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Implementation of Artificial Intelligence to Strengthen Historical Thinking in the History Teaching Material Development Course at Semarang State University

Agus Rahmat Mahmudi[1*], Djunaidi Djunaidi[2], Abrar[3], Andy Suryadi[4]
Universitas Negeri Jakarta[123]
Universitas Negeri Semarang[4.]
E-mail: agusrahmatmahmudi19@gmail.com[1*], djunaidi@unj.ac.id[2], abrar@unj.ac.id[3], andypapasikembar@mail.unnes.ac.id[4]

Abstrak

Penelitian ini bertujuan menganalisis implementasi kecerdasan buatan (*Artificial Intelligence/AI*) dalam memperkuat kemampuan berpikir historis mahasiswa serta mengidentifikasi kendala penerapannya pada mata kuliah Pengembangan Bahan Ajar Sejarah di Universitas Negeri Semarang. Penelitian menggunakan pendekatan kualitatif dengan desain studi kasus. Data dikumpulkan melalui observasi partisipatif, wawancara mendalam terhadap empat mahasiswa, satu dosen pengampu, dan Koordinator Program Studi Pendidikan Sejarah, serta *Focus Group Discussion* (FGD) dan kajian dokumen. Analisis data dilakukan secara interaktif melalui reduksi data, penyajian data, serta penarikan kesimpulan dan verifikasi. Hasil penelitian menunjukkan bahwa integrasi AI berkontribusi terhadap penguatan berpikir historis melalui fasilitasi analisis, interpretasi, evaluasi bukti sejarah, konstruksi kausalitas, serta pengembangan bahan ajar secara sistematis. Kontribusi tersebut tercermin dalam penguatan enam dimensi *Historical Thinking Concepts*, meliputi *historical significance*, *primary source evidence*, *continuity and change*, *cause and consequence*, *historical perspectives*, dan *ethical dimension*. Meskipun demikian, implementasinya masih menghadapi kendala berupa ketimpangan literasi digital dan literasi AI, keterbatasan kemampuan merumuskan *prompt*, ketidakakuratan informasi, serta risiko ketergantungan dan degradasi orisinalitas akademik. Penelitian ini menegaskan bahwa AI berpotensi menjadi *pedagogical scaffolding* dalam pembelajaran sejarah, sepanjang diintegrasikan melalui desain pedagogis yang terarah, verifikasi sumber yang ketat, dan penguatan integritas akademik. Dengan demikian, AI perlu diposisikan sebagai instrumen pendukung konstruksi pengetahuan historis, bukan substitusi atas otonomi intelektual mahasiswa.

Kata Kunci: Kecerdasan Buatan; Berpikir Historis; Pendidikan Sejarah; Pengembangan Bahan Ajar.

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Abstract

This study aims to analyze the implementation of artificial intelligence (AI) in strengthening students' historical thinking skills and identify obstacles to its application in the History Teaching Material Development course at Semarang State University. The research uses a qualitative approach with a case study design. Data were collected through participatory observation, in-depth interviews with four students, one teaching lecturer, and the Coordinator of the History Education Study Program, as well as Focus Group Discussion (FGD) and document review. Data analysis was carried out interactively through data reduction, data presentation, and conclusion drawing and verification. The results of the study show that AI integration contributes to strengthening historical thinking through the facilitation of analysis, interpretation, evaluation of historical evidence, causality construction, and systematic development of teaching materials. This contribution is reflected in the strengthening of the six dimensions of Historical Thinking Concepts, including historical significance, primary source evidence, continuity and change, cause and consequence, historical perspectives, and ethical dimension. However, its implementation still faces obstacles in the form of inequality in digital literacy and AI literacy, limited prompt formulations, inaccuracies in information, and the risk of dependence and degradation of academic originality. This study confirms that AI has the potential to become a pedagogical scaffolding in history learning, as long as it is integrated through targeted pedagogical design, strict source verification, and strengthening academic integrity. Thus, AI needs to be positioned as a supporting instrument for the construction of historical knowledge, not a substitute for students' intellectual autonomy.

