Is teaching literacy necessary in the times of GenAI? Literacy and thinking – a review of research

ISSN 2657-9774; https://doi.org/10.36534/erlj.2026.05.01

Anna Dąbrowska
University of Warsaw, Poland; anna.dabrowska@uw.edu.pl

Abstract
The development of generative artificial intelligence (GenAI) has revolutionized the text creation process and altered the human role in generating written content. This article aims to present recent research (2026) regarding the relationship between literacy skills, GenAI-assisted text creation, and human thinking processes, as well as to identify optimal conditions for collaborating with GenAI when composing written texts. A narrative review was conducted based on a purposively selected sample of 13 research papers drawn from an initial pool of 2,650 articles. The analysis of the research data highlighted two key areas: the role of literacy as scaffolding for higher-order cognitive functions, and the phenomenon of cognitive offloading and its impact on human thinking. The cited studies unequivocally confirm that acquiring literacy skills remains crucial—even in the era of GenAI—and that these skills facilitate effective cooperation with the technology. Proposed educational models advocate for active, critical human involvement, wherein GenAI serves solely an advisory and supportive function rather than replacing the author.

Keywords*: literacy, writing skills, artificial intelligence, basic literacy, advanced literacy, Grand Literacy Theory, thinking, GenAI*

Introduction

The rapid development of generative artificial intelligence (GenAI) is fundamentally transforming the process of text creation on a mass scale, necessitating a redefinition of literacy. Traditionally, text creation was tied to a material object upon which specific content was recorded using symbols. It required a multi-stage preparation process and complex cognitive skills on the part of the author to produce a written statement that met the criteria of a written text. The digital era liberated any text from its physical carrier, while the development and widespread availability of GenAI have increasingly taken over the human role in the writing process. Increasingly sophisticated language models not only correct linguistic errors but also edit text, ensure logical flow and coherence, and ultimately take over the task from humans entirely. This situation raises questions: What are the cognitive costs of this phenomenon, if any? And is teaching literacy still necessary in the times of GenAI?

Theoretical background

The theoretical framework for the relationship between writing and human thinking is defined by the Grand Literacy Theory, which is a well-established way of thinking in the literature on the subject about the social, communicative and consciousness role of writing and determines the specific features of orality and literacy. According to the position represented by the Literacy Theory, the emergence of writing and its various uses led to a revolution not only in the sphere of communication, but also in the sphere of cognition. According to this theory, writing was not just a tool or technique with limited action, but it had a holistic impact on humanity and its culture. Writing gave birth to a textual form of expression, an autonomous, decontextualized discourse that encourages the formulation of thoughts in an abstract and conceptual way, regulated by formal logic, which constructs general categories and models (Godlewski,

2018). According to Literacy Theory, mastering the skill of writing completely transforms human thinking (Ong, 2011).

However, the acquisition of literacy can occur at different levels and to varying degrees. With this in mind, Olson (2010) distinguished and developed the concepts of basic and advanced literacy. According to him, exposure to writing, even at the level of basic literacy—which involves understanding the relationship between written signs and the phonological properties of speech—changes a person's way of thinking. These changes deepen with increasing experience with the written variety of language. According to Olson (2010), the basic ability to recognize symbols and transform letters into sounds or words into meaning is a consequence of literacy. It has an important, albeit limited, significance. Advanced literacy, on the other hand, understood as the ability to understand and use the intellectual resources accumulated over approximately three thousand years of diverse written traditions, can be of immense significance. According to Olson, it allows for the accumulation of treasures stored in texts, but it also requires diverse procedures for operating in language and thinking about it, ourselves, and the world (Olson, 2010: 57).

