

AI-Based Learning Media in History Teaching: An Exploratory Mixed-Methods Study of Undergraduate History Education Students

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Abstract: Digital technologies now shape history education, yet many teachers adopt new tools without a clear pedagogical rationale. Artificial intelligence (AI) has drawn wide attention in education, but few studies examine its role in history learning from a disciplinary perspective. This study explores how history education undergraduates integrate AI into history learning media and how they experience its use. We used an explanatory sequential mixed-methods design. In the quantitative phase, 120 history education undergraduates completed a questionnaire. In the qualitative phase, we analyzed 12 student-produced AI-based learning artefacts and interviewed nine purposively selected students. Students viewed AI favorably as a learning aid, rated their readiness to use it favorably, and agreed that AI-generated historical information has limitations. They used AI mainly for idea generation, content structuring, visualization, and presentation, and reported caution about historical accuracy, the need for verification, and over-reliance. The integrated findings show students treating AI as a mediating resource that extended their design work while they kept responsibility for historical judgment. The study offers a disciplinary perspective on AI in history education and argues that teacher education should build verification, contextualization, and ethical AI literacy into its curricula.

Abstrak: Teknologi digital kini membentuk pendidikan sejarah, tetapi banyak pendidik memakai perangkat baru tanpa dasar pedagogis yang jelas. Kecerdasan artifisial (artificial intelligence, AI) mendapat perhatian luas dalam pendidikan, namun masih sedikit penelitian yang mengkaji perannya dalam pembelajaran sejarah dari sudut pandang disipliner. Penelitian ini mengkaji cara mahasiswa pendidikan sejarah mengintegrasikan AI ke dalam media pembelajaran sejarah dan pengalaman mereka menggunakannya. Kami menggunakan desain metode campuran sekuensial eksplanatori (explanatory sequential mixed-methods design). Pada fase kuantitatif, 120 mahasiswa pendidikan sejarah mengisi kuesioner. Pada fase kualitatif, kami menganalisis 12 artefak media pembelajaran sejarah berbasis AI karya mahasiswa dan mewawancarai sembilan mahasiswa yang dipilih secara purposive. Mahasiswa menilai AI bermanfaat sebagai alat bantu belajar, menilai kesiapan mereka cukup baik, dan setuju bahwa informasi sejarah dari AI memiliki keterbatasan. Mereka terutama memakai AI untuk mengembangkan gagasan, menyusun struktur konten, membuat visualisasi, dan menyiapkan presentasi, sambil melaporkan kehati-hatian terhadap akurasi historis, kebutuhan verifikasi, dan ketergantungan berlebihan. Integrasi temuan menunjukkan bahwa mahasiswa memperlakukan AI sebagai sumber daya mediasi yang memperluas kerja perancangan, sementara tanggung jawab atas penilaian historis tetap pada mereka. Penelitian ini menawarkan perspektif disipliner tentang AI dalam pendidikan sejarah dan menegaskan bahwa pendidikan calon guru perlu memasukkan verifikasi, kontekstualisasi, dan literasi AI yang etis ke dalam kurikulum.



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INTRODUCTION

Digital environments now shape history education. Information is abundant, fast-moving, and often fragmented. Students can reach more historical sources than before, yet history classrooms still struggle with engagement, critical interpretation, and understanding of the past. Many history lessons stay at the level of content coverage and rarely reach analysis or reflection. These problems grow when teachers introduce digital tools without a clear pedagogical rationale (Ertmer & Ottenbreit-Leftwich, 2010; Mishra & Koehler, 2006).

Artificial intelligence (AI) has entered educational settings in recent years, with new uses in content generation, feedback, and learning support. In higher education, students use AI-based tools to assist writing, summarize information, and generate explanations (Nguyen, 2023). In history education, AI raises a further question: how does it shape the way students learn? Its potential lies in what it produces and in how it mediates students' engagement with historical content, sources, and interpretations (Ioanid & Andrei, 2025; Wertsch, 1998).

Interest in AI in education has grown, but most research has examined technical functionality, system performance, or general learning outcomes. Few pedagogical studies address disciplinary contexts such as history education (Kim et al., 2022). Studies often examine AI as a tool in isolation and pay little attention to how teachers and students build it into learning media or use it in discipline-specific tasks. Researchers therefore still know little about how AI supports historical learning practices.

Previous studies also tend to rely on a single method, usually surveys or qualitative descriptions. Few mixed-methods studies combine students' perceptions with close analysis of learning artefacts and reflective accounts. This gap limits what we know about the breadth and depth of AI integration in history learning, especially in teacher education, where future teachers form their instructional practices (McKim, 2017).

Work on AI in education also shows where disciplinary attention remains thin. Some studies concentrate on system design, for example AI models that predict learners' styles to personalize instruction (Lokare & Jadhav, 2024). Others treat AI conceptually. Kahn and Winters (2021) trace the long relationship between constructionism and AI and position AI as something learners can build and think with. Studies in history education have started to appear. Luthfi Fahmi et al. (2025) examined the effect of AI-enhanced learning on students' history achievement and engagement, Kusmarni et

al. (2025) used AI within project-based learning of local history in Bandung, and Ioanid and Andrei (2025) documented the difficulties ChatGPT has in representing local Romanian historical and geographical knowledge. These studies focus on school-level learning outcomes or on the accuracy of AI output. We know less about how pre-service history teachers design learning media with AI and how they reason about the historical content it produces.

