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Original Research

Mapping the Rise of AI Literacy in Language Education: A Systematic Literature Review and Bibliometric Analysis of Scopus Publications

Lisa Law[1]✉, Karen Sperling[2]
[1]School of Education, University of New England, Armidale, New South Wales, Australia
[2]Department of Education, Aarhus University, Aarhus, Denmark
✉ lisalaw.research@outlook.com
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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 personalised instruction. Despite this expansion, knowledge on AI literacy in language education remains fragmented across disciplines and lacks a comprehensive synthesis of its global development. This study therefore investigates publication trends, intellectual structures, emerging themes, and future directions in this field. A systematic literature review integrated with bibliometric analysis was conducted using 198 Scopus-indexed publications retrieved in April 2026. Data were analysed using VOSviewer through publication trend analysis, keyword co-occurrence mapping, overlay visualisation, and density visualisation. The findings reveal a sharp increase in scholarly output after 2024, indicating intensified research attention following the widespread diffusion of generative AI technologies. Thematic mapping identified four dominant clusters: teacher readiness and professional development, AI-assisted language learning, generative AI applications in EFL and ESL contexts, and critical AI literacy related to ethics and learner autonomy. Overlay analysis further demonstrates a shift 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 the future of language education. These findings provide implications for curriculum design, teacher preparation, and policy development, while offering a research agenda for more inclusive and evidence-based AI integration.*

Keywords: *Artificial Intelligence; AI Literacy; Language Education; Generative AI; Bibliometric Analysis; Teacher Readiness; AI Ethics*

1. Introduction

Artificial intelligence (AI) has become one of the most influential technological developments shaping contemporary education. The rapid public diffusion of generative AI systems, particularly large language models such as ChatGPT and related platforms, has altered how learners search for information, draft texts, receive feedback, and participate in digital learning environments. Educational institutions

are therefore confronting a structural transition in which AI is no longer an external innovation but an increasingly embedded component of teaching, learning, and academic work (Kasneci et al., 2023; Tlili et al., 2023; Chan, 2023). This transformation is especially visible in language education, where AI tools can support translation, summarisation, grammar correction, conversational simulation, and adaptive feedback. Such affordances create new opportunities for personalised learning, expanded access to practice, and greater learner autonomy beyond classroom boundaries (Moorhouse et al., 2023; Law, 2024; Crompton & Burke, 2023).

At the same time, the integration of AI has generated substantial pedagogical and ethical concerns. Scholars have questioned the reliability of AI-generated content, the reproduction of algorithmic bias, threats to academic integrity, learner overdependence, and the weakening of higher-order thinking when outputs are accepted uncritically (Kasneci et al., 2023; Cotton et al., 2024; Rudolph et al., 2023). These concerns are particularly significant in language learning contexts, where students may rely on machine-generated responses rather than develop independent linguistic competence, rhetorical awareness, and critical judgement. Teachers likewise face uncertainty regarding assessment redesign, authorship boundaries, and the responsible use of AI in writing-intensive courses (Moorhouse et al., 2023; Farrokhnia et al., 2024; Zhai, 2024). As a result, the central question has shifted from whether AI should be used to how it should be used responsibly and educationally.

This shift has intensified interest in AI literacy. 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 meaningful social contexts. Recent frameworks emphasise that AI literacy extends beyond technical familiarity to include ethical reasoning, interpretive judgement, data awareness, collaboration with intelligent systems, and understanding of wider societal implications (Ng et al., 2021; Kong et al., 2021; Long & Magerko, 2020; Pinski et al., 2024). Its relevance is particularly pronounced in language education, where the boundaries between human authorship and machine assistance are increasingly blurred. Learners must be able to assess the quality of AI-generated language, identify inaccuracies, revise outputs critically, and distinguish between productive support and unproductive dependence (Law, 2024; Lu, 2025; Lee & Zawacki-Richter, 2025). Teacher preparedness is equally important, as insufficient confidence or institutional support may lead to superficial and tool-driven adoption (Sperling & Madsen, 2024; Yim & Lee, 2025; Holmes et al., 2022).