Keywords**:** *Artificial Intelligence; Historical Thinking; History Education; Teaching Material Development.*

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INTRODUCTION

Artificial intelligence (AI) has become an increasingly influential force across multiple dimensions of contemporary society, including social, cultural, political, economic, and educational domains. In higher education, its rapid integration represents more than a technological advancement; rather, it constitutes an epistemological shift that reshapes how students access knowledge, construct arguments, and produce academic work (Crompton & Burke, 2023; Maphosa & Maphosa, 2023). Accordingly, AI has evolved from a technological innovation into a pedagogical instrument that influences how lecturers design, deliver, and evaluate learning. The expanding literature on AI in education identifies diverse applications, including "adaptive learning and personalized tutoring," intelligent assessment, learner profiling, and academic performance prediction (Farhood et al., 2025; Wang et al., 2024). Furthermore, Walter (2024) characterizes AI integration in educational settings as "a transformative shift" that necessitates the development of AI literacy, prompt engineering, and critical thinking as essential competencies for contemporary learning. Consequently, AI should no longer be regarded merely as an

administrative support tool, but as an integral component of students' academic thinking ecosystem, influencing their engagement with knowledge, intellectual processes, and academic knowledge production.

Within history education, historical thinking transcends the memorization of factual information, encompassing the critical interpretation of historical evidence, the formulation of substantiated explanations, and the argumentative reconstruction of historical meaning (Seixas & Morton, 2013). Gibson et al (2025) further conceptualize it as a cognitive process through which historical evidence is analysed and interpreted to construct, deconstruct, and reconstruct narratives of the past. Similarly, Tirado-Olivares et al (2024) emphasize that history education must move beyond rote learning, as "students' ability to think historically" represents a more meaningful foundation for educational assessment than summative testing alone. Accordingly, strengthening historical thinking requires analytical, reflective, and evidence-based engagement, positioning students as critical interpreters of the past rather than passive recipients or reproducers of historical information.

The imperative to strengthen historical reasoning becomes increasingly critical as AI enters history education. Bertram et al (2021) demonstrate that computational assessment can facilitate the large-scale evaluation of open-ended historical writing, although concerns regarding objectivity, validity, and reliability remain. Similarly, Tirado-Olivares et al (2023) highlight the contribution of historical thinking-oriented instruction and error-based learning to enhancing students' critical thinking. While Chang et al (2025) demonstrate that dialogic game-based learning can foster historical causal reasoning, classroom dialogue, and critical thinking. These findings underscore that technological integration is educationally meaningful only when it deepens historical inquiry and evidence-based reasoning, rather than substituting for human intellectual agency.

Nevertheless, a significant gap remains in the contemporary literature. Existing AI research predominantly addresses higher education in general, emphasizing system design, learning personalization, and educational outcome evaluation, with limited attention to the relationship between AI implementation and the development of historical thinking within university-level History Teaching Materials Development courses. Although Wang et al (2024) identify "adoption, impacts, and challenges" as key dimensions of AI research, its context-specific applications, particularly in history education, remain insufficiently explored. Furthermore, Salido et al (2025) identify persistent challenges in integrating AI and critical thinking in higher education, including "uncritical dependence on AI", disparities in digital literacy, and limited system transparency. These limitations establish a substantive research gap and provide the rationale for investigating how pedagogically guided AI integration can strengthen historical thinking in history teacher education.

The originality of this study lies in conceptualizing AI not as a substitute for lecturers, but as a pedagogical scaffolding mechanism for strengthening historical thinking within the History Teaching Materials Development course at Semarang State University. At the practical level, the study examines how AI facilitates students' instructional material design, source verification, comparative historical interpretation, and systematic reflection on their historical reasoning processes. This focus addresses the limited empirical research examining the intersection of AI integration, history education, and historical thinking. Accordingly, the study advances an integrated analytical framework that brings together AI, history teaching materials development, and historical thinking, thereby extending the pedagogical understanding of AI-mediated learning in history education.

The significance of this study is further underscored by the institutional imperative to prepare future history educators to navigate an evolving digital ecosystem while preserving the intellectual rigour of historical thinking. Bond et al (2024) emphasize the importance of ethics, collaboration, and methodological rigour in AI research within higher education. While Zawacki-Richter et al (2019) highlight the insufficient consideration given to privacy, associated risks, and ethical implications. Accordingly, prospective history teachers must develop the capacity to engage with AI critically, ethically, and reflectively, ensuring that its application strengthens historical argumentation, source literacy, and critical thinking without compromising students' intellectual autonomy (Bond et al., 2024; Tirado-Olivares et al., 2023). Against this background, this study examines the implementation of AI in strengthening historical thinking and identifies the challenges encountered in the History Teaching Materials Development course.