This study explores how history education undergraduates integrate AI into history learning media. Using an explanatory sequential mixed-methods design, we examine students' perceptions of AI use, the characteristics of the AI-based learning media they develop, and their experiences and reflections during the process. We treat AI as learning media, an element of instruction with pedagogical effects of its own. The study draws on a sociocultural perspective on mediated action, in which cultural tools shape what learners do without determining it (Wertsch, 1998). Through this lens, AI is a mediating artefact between students and historical information. Its educational value depends on whether students still carry out the interpretive work of the discipline: sourcing, contextualization, and the construction of evidence-based interpretations (Chapman, 2024; Seixas & Morton, 2013).

Literature Review

Artificial Intelligence in Education

Research on AI in education has grown quickly as AI-based tools have become accessible to teachers and students. Many studies frame AI as learning support that provides feedback, organizes information, or generates learning materials. In this view, AI is a practical aid that helps students complete learning activities faster or more independently (Chen et al., 2020).

Several scholars go further and conceptualize AI as a learning medium and cognitive tool. In this perspective, AI shapes how learners engage with information, make decisions, and construct understanding, in addition to delivering content or correcting errors. During learning activities, AI can influence how students interpret tasks, reflect on their work, and revise their thinking. Most of this literature, however, treats AI in general terms and seldom examines how its role changes across disciplines (Doroudi, 2023).

A related strand of work concerns AI literacy. Long and Magerko (2020) define AI literacy as a set of competencies that allow people to evaluate AI technologies critically, communicate and collabo-

rate with AI, and use it as a tool. Ng et al. (2021) organize the field into four aspects: knowing and understanding AI, using and applying AI, evaluating and creating with AI, and attending to AI ethics. Both frameworks stay general. They do not specify what critical evaluation involves when the output is a claim about the past.

Digital Media in History Education

Educators have long used digital media to make history learning more engaging and accessible. Digital archives, multimedia presentations, and interactive platforms let students encounter historical materials beyond the textbook. These tools have supported inquiry-oriented approaches in which students explore sources, timelines, and narratives in digital formats (Malysheva et al., 2022).

Digital media also bring persistent problems of historical representation. Digital formats can simplify complex events, blur the line between interpretation and fact, and encourage shallow engagement with sources. The value of digital media in history learning depends on how teachers design and integrate them as much as on the technology itself. The problem grows when AI enters history classrooms, where interpretation, context, and meaning are central (Wineburg & McGrew, 2019).

Research on historical thinking specifies what this interpretive work involves. Seixas and Morton (2013) describe historical thinking through interrelated concepts: historical significance, evidence, continuity and change, cause and consequence, historical perspectives, and the ethical dimension of history. Chapman (2024) argues that historical interpretation is the foundational concept of history education, because students must learn that people construct accounts of the past from evidence and that these accounts can be contested. In digital environments, Wineburg and McGrew (2019) found that professional fact-checkers evaluated online information more accurately than historians and university students because they read laterally, leaving a website to check what other sources said about it. AI-generated historical content calls for the same habits of sourcing, corroboration, and contextualization that history education already teaches.

Pre-Service Teachers and Technology Integration

Pre-service teachers will shape future classroom practice, including how teachers use technology in subject-specific teaching. History education undergraduates need to understand historical content and to develop pedagogical judgment in selecting and using learning media. Their experiences in

teacher education influence how they later integrate technology into their own classrooms (Xu & Stefaniak, 2024).

Research on technology integration highlights pedagogical readiness. Exposure to digital tools does not guarantee meaningful use. Pre-service teachers need opportunities to reflect on how a technology fits learning goals, disciplinary thinking, and classroom realities. With AI, this need grows, because students must work with both the possibilities and the limits of automated systems. Studying how pre-service history teachers engage with AI-based learning media can inform more grounded approaches to technology integration in history education (Firmanti et al., 2024).

Three bodies of research, on AI in education, on digital media and historical thinking, and on pre-service teacher preparation, suggest that AI acts as a pedagogical mediator as well as a technical tool. We therefore conceptualize AI-based learning media as situated artefacts that influence both the design and the reflection processes in history learning. Figure 1 presents the conceptual framework. In the framework, AI mediates two processes: designing learning media (idea generation, organization, visualization, and drafting) and reflecting on the historical content produced (verification, contextualization, critical evaluation, and ethical judgment). Students' perceptions of AI (RQ1) shape how they approach both processes. The design process corresponds to RQ2 and the reflection process to RQ3.

