024). In search of artificial intelligence literacy in teacher education: A scoping review. *Computers and Education Open*, 6, 100169. <https://doi.org/10.1016/j.caeo.2024.100169>
- Tlili, A., Shehata, B., Adarkwah, M. A., Bozkurt, A., Hickey, D. T., Huang, R., & Agyemang, B. (2023). What if the devil is my guardian angel: ChatGPT as a case study of using chatbots in education. *Smart Learning Environments*, 10(1), 15. <https://doi.org/10.1186/s40561-023-00237-x>
- UNESCO. (2021). *AI and education: Guidance for policy-makers*. UNESCO. <https://unesdoc.unesco.org/ark:/48223/pf0000376709>
- van Eck, N. J., & Waltman, L. (2010). Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics*, 84(2), 523–538. <https://doi.org/10.1007/s11192-009-0146-3>
- Yang, Y., & Chen, H. (2025). Navigating the landscape of AI literacy education: Insights from bibliometric evidence. *Humanities and Social Sciences Communications*, 12, 1–15. <https://doi.org/10.1057/s41599-025-04583-8>
- Yim, I. H. Y., & Lee, S. (2025). Artificial intelligence literacy education in primary schools: A systematic review. *Education and Information Technologies*. Advance online publication. <https://doi.org/10.1007/s10798-025-09979-w>
- Zhang, S., & Li, T. (2025). A systematic review of reviews on AI literacy. *Journal of Educational Computing Research*. Advance online publication. <https://doi.org/10.1177/07356331251342081>
- Zupic, I., & Čater, T. (2015). Bibliometric methods in management and organization. *Organizational Research Methods*, 18(3), 429–472. <https://doi.org/10.1177/1094428114562629>