The invention of writing and the development of related writing practices left an indelible mark on cultural history, while learning how to deal with them has had a permanent impact on human cognition (Olson, 2010: 407). Learning writing allowed for a shift from thinking about objects to thinking about representations. According to Olson, the modern worldview can therefore be considered a result of the invention of the "world *on paper*". Practices requiring advanced levels and levels of exposure to writing shape a distinctive thinking style, which is reflected in the way texts are received, interpreted, and created. This style is developed through the acquisition and refinement of advanced writing skills and most often encompasses a specific area of knowledge. By developing in a given area through reading and creating texts, individuals simultaneously shape and enrich their general writing competencies, which they can then apply to other areas as needed. According to David Olson (2015: 41-42), mastery of advanced literacy is demonstrated by possessing universal competencies in writing, including analysis, paraphrasing, summarizing, recontextualizing, and drawing conclusions. The degree of mastery of these skills provides a reliable criterion for assessing individual writing skills.

Arguments highlighting the crucial role of acquiring advanced literacy skills have been presented within the framework of the Grand Theory of Literacy. These arguments remain relevant even in the new technological and socio-cultural context. While artificial intelligence can generate text, it cannot replace human thinking.

Although AI tools can bolster linguistic resources, expand access to scholarly texts, and redistribute forms of knowledge, they also pose a risk of diminishing text-creation skills (Hyland, 2026). Regular reliance on GenAI support can alter fundamental cognitive habits, shifting the effort from independent reasoning to a dependence on generated responses. Trusting such content can lead to superficial processing and the uncritical acceptance of system suggestions, thereby increasing the risk of cognitive dependency (Hyland, 2026).

GenAI is not a simple technological fix for the challenges associated with literacy education. In the era of GenAI, traditional writing instruction may seem overly demanding, time-consuming, or obsolete; however, the appropriate use of GenAI capabilities offers an opportunity to rethink the teaching of writing (Shanley, 2026). When approaching the use of technology in writing, one should avoid both outright bans and uncritical adoption (Hyland, 2026).

Metodology

The review was conducted based on a sample of 13 articles. The Google Scholar database was used, as it offers access to a wide range of peer-reviewed scholarly works. A search strategy appropriate for a narrative review was employed. Key search terms for selecting the articles were established based on an analysis of the relevant literature: GenAI, literacy, and thinking. To identify research material describing

the relationships between these concepts, the keywords were entered into Google Scholar using the 'and' operator, i.e., GenAI and literacy and thinking. The inclusion criteria focused on the most recent empirical studies (2026) in the social sciences that integrated knowledge regarding GenAI, literacy, and thinking. Works focusing exclusively on AI algorithms—without reference to human thinking and literacy—or those concentrating on only one of the mentioned aspects were excluded from the dataset. This process yielded 2,650 records. The selection of research material was conducted in two stages. In the first stage, duplicates and studies failing to meet the inclusion criteria were excluded based on an analysis of titles and abstracts. As a result, 2,624 items were rejected, while 26 studies were retained for a more detailed analysis aimed at determining the relationship between GenAI, literacy, and thinking. This constituted the second stage of the selection process. At this stage, 13 texts were excluded. Ultimately, 13 studies were included in the review.

The research problem addressed is interdisciplinary in nature. The analysis involved synthesizing data and identifying two main areas:

1. The role of literacy as scaffolding for higher-order cognitive functions in the times of GenAI. What are the conditions for the effective use of AI in writing? (GenAI as a partner)
2. The phenomenon of "cognitive offloading." What changes, if any, occur in human thinking when text generation is delegated to AI? (dependence on GenAI)

Results and discussion

The role of literacy as scaffolding for higher-order cognitive functions in the times of GenAI. What are the conditions for the effective use of GenAI in writing? (GenAI as a partner)

The rapid development of generative artificial intelligence tools for text creation has brought about a significant shift in societal expectations regarding the swift production of high-quality written content. In response, there is a growing body of research aimed at understanding the benefits, costs, and challenges associated with using GenAI in the writing process, as well as defining the conditions for effective human-technology collaboration. A key issue is determining the role of literacy skills in optimal leveraging of the capabilities GenAI offers for text creation.