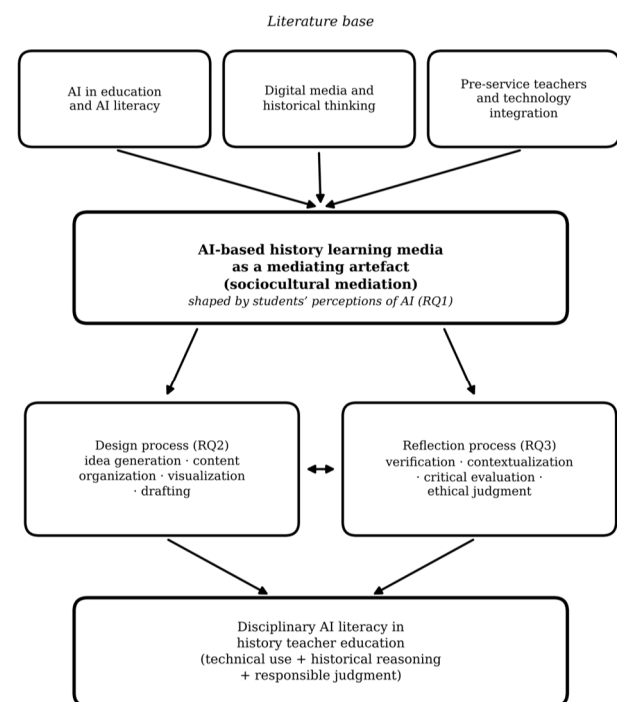


Figure 1. Conceptual framework of the study
Source: Authors' elaboration.

Research Gap

Research on AI in education and on digital media in history learning continues to expand, yet few studies treat AI as a learning medium in history education, and fewer still take the perspective of pre-service teachers. Existing research often relies on a single method and focuses on general perceptions or on technical features of AI tools. Mixed-methods studies that combine students' perceptions with close analysis of learning artefacts and reflective experiences are rare. Such studies can show how students integrate, interpret, and use AI in history learning, especially within teacher education programs. The research problems are formulated into the following questions: (1) What are pre-service history teachers' perceptions of using artificial intelligence in history learning media? (2) How is artificial intelligence integrated into history learning media created by pre-service teachers? (3) What pedagogical meanings and challenges emerge from pre-service teachers' experiences with AI-based history learning media?

METHODS

This study used an explanatory sequential mixed-methods design. We collected and analyzed quantitative data first and then conducted a qualitative phase to explain and elaborate the quantitative results (Creswell & Plano Clark, 2018). We chose this design because we first needed a descriptive profile of students' perceptions and readiness and then wanted to see how those perceptions played out in students' production of AI-based learning media. The study was descriptive and tested no hypotheses. The sequence let the qualitative phase elaborate and contextualize patterns from the quantitative phase, in line with the principle of integration in mixed-methods research (McKim, 2017; Skamagki et al., 2024).

The quantitative phase gave a general picture of students' readiness, perceptions, and perceived challenges regarding AI in history education. Building on these results, the qualitative phase examined student-produced learning media and students' reflective accounts from interviews. This sequence connected broad patterns with detailed accounts of the learning process (Creswell & Plano Clark, 2018).

We conducted the study in the History Education Program, Faculty of Teacher Training and Education (FKIP), Universitas Tadulako, Palu, Indonesia. The program has about 500 undergraduates. We recruited participants from courses in which students used artificial intelligence in history

learning activities and designed AI-based history learning media as part of their coursework.

In the quantitative phase, 120 history education undergraduates from these courses completed the questionnaire. This number was sufficient for a descriptive overview of students' perceptions of AI-based learning media. In the qualitative phase, we analyzed all 12 eligible student-produced history learning artefacts and interviewed nine students. The artefacts made up the complete set of eligible media available at the time of the study, so we did not sample them on the basis of the questionnaire results. We selected the nine interviewees purposively from students who had taken an active part in developing AI-based history learning media and could describe their experiences, decisions, and perceptions of AI-generated historical content in detail.

We informed all participants about the purpose of the research, and they gave consent before taking part. Participation was voluntary. We anonymized students' identities in all data and refer to interviewees by number (e.g., Student 3). The study posed no foreseeable risks to participants.

The questionnaire contained 20 five-point Likert-scale items in four dimensions: perceived usefulness of AI for history learning, readiness to use AI, perceived learning benefits, and perceived challenges of AI use. Each dimension had five items (Table 1). Experts reviewed the instrument, and we piloted it with 30 students before administration. Cronbach's alpha for the full instrument in the pilot was 0.87. The four dimensions measure different constructs, and agreement with the perceived-challenges items signals concern about AI, so we interpret each dimension separately and treat the pilot alpha as an indicator of overall consistency only. All items were positively worded, with no reverse-coded items.

The semi-structured interview guide covered students' experiences with AI-based history learning media, their decisions during design, their perceptions of AI-generated historical content, their strategies for verifying information, and their concerns about ethical use and dependence on AI. We aligned the questions with the research questions and with the results of the quantitative phase. For example, because most respondents agreed that AI-generated historical information may be inaccurate, the guide asked students how they checked AI output and which sources they used.

We analyzed questionnaire responses with descriptive statistics: item and dimension means, standard deviations, and the percentage of respond-

ents selecting “agree” or “strongly agree”. The quantitative phase provided an initial profile to guide the qualitative phase, so we tested no hypotheses and drew no inferential conclusions. We interpreted the perceived-challenges dimension separately from the other three, since a higher score on it indicates greater concern about AI.

