



GENERATIVE AI TOOLS AND CRITICAL
THINKING IN PRE-SERVICE ENGLISH TEACHER
EDUCATION: AN INTEGRATIVE LITERATURE
REVIEW

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ABSTRACT

Generative artificial intelligence has entered language classrooms faster than teacher education programmes could respond. Future English teachers now use chatbots for planning, writing and feedback. However, this habit raises a serious question about their critical thinking. This article reviews research on generative AI and critical thinking. Its focus is pre-service language teacher education. The study follows the integrative review method, which combines theoretical and empirical sources in one analysis. Foundational works on critical thinking were analysed together with recent studies. These studies were published between 2019 and 2025. The analysis produced five themes. The first theme is the meaning of critical thinking. The next two present AI as a support and as a cognitive risk. The last two cover AI in language teaching and teachers' AI literacy. The review shows that AI itself neither builds nor destroys critical thinking. The decisive factor is the pedagogical structure around its use. Most studies, however, describe perceptions and give few staged models for teacher training. The article closes with five design principles for such a model. It also outlines directions for future empirical work in Uzbekistan and similar contexts.



1. Introduction

The public release of ChatGPT in late 2022 changed the daily practice of many university students. Language students were among the first to adopt the tool. They use it to draft essays, explain grammar, translate texts and prepare lesson plans. For future teachers, this practice has a double meaning. They are learners today and will guide learners tomorrow. Their own way of using AI will later shape their classroom decisions.

Critical thinking has long been a central aim of higher education. It is also a key competence in modern teacher standards. Yet generative AI produces fluent answers with little visible effort from the user. Such answers can look correct even when they are not. A student who accepts them without checking does not practise analysis or evaluation. Therefore, the spread of AI tools makes the question of critical thinking more urgent than before.

Uzbekistan has also given strategic attention to artificial intelligence. The Presidential Resolution No. PQ-4996 of 17 February 2021 set measures for the rapid introduction of AI technologies [Resolution PQ-4996, 2021]. Education is one of the sectors expected to benefit from this policy. However, a national policy does not automatically create sound classroom practice. Teacher education institutions must translate it into concrete methods. This task requires a clear picture of what international research already knows.

Several broad reviews of AI in education already exist. Zawacki-Richter and colleagues mapped AI research in higher education before the generative turn [Zawacki-Richter et al., 2019]. They analysed a large body of studies on profiling, assessment, adaptive systems and intelligent tutoring. Their main finding was the weak connection between this research and pedagogical theory. Most authors came from computer science rather than education. The authors also noted that educators rarely took part in designing the systems. In my view, this warning is still relevant after 2022. Many current discussions of ChatGPT again focus on the tool and neglect the teaching design. The present review tries to reverse this order and start from pedagogy.

The aim of this article is to synthesise research on generative AI and critical thinking. The focus is on pre-service English teachers and language teacher education. The review addresses three research questions:

RQ1. How is critical thinking conceptualised in studies on AI-supported learning?

RQ2. What benefits and risks of generative AI for critical thinking does the literature report?

RQ3. What gaps remain for the design of a pedagogical model in pre-service English teacher education?

2. Methods

2.1. Review design

The study uses the integrative literature review design. This design suits young and fast-changing topics. It allows the reviewer to combine theoretical texts, empirical studies and policy documents. Whittemore and Knafl described the method as a structured alternative to purely



narrative reviews [Whittemore & Knafl, 2005]. They proposed five stages: problem identification, literature search, data evaluation, data analysis and presentation. They argued that diverse sources can be combined if the reviewer is explicit about each stage. They also warned that such breadth increases the risk of bias. For this reason, they asked reviewers to report search and selection decisions openly. I agree that this transparency is the main strength of the method. Generative AI research is still too new and too varied for a strict meta-analysis. An integrative design can therefore give a more honest picture at this stage.

Torraco also supported the integrative review for emerging topics [Torraco, 2005]. He explained that such reviews can generate new frameworks rather than only summarise findings. According to him, the review should critique the literature, not simply report it. He also suggested a conceptual model or research agenda as the final product. This view shaped the last section of the present article. Here the review ends with design principles for a future teaching model.