Tian S. and Xiang (2026) investigated the individual factors determining the effective use of GenAI in academic writing by students learning English as a foreign language (EFL). Their analysis, conducted with 342 participants, focused on the role of cognitive, motivational, technological, and linguistic resources. The results demonstrate that cognitive competencies—including self-regulation and critical thinking—combined with familiarity with artificial intelligence tools and advanced literacy skills, significantly influenced the quality of collaboration with GenAI, with self-regulation and critical thinking proving to be the most important factors. The researchers observed that stronger self-regulation fosters strategic management of the writing process, while stronger critical thinking aids in more effectively evaluating AI-generated outputs.

Furthermore, the study revealed that writing skills forecast critical thinking, thereby enhancing the effectiveness of collaboration with GenAI. Advanced language skills enable students to craft coherent, well-structured texts and effectively integrate them with AI-generated content. According to the authors, linguistic competence equips students with the internal resources necessary to utilize GenAI effectively in writing tasks (Tian S. & Xiang, 2026). It allows them to maintain a sense of agency and control over the text-creation process. This is a significant finding, as it highlights the importance of acquiring and refining literacy skills for the effective use of GenAI in writing.

Lin (2026) also highlights the importance of critical thinking. Drawing on research findings, the author concludes that critical thinking and creative self-efficacy positively influence AI proficiency; consequently, a co-creativity-based approach is identified as the most effective model for utilizing GenAI.

Similar conclusions are drawn from a longitudinal study involving two ESL students, which focused on the regularity and sustained use of GenAI and the significance of this engagement for the development of

the students' academic skills (Tan, 2026). An analysis of the data—collected through monthly interviews and surveys—revealed the socializing nature of interactions with GenAI; this interaction fosters the development of discipline-specific knowledge and, over time, leads students to adopt an increasingly critical, selective, and reflective approach to the technology. Throughout the study, the participants demonstrated responsibility for their own intellectual work and learning processes, and they also exhibited strong language proficiency (Tan, 2026). It can be inferred that high levels of language proficiency facilitate effective collaboration with GenAI. In other words, the more adept students are at writing without GenAI assistance, the more effectively they can utilize the tool when crafting their own texts, treating the technology as a partner rather than relying on it to do the work for them. According to Xiao (2026), the process of learning to use GenAI effectively should be viewed as an integral aspect of academic skill development in higher education.

The dynamics and strategy of interacting with artificial intelligence tools are also crucial for the efficiency of text creation using GenAI. Febriantoro et al. (2026) analysed 1,282 interaction logs from 32 students using a GenAI-based essay writing assistant (EWA) during a two-hour writing session, identifying specific behavioural patterns. Students who wrote the text themselves—treating the system primarily as a source of feedback—achieved better results. Poorer outcomes were observed among those who adopted a passive approach limited to asking questions. An effective approach to using GenAI, therefore, progresses from asking questions to independent writing supported by a technology-assisted revision and optimization process, positioning artificial intelligence intervention in the final stages of text creation rather than the initial ones.

Wang and Wang (2026) describe practical examples of effective cooperation with GenAI. They conducted a six-week pedagogical experiment involving 71 Chinese EFL (English as a Foreign Language) students (36 in the experimental group, 35 in the control group) to determine how multimodal teaching supported by GenAI affects their argumentative writing skills, creativity, and critical thinking. The study demonstrated that multimodal teaching supported by GenAI significantly enhances writing complexity, creativity, and critical thinking. Students in the experimental group perceived AI-generated materials as conceptually stimulating, broadening cognitive perspectives, enhancing analytical thinking, and supporting the structure of argumentation (Wang & Wang, 2026).

Similarly, other researchers are developing and investigating the impact and effectiveness of various models of collaboration with GenAI during the learning process. Chiu and Hwang (2026) proposed a digital storytelling model utilizing mind mapping based on their proprietary CIDI framework (Clarify, Ideate, Develop, Implement) to engage students and make a traditional art course more interactive. A quasi-experiment involving 45 university students in Taiwan demonstrated that applying this working model leads to improved learning outcomes, stimulates creativity, and enhances the efficiency of GenAI-supported English language learning—specifically regarding scriptwriting, video presentations, and narrative themes (Chiu & Hwang, 2026).