The qualitative phase explored how students integrated AI into history learning media and how they experienced its use. Data came from student-produced history learning media developed with AI tools and from semi-structured interviews with selected participants.

We analyzed the artefacts to see how they represented historical content and how AI supported the design process. The interviews explored students’ reflections, decisions, and perceived challenges when using AI in history learning. We analyzed the interview data with reflexive thematic analysis (Braun & Clarke, 2006, 2021): familiarization with the transcripts, generation of initial codes, construction and review of candidate themes, and definition and naming of the final themes. In line with this approach, we treated our position as history education researchers as part of the interpretive process. The analysis focused on students’ experiences, decisions, perceptions of AI-generated historical content, verification practices, and concerns about ethical use and dependence on AI.

We examined the artefacts on five analytical dimensions (Table 3): (1) the role of AI in production, including idea generation, content organization, visualization, drafting, and language refinement; (2) historical representation, including accuracy, chronological coherence, contextual relevance, and the representation of historical events; (3) human intervention, including verification, revision, modification, and contextualization of AI-generated outputs; (4) pedagogical potential, including clarity of presentation and opportunities for interpretation and reflection; and (5) critical engagement, including the use of primary or scholarly sources, identification of inaccuracies, and evidence of independent judgment. We used these dimensions as transparent indicators for qualitative interpretation and did not assign quality scores. We identified human intervention from traces in the final artefacts, such as cited sources or corrected content, and from students’ interview accounts. Where an artefact showed no such trace, we report verification as self-reported.

We integrated the two strands through two strategies described by Fetter et al. (2013). The first was connecting: the quantitative results informed

the interview guide, so the qualitative phase could explain patterns in students’ perceptions. The second was merging at the interpretation stage: we brought the questionnaire, artefact, and interview findings together in a joint display (Table 5) to see where the strands converged, expanded on one another, or diverged (Skamagki et al., 2024). The quantitative results did not determine qualitative sampling, because we analyzed all eligible artefacts and selected interviewees for their involvement in media development.

RESULTS AND DISCUSSION

Quantitative Findings: Students’ Perceptions of AI Use in History Learning

A total of 120 history education undergraduates completed the 20-item questionnaire on their perceptions of AI in history learning. The questionnaire covered four dimensions: perceived usefulness of AI, readiness to use AI, perceived learning benefits, and perceived challenges. Students responded on a five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). For each item we calculated the mean (M), standard deviation (SD), and percentage of respondents selecting “agree” or “strongly agree”. Table 1 presents the item-level results.

Students held favorable views of AI use in history learning. The highest item mean concerned confidence in using AI tools for learning (Q6: $M = 4.06$, $SD = 0.83$), followed by AI helping to develop history learning media (Q3: $M = 4.05$, $SD = 0.82$) and to generate ideas for history learning activities (Q5: $M = 4.03$, $SD = 0.86$). Agreement rates for these items were 68.3%, 69.2%, and 65.0%.

In the perceived usefulness dimension, item means ranged from 3.93 to 4.05. Students rated AI most useful for developing history learning media ($M = 4.05$, $SD = 0.82$; 69.2%) and least useful for organizing historical information ($M = 3.93$, $SD = 0.80$; 64.2%). Students saw AI mainly as a practical resource for producing learning materials.

Readiness showed a similar pattern. Confidence in using AI for learning had the highest mean in this dimension ($M = 4.06$, $SD = 0.83$; 68.3%). The other four readiness items each had $M = 3.98$ ($SD = 0.83$) and 64.2% agreement. Students saw themselves as able to use AI, including evaluating, revising, and integrating AI-generated content into learning activities.

The five perceived-learning-benefit items each had $M = 3.98$ ($SD = 0.83$) and 64.2% agreement. Students saw AI as useful for visualizing historical information, organizing historical events, developing crea-

Table 1. Descriptive statistics of the 20-item questionnaire on AI use in history education (N = 120)

Dimension	No.	Questionnaire item	M	SD	Agree (%)
Perceived Usefulness	Q1	AI is useful for supporting history learning activities.	4.01	0.84	65.8
	Q2	AI helps me organize historical information.	3.93	0.80	64.2
	Q3	AI helps me develop history learning media.	4.05	0.82	69.2
	Q4	AI makes history learning more engaging.	3.97	0.80	66.7
	Q5	AI helps me generate ideas for history learning activities.	4.03	0.86	65.0
Readiness to Use AI	Q6	I feel confident using AI tools for learning purposes.	4.06	0.83	68.3
	Q7	I understand how to use AI responsibly in academic tasks.	3.98	0.83	64.2
	Q8	I can evaluate AI-generated information critically.	3.98	0.83	64.2
	Q9	I can revise AI-generated content independently.	3.98	0.83	64.2
	Q10	I can integrate AI into history learning activities appropriately.	3.98	0.83	64.2
Perceived Learning Benefits	Q11	AI helps me visualize historical information.	3.98	0.83	64.2
	Q12	AI helps me organize historical events chronologically.	3.98	0.83	64.2
	Q13	AI helps me develop creative learning materials.	3.98	0.83	64.2
	Q14	AI helps me communicate historical information.	3.98	0.83	64.2
	Q15	AI supports my independent learning.	3.98	0.83	64.2
Perceived Challenges	Q16	AI-generated content may not always be historically accurate.	3.98	0.83	64.2
	Q17	AI may provide incomplete historical information.	3.98	0.83	64.2
	Q18	There is a risk of becoming too dependent on AI.	3.98	0.83	64.2
	Q19	AI-generated content may reflect limited perspectives.	3.98	0.83	64.2
	Q20	AI use requires verification using credible historical sources.	3.98	0.83	64.2