Despite the rapid growth of publications, the knowledge base remains fragmented across journals, countries, and methodological traditions. Many existing studies focus on single tools, short-term perceptions, or isolated classroom experiments, while fewer provide a systematic view of how the field has developed conceptually, what themes dominate current scholarship, which priorities are emerging, and where major gaps remain. Bibliometric approaches are particularly useful for addressing this limitation because they enable large-scale examination of publication trends, intellectual structures, thematic networks, and research trajectories across expanding literatures (Donthu et al., 2021; van Eck & Waltman, 2010; Zupic & Čater, 2015). In response to this need, the present study employs a

systematic literature review integrated with bibliometric analysis of Scopus-indexed publications on AI literacy in language education. Using VOSviewer-based mapping techniques, the study aims to examine publication growth, identify thematic clusters, trace emerging trends, and highlight future directions for research and practice.

2. Methodology

2.1 Research Design

This study employed a systematic literature review integrated with bibliometric analysis to examine the development of research on AI literacy in language education. The combined design was selected because systematic review procedures provide transparency and replicability in document selection, while bibliometric techniques allow large-scale mapping of publication growth, intellectual structure, thematic relationships, and emerging trends within a research field (Donthu et al., 2021; Zupic & Čater, 2015). Bibliometric methods are particularly appropriate for rapidly expanding domains such as AI in education, where conventional narrative reviews may struggle to capture the scale and complexity of recent scholarly output.

2.2 Data Source and Search Strategy

Scopus was used as the sole data source because it offers broad international coverage, strong metadata quality, and consistent indexing across education, linguistics, and technology-related disciplines. Scopus is widely recognised as a reliable database for bibliometric research due to its structured citation records and multidisciplinary scope (Baas et al., 2020; Mongeon & Paul-Hus, 2016). The search process was conducted in April 2026 using combinations of terms related to AI literacy, artificial intelligence, generative AI, ChatGPT, language education, language learning, EFL, ESL, and applied linguistics. Search terms were applied to titles, abstracts, and keywords to maximise retrieval relevance. Only documents indexed in Scopus at the time of data collection were included.

2.3 Screening and Eligibility Procedure

The screening procedure followed the logic of PRISMA 2020 to ensure a transparent and reproducible selection process (Page et al., 2021). Retrieved records were first exported in CSV format and screened for duplication, incomplete metadata, and clear topical irrelevance. Documents unrelated to education or language learning contexts were excluded. A second-stage screening examined titles, abstracts, and keywords to confirm alignment with the focus on AI literacy within language education. After the cleaning and eligibility process, a final dataset of 198 publications was retained for analysis. The dataset included journal articles, conference papers, review articles, and early access documents where sufficient metadata were available.

2.4 Data Analysis Procedure

Bibliometric analysis was conducted using VOSviewer version 1.6.20, a widely used software package for constructing and visualising bibliometric networks (van Eck & Waltman, 2010). Three forms of analysis were performed. First, performance analysis examined annual publication trends to identify patterns of scholarly productivity. Second, co-occurrence analysis of author keywords was used to map the conceptual structure of the field and identify dominant thematic clusters. Third, overlay and density visualisations were generated to trace topic evolution and detect

emerging or underexplored areas. Prior to mapping, keywords were standardised through thesaurus cleaning to merge lexical variants such as "Chat GPT" and "ChatGPT," or "GenAI" and "generative AI," thereby improving interpretive accuracy (Donthu et al., 2021).

2.5 Reliability, Validity, and Analytical Rigor

Several procedures were applied to strengthen analytical rigor. First, the use of explicit search strings and documented screening criteria improved reproducibility. Second, metadata cleaning reduced distortion caused by duplicates, fragmented keywords, or incomplete records. Third, multiple visualisation modes were interpreted comparatively rather than in isolation, allowing triangulation across productivity, thematic concentration, and temporal evolution. Finally, findings were interpreted substantively in relation to current scholarship on AI literacy and language education, rather than relying solely on software-generated patterns. This approach is consistent with best practice recommendations that bibliometric outputs should be combined with theoretically informed interpretation to produce meaningful review findings (Aria & Cuccurullo, 2017; Donthu et al., 2021).