The transformation of the writing process necessitates a reformulation of methods for assessing academic work. Cong-Lem (2026) advocates for the introduction of teacher-student evaluative interviews as a key component of assessment. The requirement to personally explain and justify one’s compositional strategy—including the critical management of GenAI’s contribution—radically alters the role of technology: it shifts from being a mere execution tool (for task completion) to a partner in the reasoning process and leading to the final output in the form of a text. Consequently, students become actively involved in the successive stages of creation and gain greater control over the process; this boosts their confidence when discussing their work and fosters a greater sense of responsibility for the resulting text.

Research by Melchior and Farinosi (2026) has revealed an ambivalent attitude toward the use of GenAI in personal, social, and academic contexts. Responses were gathered from 1,347 students across 24 Italian universities. While the respondents value the efficiency and learning support provided by GenAI, they also express concerns regarding the risk of intellectual dependency, the erosion of critical thinking skills, and

threats to academic integrity. An analysis of the results may also reveal a need for a systemic approach to the use of GenAI in the academic sphere.

The phenomenon of "cognitive offloading." What changes, if any, occur in human thinking when text generation is delegated to GenAI? (dependence on GenAI)

The easy and widespread availability of GenAI, combined with the benefits of using it to generate text, creates a risk of total reliance on GenAI-generated content; this could lead to the near-complete abandonment of independent writing—or even attempts to write—and, ultimately, to cognitive disengagement.

Choudhuri et al. (2026) investigated the impact of regular GenAI usage on students' cognitive engagement. Their findings revealed that students who frequently used GenAI showed a statistically significant reduction in cognitive engagement—specifically, a decrease in deep thinking and reflection applied during coursework. In addition to this, greater reliance on GenAI exacerbated this lack of engagement resulting from the routine use of GenAI. Individuals characterized as "digital natives"—those with strong technophilic motivation, high computer self-efficacy, and a high tolerance for risk—were found to be significantly more susceptible to the lack of cognitive engagement related to GenAI (Choudhuri et al., 2026).

Tian J. and Zhang focused on examining and analysing the relationship between students' perception of GenAI and their critical thinking, specifically through immersion in tasks performed with the aid of GenAI. The results indicate that when students perceive AI systems as capable and reliable, they engage more deeply in AI-supported academic tasks; this engagement is typically associated with more reflective and analytically oriented processing rather than a general decline in thinking abilities. Focusing on the task while using GenAI is accompanied by heightened evaluative processing, rather than an automatic decline in critical thinking. According to the study findings, the benefits of collaborating with GenAI emerge when engagement remains focused on verification, whereas risks arise when immersion shifts into dependency (Tian J. & Zhang, 2026).

Jain et al. (2026) also highlight the risks associated with over-reliance on GenAI. The researchers analysed the impact of AI-assisted task performance on cognitive processes, focusing on how these tools alter critical thinking skills. Using a mixed-methods approach, they studied a group of 120 young adults, examining their interactions with large language models (LLMs) and comparing the outcomes of the AI-using group against a traditional control group. The results indicated that while artificial intelligence improves task accuracy and reduces mental effort, it also encourages "cognitive offloading." The researchers note, however, that the impact on critical thinking is not uniform; it depends on the user's approach—ranging from the mechanical and complete delegation of reasoning processes to the machine, to the strategic use of the technology as a "cognitive scaffold" while maintaining one's own analytical autonomy. The study concludes that AI must be skilfully integrated and utilized as an "augmented intelligence" tool within the educational system. Excessive reliance on GenAI can significantly hinder the development of independent human reasoning. Chan et al. (2026) point to a similar risk associated with using GenAI in literacy. They examined how Chinese secondary and tertiary students learning English as a second language (ESL) utilize generative artificial intelligence tools—such as ChatGPT, Claude, Doubao, and Pigai—not merely as writing aids but as co-authors in the academic writing process. Despite the many opportunities created by this collaboration, the authors note the risks of epistemic dependence and diminished critical thinking, as well as the need to solve ethical dilemmas regarding the authorship of the texts created as a result of this cooperation. It is very difficult to definitively determine the scope of which a person or GenAI is the author of a generated text (Chan et al., 2026). Awareness of these challenges should therefore lead to the development of a model for effective collaboration with artificial intelligence, by means of which the issues of authorship will be clarified and students will engage deeply in the educational process and they will gain the sense of control while creating a text in partnership with GenAI.