Note. M = mean; SD = standard deviation; Agree (%) = percentage of respondents selecting agree or strongly agree (Likert responses 4 or 5)

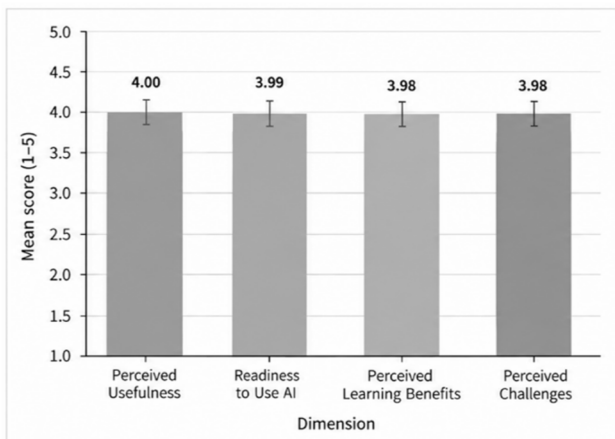


Figure 2. Mean scores across the four dimensions of students' perceptions of AI use in history learning (N = 120). Error bars represent 95% confidence intervals.

tive materials, communicating historical information, and supporting independent learning.

The five perceived-challenge items showed the same values: M = 3.98 (SD = 0.83) and 64.2% agreement for each item. Agreement with these items signals

concern. About two-thirds of respondents agreed that AI-generated historical information may be inaccurate, incomplete, or limited in perspective, that dependence on AI is a risk, and that users must verify AI output against credible sources (Ioanid & Andrei, 2025). Readers should interpret these responses alongside the favorable scores on the other three dimensions and should not average them together.

Students viewed AI's usefulness, their own readiness, and AI's learning benefits favorably, and they also agreed that AI-generated historical information has limits. The questionnaire relied on self-report and contained only positively worded items, so these results describe students' stated orientation and not their actual competence with AI.

Figure 2 shows the mean score for each dimension. Perceived usefulness had the highest mean (M = 4.00), followed by readiness to use AI (M = 3.99), perceived learning benefits (M = 3.98), and perceived challenges (M = 3.98). A higher score on perceived challenges indicates greater concern, so the similar values mean that students found AI

Table 2. Types of AI-based history learning media produced by students

Type of media	Number of artefacts	Role of AI
Digital posters and infographics	5	Generating visuals and summarizing content
Digital timelines	4	Structuring historical events and narratives
Presentation slides and videos	3	Assisting content organization and script drafting
Total	12	

Table 3. Analytical indicators for AI-based history learning artefacts

Analytical dimension	Indicators
Role of AI	Idea generation, content organization, visualization, drafting, language refinement
Historical representation	Accuracy, chronological coherence, contextual relevance, representation of historical events
Human intervention	Verification of AI outputs, revision, modification, contextualization
Pedagogical potential	Clarity of presentation, support for historical understanding, opportunities for interpretation and reflection
Critical engagement	Use of primary or scholarly sources, identification of inaccuracies, evidence of independent judgment

useful and also agreed that its use calls for care and responsibility.

Artefact Analysis: AI-Based History Learning Media

To examine how students used AI in practice, we analyzed 12 student-produced history learning artefacts. These were all the eligible media available for analysis. Students produced them for course assignments that asked them to design digital history learning media with AI tools (Table 2).

We identified three forms of AI-based learning media. Digital posters and infographics formed the largest category ($n = 5$), followed by digital timelines ($n = 4$) and presentation slides or videos ($n = 3$). Students used AI across these formats for visual generation, content summarization, chronological organization, content structuring, and preliminary script development.

In the artefacts, AI served as a production aid, and students made the final decisions. Students used AI to generate initial ideas, organize information, develop visual materials, or prepare preliminary content, and then revised and contextualized the outputs (Table 3).

Our analysis looked at whether AI appeared in the final products and at how students worked with AI-generated outputs, with attention to revision, verification, contextualization, and human decision-making.

On historical representation, the artefacts drew on AI for visual elements, summaries, and chronological structures, while students selected the historical content and placed it in context. On critical engagement, the two projects described above show how this worked: the student who drafted the independence chronology with ChatGPT checked it against primary and scholarly sources, and the students who generated a poster image refined the accompanying text before the poster was factually consistent. In both cases the historical quality of the final artefact depended on the students' checking and revision of the AI output.

In one project, a student used ChatGPT to draft a chronological list of events related to Indonesian independence; according to the student's account, they then checked the list against primary and scholarly sources. In another project, students used an AI image-generation tool to develop visual material for a historical poster and then refined the text to improve factual consistency. In both cases, students evaluated the AI output before using it in the final product.