3. Results and Discussion

3.1 Publication Trends and Scholarly Productivity

The final dataset comprised 198 Scopus-indexed publications. The annual distribution indicates a rapid expansion of scholarship on AI literacy in language education, suggesting that the topic has moved quickly from an emerging concern to an established line of inquiry. As presented in Table 1, publication activity remained limited in 2023 (n = 3) and increased modestly in 2024 (n = 17). Output then rose sharply in 2025 (n = 112). By April 2026, a further 66 records had already been indexed, indicating that growth is likely to continue through the remainder of the year.

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

Year	Documents	Percentage (%)	Cumulative
2023	3	1.5	3
2024	17	8.6	20
2025	112	56.6	132
2026*	66	33.3	198

*Data retrieved in April 2026.

The marked increase in 2025 appears closely associated with the widespread uptake of generative AI tools, particularly ChatGPT and related large language models. Their rapid diffusion prompted renewed attention to writing support, feedback practices, academic integrity, teacher preparedness, and curriculum redesign. Recent studies have described similar developments, arguing that AI literacy is increasingly recognised as a core educational competence rather than a temporary technological trend (Chan, 2023; Kasneci et al., 2023; Law, 2024). The

sustained output recorded in early 2026 further suggests that research interest is becoming institutionalised rather than episodic.

The publication trajectory also reflects a broader shift in scholarly priorities. Earlier discussions often focused on technological novelty and speculative possibilities, whereas more recent work addresses implementation, governance, pedagogy, and measurable learning outcomes. This transition indicates growing maturity in the field, as researchers move from descriptive enthusiasm toward more systematic and evidence-based inquiry.

3.2 Intellectual Structure and Thematic Clusters

The keyword co-occurrence network reveals a field that is both coherent and increasingly differentiated. As shown in Figure 1, the most prominent nodes include AI literacy, artificial intelligence, ChatGPT, generative AI, language learning, and academic writing. Their centrality suggests that current scholarship is shaped by the intersection of conceptual debate and classroom application, with literacy concerns now closely tied to the practical realities of teaching and learning.