Beyond the cognitive costs identified by researchers regarding an over-reliance on GenAI for text generation, studies also highlight other significant aspects: the ethical dilemmas and associated emotional costs of using GenAI. Hass et al. (2026) drew attention to this issue while investigating the use of GenAI to create personal messages—such as well-wishes, greetings, and even love poems—typically exchanged between people in close relationships. They conducted five experiments covering various messaging contexts. The findings indicate that presenting AI-generated private content as one's own triggers feelings of guilt, as users perceive such actions as dishonest (Hass, Kirk & Givi, 2026). It appears that this emotional discomfort is linked with the recipient's awareness and the nature of the relationship. If a GenAI-generated message is not actually delivered to the recipient, or if the relationship between the people is not close, the sense of guilt diminishes—much like when greetings are pre-printed on a greetings card. In such cases, the recipient does not expect the sender to be the author of the message. Perceiving one's own behaviour as dishonest—specifically, as misleading the recipient regarding the message's authorship—is a key factor causing emotional discomfort for the sender during personal communication supported by GenAI.

Conclusion

The development of generative artificial intelligence (GenAI) has revolutionized the text-creation process. These changes necessitate a new perspective on literacy—specifically, a reconceptualization of literacy competencies—as well as the establishment of conditions for effective cooperation with GenAI, the evaluation of its outputs, and the resolution of ethical issues.

The research presented indicates that effective collaboration with GenAI requires substantial personal resources. Technology becomes an effective partner in the writing process only when the individual possesses a strong, autonomous cognitive "scaffold." High linguistic proficiency, independent writing skills, self-regulation, and critical thinking are crucial for successful leveraging GenAI's capabilities—ensuring a partnership rather than a scenario where the AI simply takes over the task. Active participation in the writing process stimulates creativity and critical thinking, thereby fostering human intellectual potential. It allows the individual to maintain control over the text-creation process and avoid ethical dilemmas. Excessive—and especially habitual—reliance on technology carries the risk of cognitive disengagement. It is easy to fall prey to the illusion that GenAI is doing all the work. The educational models proposed in the material emphasize the human writer's active, critical role; in this framework, GenAI offers guidance, corrects errors, and provides feedback, but does not replace the author. The conclusions drawn from the cited research provide a definitive answer to the question posed in the article's title: literacy education remains essential, even in the times of GenAI.

References

Chan, J., Wong, J., Ieong, J., & Pang, H. (2026). Human–AI co-learning in academic writing among Chinese ESL learners. *Frontiers of Digital Education*, *3*, 15. https://doi.org/10.1007/s44366-026-0089-8

Chiu, M. C., & Hwang, G. J. (2026). Enhancing student creative and critical thinking in generative AI-empowered creation: A mind-mapping approach. *Interactive Learning Environments*, *34*(2), 869-890. https://doi.org/10.1080/10494820.2025.2511244

Choudhuri, R., Sanchez, C. A., Burnett, M., & Sarma, A. (2026). Thinking less, trusting more: GenAI's impacts on students' cognitive habits. *SSRN Electronic Journal*. https://ssrn.com/abstract=6711809

Cong-Lem, N. (2026). "Is this really your work?" A qualitative study of teacher-led interviews and student accountability in the age of generative AI. *Journal of Academic Ethics*, *24*(1), 29. https://doi.org/10.1007/s10805-025-09704-1

Febriantoro, W., Zhou, Q., Suraworachet, W., Bulathwela, S., Gauthier, A., Millan, E., & Cukurova, M. (2026). Examining student interactions with a pedagogical AI-assistant for essay writing and their impact

on students' writing quality. In J. Jovanovic, M. Khalil & M. Cukurova (Eds.), *Proceedings of the 16th International Learning Analytics and Knowledge Conference (LAK '26)* (pp. 193-204). Association for Computing Machinery. https://doi.org/10.1145/3785022.3785048

Godlewski, G. (2018). *Poza nachylenie tekstowe, w stronę doświadczenia przedtekstowego. Wskazówki terapeutyczne* [Beyond textual inclination, toward pre-textual experience: Therapeutic guidelines]. *Teksty Drugie*, (1), 61-78.