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Figure 3 shows the distribution of the 12 artefacts. Posters and infographics were the most frequent format, followed by timelines and presenta-

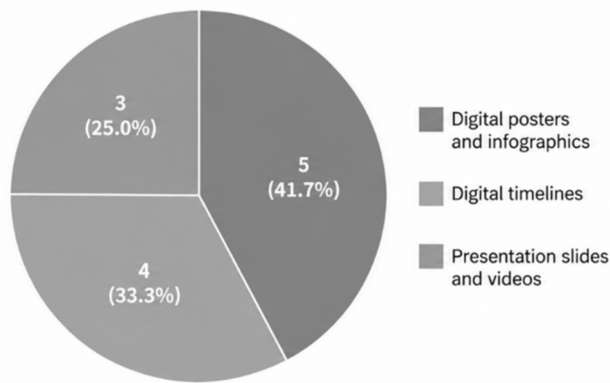


Figure 3. Distribution of AI-based history learning media produced by students (N = 12)

tion slides or videos. Students used AI for both visual production and content organization.

Interview Findings: Students' Experiences with AI-Based Learning Media

We interviewed nine purposively selected students who had taken an active part in developing AI-based history learning media. Thematic analysis produced four interconnected themes: (1) AI as a source of initial ideas and structure, (2) support for visualization and presentation of historical content, (3) concerns about historical accuracy, and (4) awareness of ethical use and dependence on AI (Table 4).

Theme 1: AI as a source of initial ideas and structure

Students found AI useful in the early stages of developing history learning media. AI helped them organize information, generate ideas, and set up an initial structure for their materials. One participant

said AI provided an “initial structure” when they did not know where to begin. Students used AI as a starting point for planning and did not treat it as a final source of content.

Theme 2: Support for visualization and presentation

Students also stressed AI's contribution to visual and multimedia production. They described posters, slides, timelines, summaries, and other visual materials as easier to develop with AI. AI helped students turn historical information into visual and presentation formats (Ringvold et al., 2024).

Theme 3: Concerns about historical accuracy

Students also raised concerns about the reliability of AI-generated historical information. Participants reported that some outputs looked convincing but still needed checking. Student 9 described having to check whether plausible-looking information was historically correct. Students reported using textbooks and scholarly sources to verify questionable information. They did not treat AI-generated information as authoritative and saw a need for human judgment and source verification in historical content.

Theme 4: Awareness of ethical use and dependence on AI

Students also reflected that heavy reliance on AI could weaken critical thinking and personal engagement. Student 1 stated that AI should support learning and not replace it. Students understood responsible AI use as keeping an active role in learning instead of handing intellectual work over to AI. Across the four themes, students recognized

Table 4. Summary of qualitative themes from student interviews

Theme	Main finding	Illustrative evidence
AI as a source of initial ideas and structure	AI supported brainstorming, organization, sequencing, and initial planning.	“AI helped me organize historical information when I didn't know where to begin. It gave me an initial structure.” (Student 3)
Support for visualization and presentation	AI facilitated the production of posters, slides, timelines, summaries, and visual materials.	“It was easier to make visual materials like posters or slides because AI helped generate images and summaries.” (Student 6)
Concerns about historical accuracy	Students questioned AI reliability and reported checking information against credible sources.	“Sometimes the information looked convincing, but I wasn't sure if it was historically correct, so I had to check again.” (Student 9)
Ethical use and dependence on AI	Students recognized that excessive reliance could reduce critical thinking and independent learning.	“If we use AI too much, we might stop thinking critically. I think it should only support, not replace our learning.” (Student 1)

Table 5. Integration of quantitative and qualitative findings

Quantitative finding	Artefact/interview evidence	Integrated interpretation
AI was perceived as useful for history learning and media development.	AI was used in posters, infographics, timelines, slides, and videos.	Students perceived AI as a practical resource for creative and multimodal media production.
Students reported relatively favorable readiness to use AI.	Students used AI for idea generation and organization while retaining responsibility for revision.	Students viewed themselves as capable AI users but maintained an active role in content development.
Students recognized potential limitations of AI-generated historical information.	Students reported checking AI outputs against textbooks and scholarly sources.	Historical verification was an important condition of responsible AI use.
Students recognized the possibility of AI dependence.	Students emphasized that AI should support rather than replace human thinking.	Students positioned AI as a supportive resource rather than a substitute for independent reasoning.

AI's creative and organizational value and also raised concerns about accuracy, dependence, and responsible use. This pattern helps explain the quantitative finding that students viewed AI favorably while agreeing that it has limitations.

Integration of Quantitative and Qualitative Findings

Integrating the questionnaire, artefact, and interview findings showed a consistent pattern of positive but critical engagement with AI (Table 5).

The quantitative and qualitative strands converged: students used AI mainly as a resource for developing learning media. The questionnaire showed favorable perceptions of usefulness, readiness, and benefits, and the artefacts showed concrete uses of AI for visual production, organization, and presentation.

The interviews explained how students managed this assistance. Students did not describe AI as an independent source of historical knowledge. They described generating, checking, revising, and contextualizing AI-supported outputs.