2.2. Search and selection

Sources were searched in Scopus, Web of Science, ERIC and Google Scholar. The main search terms were "generative AI", "ChatGPT", "critical thinking", "EFL", "pre-service teachers" and "AI literacy". Boolean combinations of these terms were applied in each database. The period for empirical and conceptual studies was 2019 to 2025. Classic theoretical works on critical thinking were added without a date limit. Policy documents of UNESCO and of the Republic of Uzbekistan were also included.

A source was included if it met three criteria. First, it discussed critical thinking or closely related higher-order skills. Second, it dealt with AI tools in education or knowledge work. Third, it appeared in a peer-reviewed journal, a recognised conference or a scholarly book. Official policy documents were also accepted. Opinion blogs and non-academic news were excluded. After screening, the final corpus consisted of 25 sources. They include 7 foundational works and 13 empirical or conceptual studies. The other 5 are policy and methodological documents.

2.3. Analysis

Each source was read in full and coded with a simple matrix. The matrix recorded the aim, context, method, view of critical thinking and main conclusion. Codes were then grouped into broader themes through constant comparison. Themes were revised twice until they covered all sources without overlap. The final set included five themes. They are presented in the Results section below.

3. Results

3.1. Theme 1. The meaning of critical thinking in AI-related studies

Most studies in the corpus define critical thinking through the American Philosophical Association Delphi report [Facione, 1990]. Facione led a panel of forty-six experts from philosophy, education and psychology. The panel described critical thinking as purposeful and self-regulatory judgement. This judgement includes interpretation, analysis, evaluation and



inference. It also includes explanation and self-regulation, which make thinking visible and correctable. The report stressed dispositions as well, such as inquisitiveness, open-mindedness and honesty in facing bias. I find this double structure of skills and dispositions very useful for the AI context. A student may know how to check a source but still not want to check it. Generative AI tests the disposition side even more than the skill side.

Paul and Elder offered a more practical model for classrooms [Paul & Elder, 2019]. Their model describes eight elements of thought, such as purpose, question, information and assumptions. It also lists intellectual standards, including clarity, accuracy, relevance, depth and logic. The authors argue that a thinker should apply these standards to each element. They present this as a habit that teachers can train through regular questioning. In their view, critical thinking means thinking about one's own thinking in order to improve it. This model seems especially suitable for evaluating AI output. The standards of accuracy and relevance give a ready checklist for a chatbot answer. A future teacher can ask whether the answer is clear, precise and evidence-based.

Ennis gave a shorter definition that many later studies repeat [Ennis, 1987]. He defined critical thinking as reasonable reflective thinking focused on deciding what to believe or do. Ennis linked this definition to a long list of abilities and dispositions. Among them are judging the credibility of a source and identifying unstated assumptions. He also stressed the role of context and background knowledge in good judgement. The value of this definition lies in its focus on decision. In AI-supported learning, the key decision is whether to accept, modify or reject an answer. Therefore, I consider Ennis's view very close to the practical needs of AI-era teacher education.

Halpern added an important pedagogical point [Halpern, 1998]. She argued that critical thinking can be taught, but transfer across domains is not automatic. Her model includes four parts: dispositional preparation, skills instruction, structure training and metacognitive monitoring. Structure training helps learners recognise when a new problem needs a familiar skill. Metacognitive monitoring helps them check the quality of their own reasoning. This model explains why a single AI tutorial rarely changes student behaviour. Learners need repeated, structured tasks with explicit reflection. In my opinion, a pedagogical model for AI use must include all four of Halpern's parts.

Abrami and colleagues tested such claims with a large meta-analysis [Abrami et al., 2015]. They synthesised 341 effect sizes from studies on teaching critical thinking. Their results showed that explicit instruction can produce clear gains. Three strategies proved especially effective: dialogue, authentic problems and mentoring. The combination of these strategies produced the strongest effects. This evidence is important for the present review. It shows that critical thinking grows through structured interaction, not through exposure to information. A chatbot alone provides information, but the teacher must provide dialogue and authentic tasks. This finding supports the idea of a guided cycle rather than free AI use.