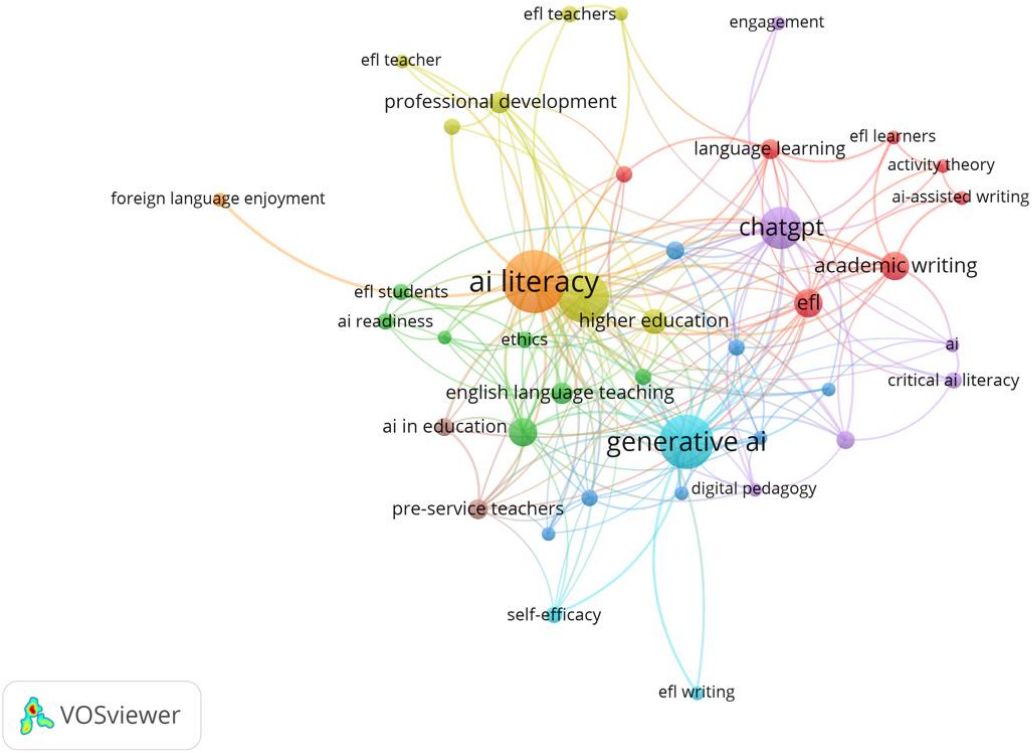

Figure 1. Network Visualization of Keyword Co-occurrence in AI Literacy Research within Language Education

One major cluster links AI literacy with teacher education, self-efficacy, pre-service teachers, and professional development. This pattern indicates that teacher readiness has become one of the most important concerns in the literature. Across recent studies, effective AI integration is consistently associated with pedagogical confidence, ethical awareness, and institutional support rather than simple access to technology (Ng et al., 2021; Sperling & Madsen, 2024; Yim & Lee, 2025). The evidence

suggests that institutions increasingly view AI literacy as part of the professional knowledge base expected of contemporary educators.

A second cluster connects ChatGPT, academic writing, feedback, and language education, highlighting sustained interest in AI-assisted writing instruction. Researchers have examined the use of AI for brainstorming, drafting, revision, and automated feedback, while also raising concerns about plagiarism, dependency, and uncertain authorship boundaries (Kasneci et al., 2023; Moorhouse et al., 2023; Tlili et al., 2023). This dual pattern of opportunity and concern reflects a broader tension between innovation and academic integrity.

A further cluster centres on EFL, English language teaching, EFL writing, and generative AI, indicating that English language classrooms have become a key testing ground for AI-supported pedagogical practices. This is unsurprising given the textual strengths of generative AI systems and the global demand for English proficiency. Overall, the network suggests that the field is moving beyond tool adoption toward broader questions of pedagogy, ethics, and professional capability.

3.3 Emerging Trends and Research Evolution

The overlay visualization provides a useful indication of how research priorities have changed over time. As presented in Figure 2, earlier work clustered around terms such as ChatGPT, academic writing, AI readiness, and pre-service teachers. This reflects an initial phase in which scholarship responded quickly to the sudden availability of public AI tools and their immediate implications for teaching and learning.