The strands converged most clearly on historical accuracy. Questionnaire respondents agreed that AI-generated information has limitations, and interviewees described verifying information against textbooks and scholarly sources. These verification practices are self-reported; the artefacts alone did not show them in every case.

The quantitative findings on dependence matched students' statements that AI should support their thinking and not replace it. Students' engagement with AI involved a negotiation between convenience and intellectual responsibility (M. Wang & Guo, 2025).

The integrated findings position AI as a mediating learning resource that leaves reasoning with

the student. Its educational contribution depended on students selecting, evaluating, revising, and contextualizing AI-generated outputs.

Discussion

History education undergraduates viewed AI favorably on usefulness, readiness, and learning benefits, and they agreed with the perceived challenges. The highest item means concerned confidence in using AI for learning ($M = 4.06$) and using AI to develop history learning media ($M = 4.05$). Students valued AI for designing and producing learning materials as well as for finding information.

The artefacts help explain this pattern. Students used AI in posters, infographics, timelines, slides, and videos, mostly to generate visual ideas, organize information, summarize content, and draft early versions. These practices fit the view that educational technologies act as mediating resources through which learners reorganize and transform information (Wertsch, 1998).

This interpretation agrees with studies that position AI as a collaborator in learning and design. AI can support learners while leaving decisions about interpretation and final production with them (Kim et al., 2022). Our findings extend this perspective to history education, where students built AI into discipline-specific media production.

The educational value of AI cannot be read from the quality or attractiveness of its outputs. The artefacts suggest that learning happened when students worked with, revised, and contextualized those outputs. AI-assisted production becomes a learning activity when students decide what information is appropriate and how to represent it (Kahn & Winters, 2021).

The quantitative results were favorable, yet students agreed with the perceived-challenge items as much as with the usefulness, readiness, and ben-

efit items. They found AI useful and also saw that using it well requires competence and judgment.

Instead, students appeared to hold a dual orientation: AI was useful, but its use required competence and judgment. This dual view matters for teacher education. Pre-service teachers need more than technical familiarity with AI tools. They need to evaluate generated information, revise outputs, recognize limitations, and decide when AI assistance is pedagogically appropriate. This view aligns with conceptualizations of AI literacy that combine technical use with critical evaluation and ethical awareness (Long & Magerko, 2020; Ng et al., 2021).

The interviews support this interpretation. Students described using AI as an initial resource and keeping responsibility for the final product. AI literacy in history education thus combines technical use, critical evaluation, disciplinary judgment, and responsible decision-making (Long & Magerko, 2020; Ng et al., 2021).

Students valued AI and recognized its limits as a source of historical information. Each challenge item had a mean of 3.98, and interviewees described checking AI-generated information against textbooks and scholarly sources. This matters in history education because historical knowledge requires more than fluent presentation. Historical interpretation depends on evidence, context, chronology, provenance, and competing perspectives. An AI-generated response that reads coherently may still need substantial evaluation before a student uses it in a learning resource.

The concern is sharper for difficult histories: emotionally charged, controversial, or traumatic pasts such as slavery, the Holocaust, colonial violence, or internal armed conflict. In a systematic review of 23 studies, Ahmad et al. (2024) found that teaching such topics relies on affective, experiential, and inquiry-based approaches and contributes to students' empathy, critical thinking, and historical consciousness, including their ability to connect past events to present-day issues. A fluent AI-generated summary of a violent or contested event can flatten these dimensions into a seemingly neutral narrative that omits victims' perspectives, competing interpretations, and the moral questions the event raises. Pre-service teachers who design AI-based media on such topics need to check whether the information is accurate and also whose experiences and interpretations it includes or leaves out.

Students' reported verification practices are a form of disciplinary AI literacy. Beyond asking whether AI can generate content, students need to ask whether the content is historically defensible,

what evidence supports it, and which interpretations it leaves out. This finding fits research on historical thinking and on evaluating digital information, which stresses sourcing, corroboration, and contextualization (Ofianto et al., 2024; Seixas & Morton, 2013; Wineburg & McGrew, 2019). It supports treating AI as an object of critical inquiry in history education, open to the same questioning as any other source.

The fourth theme concerns AI use and learner agency. Students recognized that heavy reliance on AI could weaken critical thinking and independent engagement. Their view that AI should "support, not replace" learning captures the central tension in the study.

This finding moves the discussion from technology adoption to learner agency. AI reduces the effort needed to generate ideas, summarize information, or produce visual materials, but less effort does not guarantee better learning. If AI removes the need for students to make interpretive decisions, evaluate evidence, or revise ideas, efficiency may come at the cost of disciplinary learning.

The findings support a human-AI collaboration model in which AI assists selected parts of learning and students stay responsible for reasoning and decision-making. Research on student-AI collaboration and learner-centered AI integration takes a similar position (Kim et al., 2022).

This distinction matters for teacher education. Future history teachers will use AI themselves and may decide how younger learners encounter AI in class. They need experience with AI tasks that require critique, verification, revision, and reflection, beyond simple generation.

Students used AI across several media formats. Posters and infographics formed the largest group, followed by timelines and presentation slides or videos. AI integration in history learning therefore extends beyond text generation.