RESEARCH METHODS

Types of Research

This study adopts a qualitative approach within a case study design to develop an in-depth understanding of AI implementation in teaching and learning, focusing not on statistically measuring effects but on examining the processes involved and the meanings lecturers and students attribute to AI as a pedagogical means of strengthening historical thinking. Creswell & Poth (2018) describe qualitative inquiry as an interpretive process through which researchers construct meaning from textual and visual data holistically. A case study design is appropriate because the investigation centres on a bounded, context-specific phenomenon: AI implementation in the History Teaching Materials Development course at Semarang State University, allowing for its holistic, contextual, and in-depth examination. Data were collected through classroom observations, interviews, focus group discussions (FGDs) involving 20 students, and document analysis, with methodological and source triangulation employed to enhance the robustness of the findings. Jason & Glenwick (2016) identify triangulation as an important procedure in

qualitative data analysis. While (Kelle et al., 2019; Schlunegger et al., 2024). highlight its contribution to mitigating research bias, strengthening credibility, and developing a more comprehensive understanding of the phenomenon under investigation. Data analysis followed the interactive model of Miles & Huberman (1994) involving continuous and iterative cycles of data collection, data reduction, data display, and conclusion drawing and verification.

Population and Sample

The study population comprises all individuals directly involved in, or associated with, the implementation of the History Teaching Materials Development course at Semarang State University, particularly those with first-hand experience of AI integration in the learning process. Specifically, it includes programme-level academic leadership, the course lecturer, and 20 students enrolled in the course. Given the qualitative case study design, participants are selected through purposive sampling to ensure the inclusion of information-rich informants with relevant knowledge and direct experience of the phenomenon under investigation, thereby generating comprehensive, in-depth, and contextually grounded data.

Participant selection was guided by four criteria: direct involvement in the course, familiarity with AI applications in teaching and learning, willingness to participate as an informant, and the capacity to provide in-depth insights into AI implementation for strengthening historical thinking. Furthermore, the triangulation of in-depth interviews, focus group discussions (FGDs), classroom observations, and document analysis enhances data richness and analytical rigour, ensuring that the selected participants are appropriately aligned with the research objectives and capable of generating relevant, credible, and contextually meaningful evidence.

RESULTS AND DISCUSSION

Implementation of Artificial Intelligence to Strengthen Historical Thinking in the History Teaching Material Development Course at Semarang State University

The implementation of AI in the History Teaching Materials Development course at Semarang State University demonstrates that AI is positioned not as a substitute for students' intellectual engagement, but as a pedagogical instrument that facilitates and structures cognitive processes. The course lecturer described AI as a "supportive pedagogical tool rather than a replacement for students' thinking", particularly in brainstorming ideas, structuring instructional content, formulating diverse questions, and exploring alternative learning product formats (Course Lecturer, 13 April 2026). Similarly, the Head of the History Education Study Programme emphasized that AI represents a strategic technological development but "must not replace critical reasoning, pedagogical creativity, or the academic responsibility of lecturers and students" (Coordinator of the History Education Study Program, Semarang State University, 9 April 2026). These

findings are consistent with broader research indicating that AI applications in education predominantly encompass adaptive learning, personalized tutoring, intelligent assessment, and learning management, while their academic value remains contingent upon sound pedagogical design (Tan et al., 2025; Wang et al., 2024).

Operationally, AI integration is embedded within a structured instructional sequence rather than applied spontaneously. The course lecturer identified six stages of implementation: needs analysis, planning, development, implementation, evaluation, and reflection and revision (Course Lecturer, 13 April 2026). During needs analysis, AI supports the identification of relevant historical sources and learning difficulties; in planning, it facilitates the formulation of instructional frameworks, topics, and subtopics; and in development, it serves as an ideation tool and preliminary drafting assistant. During implementation, AI assists in transforming complex content into accessible and communicative teaching materials, while evaluation involves critically verifying students' outputs rather than delegating final judgement to AI. Finally, reflection and revision require students to distinguish AI-generated content from their own interpretations and refine preliminary outputs against credible academic sources. This structured approach positions AI as a means of strengthening transparent and traceable intellectual processes rather than merely generating polished instructional products.

At the student-practice level, AI is primarily employed for three purposes: ideation, preliminary drafting, and refinement. One student explained, "I primarily use AI to generate initial ideas when developing teaching materials. It helps me map out topics and subtopics more systematically before consulting the primary references" (FGD Respondent 1, 14 April 2026). Other participants reported that AI facilitates their ability to "understand conceptual summaries before engaging with the primary sources" and supports the organisation of instructional content (FGD Respondent 10 and FGD Respondent 8, 14 April 2026). Additionally, students use AI to refine academic language, improving the formality, coherence, and clarity of their preliminary drafts (FGD Respondent 3, 14 April 2026). These practices indicate that AI functions primarily as an initial cognitive stimulus and structural aid, while the substantive academic content remains dependent on students' independent reading, critical interpretation, and intellectual reasoning.