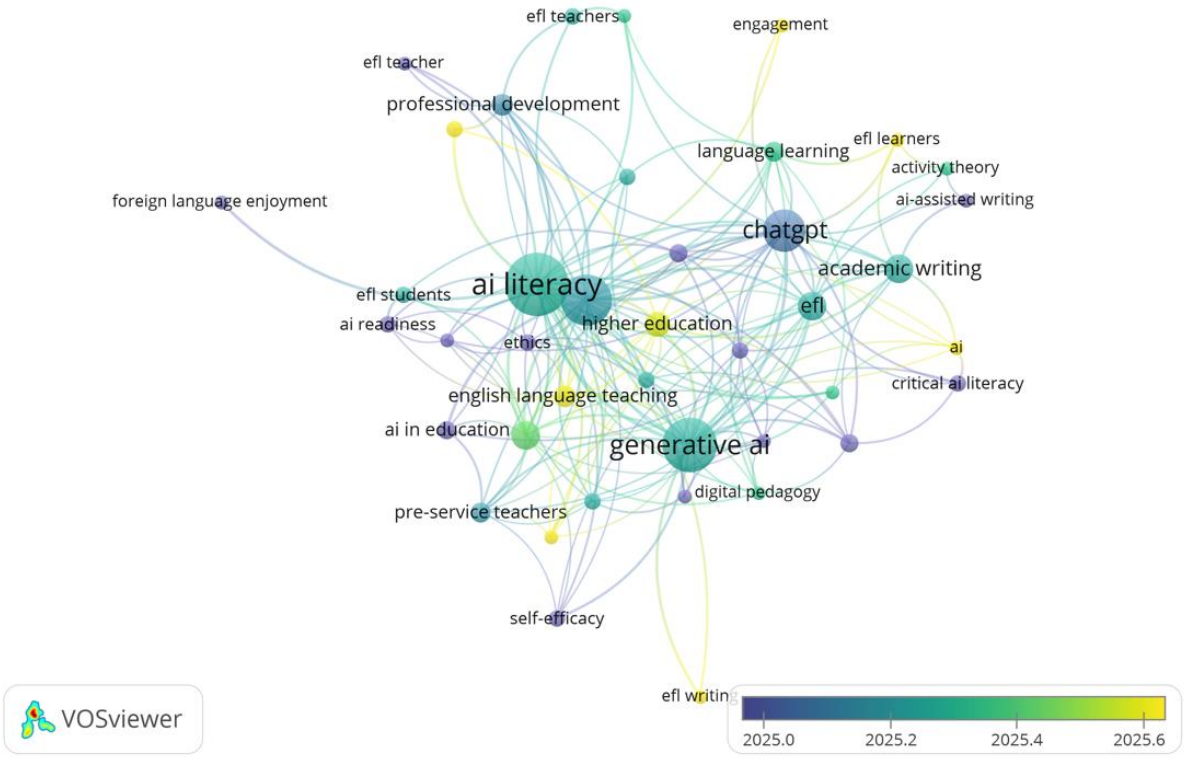

Figure 2. Overlay Visualization of Emerging Themes in AI Literacy Research within Language Education

More recent terms include engagement, critical AI literacy, language teacher education, EFL writing, and ethical use. This shift is analytically significant because it indicates a move away from narrow concerns with functionality toward more substantive questions about how AI should be integrated into educational practice. The literature is therefore beginning to address not only what AI can do, but also what educators and learners should do with it.

The growing visibility of critical AI literacy is especially noteworthy. It suggests increasing recognition that learners and teachers must be able to judge the reliability, bias, and limitations of AI-generated content. Likewise, the emergence of engagement-related terms points to stronger interest in motivation, participation, and learner agency in AI-mediated settings (Chan, 2023; UNESCO, 2021; Zhang & Li, 2025). Taken together, these patterns indicate that the field is entering a more mature and reflective stage of development.

3.4 Research Gaps, Challenges, and Future Directions

The density visualization highlights both dominant themes and areas that remain comparatively underdeveloped. As shown in Figure 3, the most concentrated topics are AI literacy, generative AI, ChatGPT, and language learning. These themes currently define the centre of the literature and reflect the strong influence of recent technological developments on research priorities.