3.2. Theme 2. Generative AI as a support for critical thinking

A group of studies presents AI as a potential partner in thinking. Kasneci and colleagues discussed the opportunities and challenges of large language models in education [Kasneci et al., 2023]. They argued that such models can support personalised learning and feedback at every educational level. For university students, they highlighted help with writing, research and problem solving. At the same time, they warned about bias, copyright and over-reliance. Their main recommendation was to develop clear competences for both teachers and learners. I share their balanced position. However, their paper treats critical thinking as a general outcome rather than a trained process. Teacher education needs a more operational description of how this outcome appears in tasks.

Walter developed this line of argument further [Walter, 2024]. He examined AI in a Swiss university through a case study and a narrative literature review. He identified three skills as most important for the future of education. These were AI literacy, prompt engineering and critical thinking. In his view, critical thinking protects learners from hallucinated answers and hidden bias. He also argued that prompting itself can train precise and reflective thinking. This connection between prompting and thinking is valuable. Formulating a good question requires a clear purpose, a defined context and awareness of assumptions. Still, I believe that prompting skill alone is not enough. A student may write an excellent prompt and still accept a weak answer without checking.

Darwin and colleagues studied the perceptions of EFL students directly [Darwin et al., 2024]. They interviewed seven master's students from two Indonesian universities. The participants saw critical thinking as questioning norms, analysing context and evaluating evidence. They reported that AI enriched their academic research and their scrutiny of theories. However, they also noted a lack of personalisation and a risk of echo chambers. The authors concluded that AI can be an asset only with careful management. This study is close to the context of the present review. It shows that language students can reflect maturely on AI when asked to do so. Yet the small sample and the self-report design limit its conclusions. The authors themselves called for more objective measures and pedagogical methods.

3.3. Theme 3. Generative AI as a cognitive risk

The second large group of studies focuses on cognitive risks. The key concept here is cognitive offloading. Risko and Gilbert defined it as using actions or external tools to reduce mental demand [Risko & Gilbert, 2016]. They showed that people offload memory and calculation to devices in many daily tasks. Offloading can be rational, because it frees mental resources for other work. However, they also noted that it can weaken internal skills over time. People often offload even when they could perform the task themselves. This theory was formulated before generative AI, but it fits the new situation well. A chatbot can take over not only memory but also analysis and evaluation. In that case, the student offloads the very process that critical thinking requires.



Gerlich tested this concern with a mixed-methods study [Gerlich, 2025]. He surveyed 666 participants of different ages and educational backgrounds. Critical thinking was measured with instruments based on the Halpern Critical Thinking Assessment. The results showed a significant negative correlation between frequent AI use and critical thinking. Cognitive offloading partly mediated this relationship. Younger participants aged 17 to 25 showed the highest AI dependence and the lowest scores. Higher education, on the other hand, was associated with better critical thinking. These findings are alarming for teacher education, because most pre-service teachers belong to this young group. Still, the study is correlational and cannot prove a causal effect. In my view, its practical lesson is clear. Unstructured AI use is risky, so education must provide structure.

Lee and colleagues reached a similar conclusion among professionals [Lee et al., 2025]. They surveyed 319 knowledge workers who shared 936 real examples of AI use. Higher confidence in AI was associated with less critical thinking. Higher self-confidence, in contrast, was associated with more critical thinking. The authors also found a shift in the nature of critical thinking. With AI, it moves towards information verification, response integration and task stewardship. This shift is a key finding for teacher education. It suggests that verification and integration should become explicit learning goals. Future teachers must learn not only to produce answers but to supervise machine answers.

The risk of false content makes verification even more important. Ji and colleagues reviewed research on hallucination in natural language generation [Ji et al., 2023]. They defined hallucination as generated content that is nonsensical or unfaithful to the source. They distinguished intrinsic hallucination, which contradicts the source, from extrinsic hallucination, which cannot be verified. They showed that the problem appears in summarisation, dialogue, translation and question answering. They also explained that fluent style can hide factual errors. For language teachers, this point has special weight. A fluent English answer may contain an invented rule or a false reference. Without a habit of checking, a future teacher may pass such errors to pupils.