Turning historical information into timelines, visual summaries, posters, and presentations requires students to decide what to select, emphasize, order, and represent. Media production can create opportunities for historical interpretation when students stay involved in these decisions (Smith, 2025).

This agrees with research showing that digital formats can support inquiry-oriented history learning when teachers design them with a clear pedagogical purpose (Malysheva et al., 2022). Our results locate the pedagogical value in the process of selecting, organizing, verifying, and contextualizing

historical information, more than in the visual appeal of the product.

Teachers should design AI-based history learning tasks that ask students to explain why they selected particular historical information and how they evaluated AI-generated material. Such tasks build AI into disciplinary learning.

Theoretical Contribution: AI as a Mediating Resource In Disciplinary Learning

The integrated findings support a view of AI as a mediating resource in disciplinary learning. Students used AI between their first encounter with historical information and the production of a final artefact. AI influenced how students generated ideas, organized content, visualized information, and prepared presentations, while students kept responsibility for interpretation and validation. This finding situates AI within the epistemology of history education. In a discipline built on evidence, interpretation, chronology, and perspective, AI cannot count as a neutral content generator.

The study's theoretical contribution is a form of human–AI disciplinary mediation. AI can extend students' productive and creative capacities, and meaningful learning depends on the learner's continuing role as evaluator, interpreter, and decision-maker. This interpretation builds on the sociocultural notion of mediated action, in which cultural tools transform what learners can do while learners remain responsible for how they use the tools (Wertsch, 1998).

AI integration in teacher education should go beyond demonstrations of how to operate individual tools. Students need structured opportunities to use AI while practicing verification, historical interpretation, ethical judgment, and reflection. Figure 4 proposes such a sequence: AI generation, source verification, critical evaluation, revision, contextualization, and reflection.

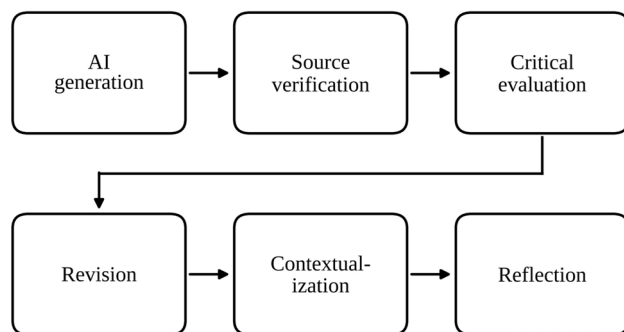


Figure 4. Proposed instructional sequence for AI integration in history teacher education (Source: Authors' elaboration based on the findings of this study)

The sequence keeps the productive benefits of AI and leaves students responsible for the intellectual quality of the final learning resource.

Future history teachers will need to help school students distinguish generated information from historically credible evidence. Teacher preparation should treat AI literacy as part of disciplinary literacy, alongside technical skill.

The study contributes to the literature in three ways. First, it offers a mixed-methods account of AI use in history education, combining questionnaire data from 120 students with analysis of 12 learning artefacts and interviews with nine students.

Second, it goes beyond general attitudes toward AI by examining how students used AI in learning-media production. The artefacts show AI used for visualization, organization, summarization, and initial drafting, with students responsible for revision and contextualization.

Third, it identifies a pattern of positive but critical AI engagement. Students valued AI's productive potential and raised concerns about historical accuracy, dependence, and responsible use. AI literacy in history education thus involves technical competence, critical evaluation, disciplinary reasoning, and ethical judgment.

This study has several limitations. First, the questionnaire relied on self-report and contained only positively worded items, so acquiescence and social desirability may have affected the results. Students who used AI in coursework and were then interviewed within their own study program may have presented themselves as more careful AI users than they were.

Second, evidence of verification came mainly from interviews and from traces in the final artefacts. The study did not draw on drafts, prompt histories, or process logs that would show verification as it happened, so we could not establish how far students checked AI-generated content against credible sources.

Third, the quantitative analysis was descriptive, and the data came from one history education program at one Indonesian university. The findings do not generalize to other institutions and cannot show relationships between readiness, perceived usefulness, and perceived challenges. Future studies could combine process data from AI-assisted design tasks with independent assessment of the historical accuracy of student artefacts, and could use confirmatory designs with validated scales to test these relationships.

CONCLUSION

This study examined how history education undergraduates integrated artificial intelligence into history learning media, using an explanatory sequential mixed-methods design. Students viewed AI positively and used it as a supporting tool in designing learning media, mainly for idea generation, content structuring, and visualization. They also reported awareness of AI's limitations and risks, especially for historical accuracy and over-reliance. Theoretically, the study describes AI in history education as a mediating tool whose value depends on the learner's interpretive work. Methodologically, it shows the value of combining questionnaire data with analysis of learning artefacts and student interviews. The findings come from one context and offer a starting point for further research on AI-based learning media in history education and teacher preparation. Higher education institutions should build AI literacy and ethical reasoning into teacher education curricula so that future teachers can use technology critically, responsibly, and in ways that suit their discipline.

DECLARATIONS

Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

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Data Availability

The anonymized questionnaire data and interview excerpts that support the findings of this study are available from the corresponding author upon reasonable request.

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