Viewed through Seixas and Morton's framework of historical thinking, AI integration appears to contribute most significantly to the development of historical evidence evaluation, historical perspectives, continuity and change, cause and consequence, and the ethical dimension. The course lecturer emphasized that AI is particularly valuable when working with complex and extensive historical sources, as it facilitates content summarization, identification of key information, cross-

source comparison, and chronological organization of historical data (Course Lecturer, 13 April 2026).

Furthermore, AI supports the development of historical perspectives and causal reasoning by providing preliminary insights into historical contexts, relationships among events, and potential causal connections, although definitive interpretations require students' critical examination. The course lecturer emphasized that AI is particularly effective in facilitating preliminary analysis; however, critical reasoning, source evaluation, and conclusion-drawing must remain the intellectual responsibility of students as active historical thinkers (Course Lecturer, 13 April 2026). This position is consistent with recent scholarship conceptualizing historical thinking as a cognitive process involving the analysis and interpretation of historical evidence to construct, deconstruct, and reconstruct narratives of the past (Gibson et al., 2025).

Viewed through Seixas & Morton (2013) historical thinking concepts framework, the findings demonstrate that AI contributes differently across six interrelated dimensions. Regarding historical significance, AI assists students in identifying relevant historical issues and formulating preliminary inquiry questions. In relation to primary source evidence, it facilitates the retrieval and comparison of historical evidence, while necessitating independent verification to prevent uncritical acceptance of AI-generated outputs. Within continuity and change, AI supports chronological sequencing, enabling students to identify patterns of historical continuity and transformation. For cause and consequence, it helps structure causal relationships by connecting historical backgrounds, developments, and subsequent impacts. Regarding historical perspectives, AI introduces alternative interpretative viewpoints, although final judgements must remain grounded in students' independent reasoning. Finally, the ethical dimension emphasizes the responsibility to substantiate historical claims, avoid uncritical reproduction of AI-generated content, and verify information against authoritative sources. Collectively, these six dimensions constitute the conceptual foundation of Historical Thinking Concepts and remain central to contemporary approaches to history education.

Obstacles to the Implementation of Artificial Intelligence to Strengthen Historical Thinking in the History Teaching Material Development Course at Semarang State University

The challenges associated with implementing artificial intelligence in the History Teaching Materials Development course at Semarang State University extend beyond the technical use of digital applications, encompassing interconnected pedagogical, epistemological, and ethical concerns. Recent scholarship indicates that although AI is rapidly transforming education through adaptive learning, intelligent assessment, and personalised instruction, its integration simultaneously raises critical questions regarding

pedagogical clarity, technological dependency, and the quality of academic decision-making. Wang et al (2024) emphasise that despite the expanding application of AI in education, its effectiveness remains contingent upon sound instructional design and the context of implementation. Similarly, Fu & Weng (2024) argue that educational AI must be governed by the principles of fairness, privacy, autonomy, transparency, and non-maleficence. These concerns are particularly consequential in history education, where the validity of historical knowledge depends on source reliability, contextual accuracy, and evidence-based interpretation intellectual processes that cannot be delegated to the instantaneous outputs of AI systems.

The primary challenge identified in the field data is the disparity in students' digital, information, and AI literacy. The Programme Coordinator noted that some students regard AI as a source of instant answers rather than a partner in academic inquiry, fostering superficial and unreflective engagement. Accordingly, AI integration in history education is "not merely technical, but also epistemological and pedagogical" (Coordinator of the History Education Study Program, Semarang State University, 9 April 2026). Students similarly reported that "AI-generated answers are sometimes too general and lack specificity" (FGD respondent 1, 14 April 2026), difficulties in "formulating specific prompts" (FGD respondent 9, 14 April 2026), and that "AI does not always understand the contextual requirements of history learning" (FGD respondent 10, 14 April 2026). These findings reveal deficiencies in students' ability to direct AI effectively and critically evaluate its outputs through historical reasoning, contextual interpretation, and evidence-based analysis.