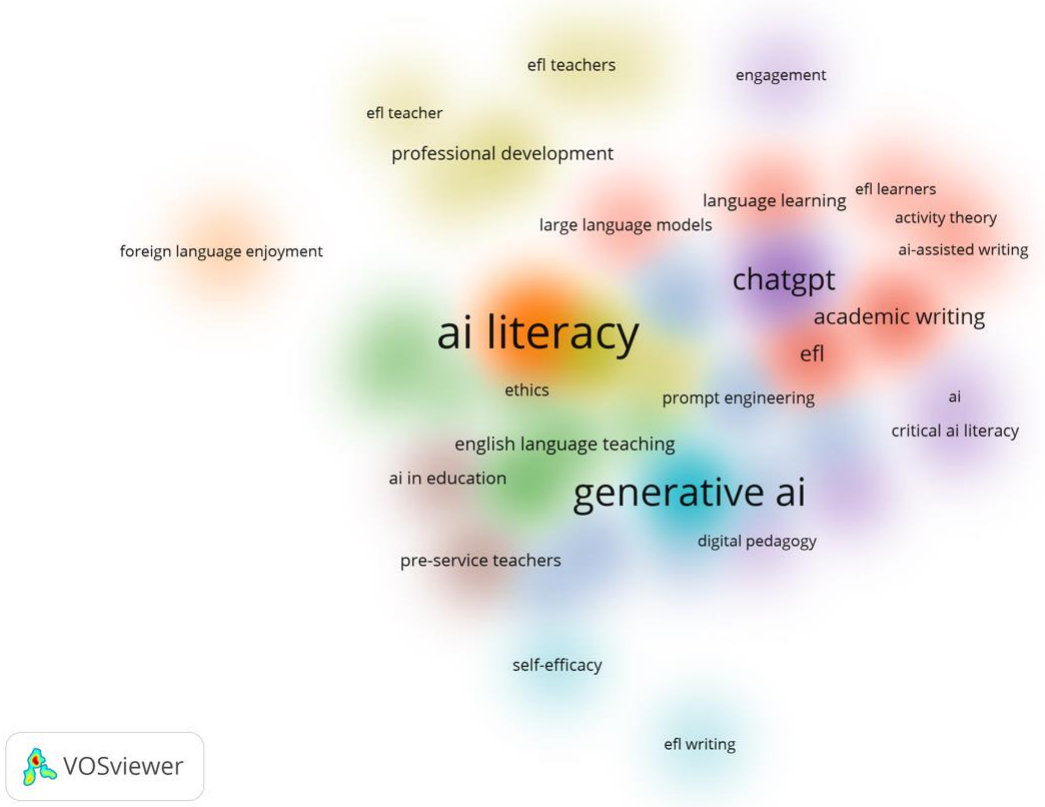

Figure 3. Density Visualization of Thematic Concentration in AI Literacy Research within Language Education

At the same time, several important areas remain less visible, including assessment, multilingual contexts, low-resource environments, learner autonomy, and longitudinal intervention studies. This pattern suggests that much of the current

literature is still exploratory, perception-based, and concentrated in relatively well-resourced settings. As a result, the evidence base remains uneven across educational contexts.

The limited attention to assessment is particularly significant. Although AI tools are increasingly used for writing feedback and language support, there is still a shortage of validated instruments for measuring AI literacy in language education. Similarly, the underrepresentation of multilingual and Global South contexts raises questions about how widely current findings can be generalised (Ng et al., 2021; Law, 2024; Yim & Lee, 2025). Without broader contextual coverage, the field risks producing conclusions that reflect only a narrow segment of educational reality.

Future work would benefit from four priorities: the development of robust assessment measures, more longitudinal and intervention-based research designs, stronger representation of diverse linguistic contexts, and curriculum frameworks that combine practical AI use with ethical reasoning and critical judgment. Addressing these issues would help move the field from early-stage enthusiasm to a more mature and evidence-informed research agenda.

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 show that the field has expanded rapidly, particularly after the widespread emergence of generative AI technologies. What began as exploratory discussion of new tools has developed into a broader scholarly agenda concerned with teacher readiness, learner engagement, academic integrity, critical evaluation, and pedagogically meaningful integration. AI literacy is therefore no longer a narrow technical concept, but an educational competence that intersects language pedagogy, digital citizenship, professional development, and curriculum innovation.

The analysis also identified several gaps that require sustained attention. Research remains concentrated in English-dominant and relatively well-resourced contexts, while multilingual settings, low-resource environments, and Global South perspectives remain comparatively underrepresented. In addition, there is still limited evidence from longitudinal studies and a shortage of validated instruments for measuring AI literacy outcomes in language education. Future scholarship should therefore prioritise context-sensitive pedagogical models, robust assessment frameworks, and ethically grounded implementation strategies. Overall, AI literacy is likely to remain a strategic priority in language education, and institutions that invest in evidence-based teacher preparation and responsible AI integration will be better positioned to meet the demands of future learning environments.

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Author Contributions

Lisa Law: Conceptualization, Methodology, Data collection, Formal analysis, Writing—original draft, Writing—review and editing.
Karen Sperling: Conceptualization, Methodology, Visualization, Writing—review and editing, Supervision.

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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.

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