3.4. Theme 4. Generative AI in English language teaching

Studies in language education show both promise and caution. Kohnke, Moorhouse and Zou analysed ChatGPT as a tool for language teaching and learning [Kohnke et al., 2023]. They described its potential for communicative practice, explanation of vocabulary and feedback on writing. They also discussed risks such as inaccurate information and academic dishonesty. The authors argued that teachers need new digital competences to use the tool well. They also stressed the need to guide students in evaluating chatbot output. I find their focus on teacher competence highly relevant. Their paper shows that the teacher's role does not disappear but changes. The teacher becomes a designer of tasks and a model of critical use.

Barrot examined ChatGPT specifically for second language writing [Barrot, 2023]. He noted that the tool can help with ideas, organisation and language accuracy. At the same time, he listed



serious limitations. These include a formulaic style, limited cultural sensitivity and possible threats to authentic learning. He recommended that teachers integrate the tool deliberately rather than ban it. He also suggested activities in which students compare and revise AI drafts. Such comparison tasks are a natural space for critical thinking. The student must decide which parts are accurate, appropriate and convincing. In my view, these tasks should become a standard element of methodology courses.

Su, Lin and Lai explored the use of ChatGPT in argumentative writing classrooms [Su et al., 2023]. They proposed that the tool can support outlining, revision and dialogic feedback. They also emphasised that argumentation requires claims, evidence and counterarguments. In their view, ChatGPT can help students notice weak reasoning in their drafts. Yet they warned that students may copy arguments without understanding them. They therefore called for structured collaboration between the learner and the machine. Argumentative writing is one of the clearest windows into critical thinking. For this reason, it offers an ideal genre for training AI-supported reasoning in teacher education.

3.5. Theme 5. AI literacy and teacher competence

The final theme concerns AI literacy. Long and Magerko proposed one of the first definitions of this concept [Long & Magerko, 2020]. They described AI literacy as competences for evaluating AI critically and using it well. Their framework includes seventeen competences and fifteen design considerations. Among the competences are understanding what AI can and cannot do. Learners should also understand how AI represents knowledge and how it learns from data. This definition places critical evaluation at the core of AI literacy. Therefore, AI literacy and critical thinking should not be taught as separate subjects. In my view, they form one integrated competence for the future teacher.

Ng and colleagues later reviewed the literature on AI literacy [Ng et al., 2021]. They identified four aspects of the concept. These are knowing AI, using AI, evaluating and creating AI, and AI ethics. They linked these aspects to the levels of Bloom's taxonomy. The higher levels, such as evaluating and creating, require advanced reasoning. The authors noted that few studies addressed these higher levels in practice. This gap matches the findings of the present review. Most teacher education courses still teach how to use AI, but not how to judge it. A pedagogical model should therefore aim at the evaluative level from the beginning.

International policy documents support the same direction. UNESCO published its guidance on generative AI in education and research in 2023 [UNESCO, 2023]. The document recommends a human-centred approach and an age limit for independent use. It asks institutions to validate AI tools ethically and pedagogically before adoption. In 2024, UNESCO also issued an AI competency framework for teachers [UNESCO, 2024]. This framework includes a human-centred mindset, ethics, AI foundations, AI pedagogy and AI for professional development. Both documents place the teacher, not the tool, at the centre of the learning



process. I consider this principle the most important policy message for teacher education in Uzbekistan.

The integration of AI into teacher education also continues earlier work on digital pedagogy. Mishra and Koehler described teacher knowledge as an interaction of technology, pedagogy and content [Mishra & Koehler, 2006]. Their TPACK framework argued that technology cannot be learned apart from teaching aims. Teachers need to understand how a specific tool changes the presentation of specific content. They also need to know when a tool helps learning and when it hinders it. This framework remains useful in the age of generative AI. A chatbot is a new technology, but the old question about pedagogical purpose stays the same. Research on blended learning in English teaching makes a similar point [Soleyeva & Suleymanova, 2025]. It stresses the balance of traditional and digital methods. In my opinion, AI should enter teacher training as part of this balanced tradition, not as a separate trend.