These challenges become particularly significant when analysed through Seixas & Morton (2013) six Historical Thinking Concepts: historical significance, evidence, continuity and change, cause and consequence, historical perspectives, and the ethical dimension. Within this framework, the concept of evidence is particularly pertinent, as students are expected not merely to comprehend historical information but also to critically evaluate the provenance, credibility, contextual validity, and limitations of sources. Interview findings indicate that AI poses particular challenges to the processes of sourcing and corroboration, as its outputs may appear authoritative and convincing despite containing historical inaccuracies. The course lecturer emphasised that "AI-generated outputs should not be treated as primary sources, but rather as initial prompts, and students must verify critical information through books, journal articles, digital archives, or relevant primary sources" (Course Lecturer, 13 April 2026). Similarly, FGD participants acknowledged that "AI is helpful, but only at the initial stage. To think critically, I still need to examine original sources" (FGD respondent 1, 14 April 2026), while another observed that "AI can stimulate historical questions, but its answers must be tested against sources" (FGD respondent 9, 14 April 2026). These findings demonstrate that although AI

can facilitate initial historical exploration, its pedagogical contribution to the development of historical thinking across the six conceptual dimensions remains dependent on students' capacity to interrogate evidence, establish historical significance, examine continuity and change, evaluate causal relationships, reconstruct historical perspectives, and engage with the ethical implications of historical interpretation through rigorous source-based verification.

Regarding historical perspectives, the findings indicate that AI-generated explanations often oversimplify historical events, generalise interpretations, and overlook local contexts and curricular requirements. Students acknowledged that "they need to critically filter AI-generated responses because AI often provides answers that are too general" (FGD respondent 7, 14 April 2026), while others noted that "not all AI-generated answers can be used directly, as they require further alignment with historical facts" (FGD respondent 8, 14 April 2026). According to Seixas and Morton's framework, historical understanding requires contextualising past actors, events, and ideas within their specific social, political, cultural, and power structures (Seixas & Morton, 2013; Thorp & Persson, 2020). Consequently, reliance on generic AI-generated narratives may undermine students' interpretive depth and understanding of cause and consequence, particularly given the complex, non-linear, and context-dependent nature of historical causation.

Furthermore, within the dimension of continuity and change, overly generalized AI-generated responses may obscure the distinctive dynamics of historical transformation, encouraging students to perceive the past as a homogeneous narrative rather than a complex process shaped by continuity and change over time. Accordingly, although AI can facilitate preliminary historical inquiry, the development of sound historical understanding remains contingent upon students' critical reasoning, source verification, and responsible contextual interpretation. This finding aligns with research on AI in higher education, which emphasizes that its educational benefits depend on the integration of technological capabilities with critical judgement and pedagogical expertise (Farhood et al., 2025; Fortuna et al., 2025; Park, 2025; Wang et al., 2024).

A further challenge concerns technological dependency, plagiarism, and declining academic originality. The Programme Coordinator emphasised the need for clear AI-use guidelines governing its purposes, limitations, and ethical responsibilities, alongside critical verification and academic accountability (Coordinator of the History Education Study Program, Semarang State University, 9 April 2026). Students reinforced these concerns, stating that "excessive use may tempt students to reproduce AI-generated outputs without critically processing them" (FGD Respondent 1, 14 April 2026); "dependency is a genuine concern, as frequent reliance on

AI may weaken students' ability to formulate independent arguments" (FGD Respondent 3, 14 April 2026); and "academic integrity must remain fundamental to the use of AI" (FGD Respondent 12, 14 April 2026). These findings highlight that AI integration in history education must preserve students' intellectual autonomy, evidence-based reasoning, independent argumentation, and academic integrity.

CONCLUSION

The findings indicate that AI integration in the History Teaching Materials Development course at Semarang State University contributes to strengthening students' historical thinking, particularly in historical analysis, interpretation, evidence evaluation, causal reasoning, and instructional material development. These contributions are reflected across the six dimensions of Seixas and Morton's Historical Thinking Concepts: historical significance, primary source evidence, continuity and change, cause and consequence, historical perspectives, and the ethical dimension. Conceptually, this study advances an understanding of AI as a form of pedagogical scaffolding in history education rather than a substitute for students' intellectual engagement. Its effective integration therefore requires purposeful instructional design, lecturer facilitation, strengthened AI literacy, rigorous historical source verification, and academic integrity safeguards. Nevertheless, implementation remains constrained by disparities in digital and AI literacy, limited prompt formulation skills, information inaccuracies, and the risks of technological dependency and diminished academic originality. Given that this investigation is confined to a single course within one institution, future research should examine AI integration across diverse institutional and educational contexts, involving broader participant populations to develop a more comprehensive and comparative understanding of its effectiveness in strengthening historical thinking.

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