Hass, D., Kirk, C. P., & Givi, J. (2026). AI ghostwriting remorse: Guilt for using generative AI in interpersonal heartfelt messages. *Journal of Consumer Behaviour*, *25*(1), 344-361. https://doi.org/10.1002/cb.70057

Hyland, K. (2026). Writing in the AI era: Rethinking writing, research and teaching. *Journal of Second Language Writing*, *72*. https://doi.org/10.1016/j.jslw.2026.101302

Jain, P., Shajit, D., Maini, A., Shahin, Y., & Panda, A. (2026). Cognitive offloading, critical thinking and attitudes towards artificial intelligence in the era of ChatGPT: a comparative study of artificial intelligence-assisted and manual task performance in young adults. *Cognitive Processing*, *27*, 1147-1164. 10.1007/s10339-026-01375-z

Lin, C.-S. (2026). Co-creating with AI: How communication students learn, think, and rely on intelligent systems. *Journal of Educational Computing Research*, *64*(1), 155-179. https://doi.org/10.1177/07356331251385944

Melchior, C., & Farinosi, M. (2026). From support to dependency: Exploring student perceptions of generative AI. *Comunicar*, *34*(84), 215-227. https://doi.org/10.5281/zenodo.18115566

Olson, D. R. (2010). *Papierowy świat. Pojęciowe i poznawcze implikacje czytania i pisania* [The world on paper: The conceptual and cognitive implications of writing and reading] (M. Rakoczy, Trans.). Wydawnictwa Uniwersytetu Warszawskiego.

Olson, D. R. (2015). *Piśmienność, polityka piśmienności, szkoła* [Literacy, literacy policy, school] (A. Brylska & I. Hryniewicz, Trans.). In T. Buliński & M. Rakoczy (Eds.), *Almanach antropologiczny. Communicare: Vol. 5. Szkoła/Pismo* (pp. 29-43). Wydawnictwa Uniwersytetu Warszawskiego.

Ong, W. J. (2011). *Oralność i piśmienność. Słowo poddane technologii* [Orality and literacy: The technologizing of the word] (J. Japola, Trans.). Wydawnictwa Uniwersytetu Warszawskiego.

Shanley, B. J. (2026). AI & the end of college writing as we've known it. *Changing English*, *33*(2), 183-204. https://doi.org/10.1080/1358684X.2025.2598220

Tan, X. (2026). "I haven't felt AI writing is taking away my agency as a person": A longitudinal study of ESL students' use of GenAI in academic literacies development. *System*, *141,* https://doi.org/10.1016/j.system.2026.104099

Tian, J., & Zhang, R. (2026). Outsourcing thinking to AI? Focused immersion, AI dependency, and the double-edged impact on critical thinking. *Humanities and Social Sciences Communications*, *13*, https://doi.org/10.1057/s41599-026-07153-8

Tian, S., & Xiang, H. (2026). Exploring EFL students' effective use of GenAI in writing: Interplay of self-regulation, critical thinking, growth mindset, general writing competence, and GenAI literacy. *Education and Information Technologies*, *31*(5), 1351-1383. https://doi.org/10.1007/s10639-025-13725-z

Wang, Y., & Wang, S. (2026). Multimodal GenAI-assisted instruction in EFL argumentative writing: Effects on writing skills, creativity, and critical thinking. *Innovation in Language Learning and Teaching*, 1-26. https://doi.org/10.1080/17501229.2026.2683871