3.6. Summary of the gaps

The five themes reveal three clear gaps. First, most empirical studies measure perceptions rather than actual changes in critical thinking. Second, few studies focus on pre-service English teachers as a distinct group. Third, the literature offers many recommendations but very few staged pedagogical models. Teachers are told to "use AI critically", but they rarely receive a clear sequence of steps. This last gap is the most important for methodology research.

4. Discussion

The first research question asked how critical thinking is conceptualised. The review shows that most AI studies rely on the Delphi definition and its later versions. These definitions treat critical thinking as both skills and dispositions. In the AI context, the dispositional side becomes especially important. The tool removes the effort barrier, so only the learner's attitude can trigger checking. Lee and colleagues confirmed this with their finding on confidence. Students who trust AI more think less critically about its output. Therefore, a teaching model should address trust and self-confidence, not only skills.

The second research question concerned benefits and risks. The literature shows a clear tension between two positions. One group of authors sees AI as a partner in thinking. The other group sees it as a source of cognitive offloading. The review suggests that both positions are correct under different conditions. Free and unguided use tends to produce offloading. Structured use with explicit evaluation tends to produce deeper reasoning. In this sense, the effect of AI depends on pedagogy rather than on technology. This conclusion agrees with Abrami and colleagues. They found that structure and dialogue drive critical thinking gains.

The third research question concerned gaps for model design. Based on the review, I propose five design principles for pre-service English teacher education. They are formulated as working hypotheses for future testing.



Principle 1. Context before consultation. The learner should define the task, the audience and the criteria before using AI. This step reduces passive acceptance and activates prior knowledge.

Principle 2. Consultation as inquiry. The learner should treat AI as a source to question, not as an authority. Prompting should be taught as a form of precise questioning.

Principle 3. Explicit critique and verification. Each AI answer should be checked against intellectual standards and external sources. This principle responds directly to the risk of hallucination.

Principle 4. Challenge and alternative views. The learner should ask for counterarguments and compare several answers. This step trains open-mindedness and reduces echo chamber effects.

Principle 5. Reflective conclusion. The learner should explain the final decision and evaluate their own reasoning. This step corresponds to Halpern's metacognitive monitoring.

These principles form a cycle rather than a linear list. A learner may return to an earlier stage when new evidence appears. The cycle also fits the language teaching context. Each stage can be practised through authentic tasks. Examples are lesson planning, error correction and essay feedback. In addition, the principles can be built into a digital platform for regular practice. Such a platform could guide students step by step and record their reasoning.

The review has several limitations. The corpus is relatively small, because the field is still young. Most studies come from Asian, European and American contexts. Research from Central Asia is almost absent from international databases. The review also depended on English-language publications. Future reviews should include Uzbek and Russian sources more systematically.

5. Conclusion

This integrative review examined how research links generative AI with critical thinking in language teacher education. It found that AI neither guarantees nor destroys critical thinking by itself. Unstructured use is associated with offloading and overconfidence in machine answers. Structured use with critique and verification is associated with deeper reasoning. The literature, however, offers few staged models for pre-service English teachers. The five design principles proposed here aim to fill this gap. They require empirical testing in real classrooms. The next stage of this research will develop a structured AI-based cycle. It will then be piloted at a teacher education institution in Uzbekistan.

References

1. Abrami, P. C., Bernard, R. M., Borokhovski, E., Waddington, D. I., Wade, C. A., & Persson, T. (2015). Strategies for teaching students to think critically: A meta-analysis. *Review of Educational Research*, 85(2), 275-314. <https://doi.org/10.3102/0034654314551063>



2. Barrot, J. S. (2023). Using ChatGPT for second language writing: Pitfalls and potentials. *Assessing Writing*, 57, 100745. <https://doi.org/10.1016/j.asw.2023.100745>
3. Darwin, Rusdin, D., Mukminatien, N., Suryati, N., & Laksmi, E. D. (2024). Critical thinking in the AI era: An exploration of EFL students' perceptions, benefits, and limitations. *Cogent Education*, 11(1).
4. Ennis, R. H. (1987). A taxonomy of critical thinking dispositions and abilities. In J. B. Baron & R. J. Sternberg (Eds.), *Teaching thinking skills: Theory and practice* (pp. 9-26). W. H. Freeman.
5. Facione, P. A. (1990). *Critical thinking: A statement of expert consensus for purposes of educational assessment and instruction (The Delphi Report)*. California Academic Press.
6. Gerlich, M. (2025). AI tools in society: Impacts on cognitive offloading and the future of critical thinking. *Societies*, 15(1), 6. <https://doi.org/10.3390/soc15010006>
7. Halpern, D. F. (1998). Teaching critical thinking for transfer across domains: Dispositions, skills, structure training, and metacognitive monitoring. *American Psychologist*, 53(4), 449-455. <https://doi.org/10.1037/0003-066X.53.4.449>
8. Ji, Z., Lee, N., Frieske, R., Yu, T., Su, D., Xu, Y., Ishii, E., Bang, Y. J., Madotto, A., & Fung, P. (2023). Survey of hallucination in natural language generation. *ACM Computing Surveys*, 55(12), 1-38. <https://doi.org/10.1145/3571730>
9. Kasneci, E., Sessler, K., Küchemann, S., Bannert, M., Dementieva, D., Fischer, F., et al. (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>
10. Kohnke, L., Moorhouse, B. L., & Zou, D. (2023). ChatGPT for language teaching and learning. *RELC Journal*, 54(2), 537-550. <https://doi.org/10.1177/00336882231162868>
11. Lee, H.-P., Sarkar, A., Tankelevitch, L., Drosos, I., Rintel, S., Banks, R., & Wilson, N. (2025). The impact of generative AI on critical thinking: Self-reported reductions in cognitive effort and confidence effects from a survey of knowledge workers. In *Proceedings of the 2025 CHI Conference on Human Factors in Computing Systems (CHI '25)*. ACM. <https://doi.org/10.1145/3706598.3713778>
12. Long, D., & Magerko, B. (2020). What is AI literacy? Competencies and design considerations. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems* (pp. 1-16). ACM. <https://doi.org/10.1145/3313831.3376727>
13. Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record*, 108(6), 1017-1054.
14. 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>



15. Paul, R., & Elder, L. (2019). The miniature guide to critical thinking: Concepts and tools (8th ed.). Rowman & Littlefield.

16. Resolution of the President of the Republic of Uzbekistan No. PQ-4996. (2021, February 17). On measures to create conditions for the accelerated introduction of artificial intelligence technologies. Tashkent.

17. Risko, E. F., & Gilbert, S. J. (2016). Cognitive offloading. Trends in Cognitive Sciences, 20(9), 676-688. <https://doi.org/10.1016/j.tics.2016.07.002>

18. Soleyeva, S. S., & Suleymanova, N. M. (2025). Blended learning: Combining traditional and digital methods in ELT. Proceedings of the International Conference and Annual Business Meeting (ICON-ABM 2025), 1(1), 12-21.

19. Su, Y., Lin, Y., & Lai, C. (2023). Collaborating with ChatGPT in argumentative writing classrooms. Assessing Writing, 57, 100752. <https://doi.org/10.1016/j.asw.2023.100752>

20. Torraco, R. J. (2005). Writing integrative literature reviews: Guidelines and examples. Human Resource Development Review, 4(3), 356-367. <https://doi.org/10.1177/1534484305278283>

21. UNESCO. (2023). Guidance for generative AI in education and research. UNESCO.

22. UNESCO. (2024). AI competency framework for teachers. UNESCO.

23. Walter, Y. (2024). Embracing the future of artificial intelligence in the classroom: The relevance of AI literacy, prompt engineering, and critical thinking in modern education. International Journal of Educational Technology in Higher Education, 21, 15. <https://doi.org/10.1186/s41239-024-00448-3>

24. Whittemore, R., & Knafl, K. (2005). The integrative review: Updated methodology. Journal of Advanced Nursing, 52(5), 546-553. <https://doi.org/10.1111/j.1365-2648.2005.03621.x>

25. Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education: Where are the educators? International Journal of Educational Technology in Higher Education, 16, 39. <https://doi.org/10.1186/s41239-019-0171-0>