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A Qualitative Study on the Impact of Artificial Intelligence on Middle School Students' Interdisciplinary Learning Processes in History Education

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Abstract
The advancement of artificial intelligence (AI) has created new opportunities for interdisciplinary learning. However, extant research has predominantly concentrated on STEM disciplines, with limited empirical evidence focusing on history education, especially at the middle school level. Situated in middle school history classrooms, this qualitative study investigated how AI tools shape eighth-grade students' interdisciplinary learning processes. Participants included 20 eighth-grade students and one teacher from a public middle school in Beijing. Data were collected from multiple sources: semi-structured interviews, classroom observations, and student artifact analysis. The findings demonstrated that AI holds substantial potential for breaking down disciplinary barriers, expanding access to learning resources, and boosting learning motivation, thus supporting broader knowledge integration and more active resource use during the intervention. In particular, students with moderate academic performance exhibited more active interdisciplinary inquiry behaviors and greater perceived gains in knowledge integration and problem-solving when using AI tools. Nevertheless, the results also revealed key limitations: AI did not automatically support deep knowledge integration, it proved unable to replace teachers' value guidance, and it was associated with passive reliance on AI outputs among certain students. Students at different academic levels exhibited markedly varied AI usage behaviors. The study further indicated that teachers' structured task design and critical guidance were essential for AI to yield its positive effects. This study provides empirical evidence for the integration of AI into history education and proposes that a new pedagogical ecosystem of human-AI collaboration should be established in the future, one that upholds the essential nurturing purpose of education while judiciously harnessing the empowering potential of technology.

Keywords: Artificial Intelligence (AI); Interdisciplinary Learning; Learning Processes; Middle School History Education; Human-AI Collaboration
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1. Introduction

In the 21st century, defined by the growing convergence and integration of knowledge, interdisciplinary learning has emerged as a central theme in education (Liao et al., 2025). As a pedagogical approach that integrates multidisciplinary perspectives, strategies, and methodologies to explore complex topics (Self et al., 2018), interdisciplinary learning fosters students' critical thinking, integrative competence, and systems thinking when solving complex problems (Boix-Mansilla, 2010; Kaynar & Kurnaz, 2024). However, its implementation faces multiple barriers: students' cognitive difficulties in knowledge integration, teachers' disciplinary preferences in instructional design, and schools' over-reliance on single-discipline curriculum structures (Akkerman & Bakker, 2011; Schwarz et al., 2024; Reimann, 2024).

The rapid development of AI offers new possibilities for addressing the aforementioned challenges. AI can not only possess an interdisciplinary knowledge base but also track learning processes and provide personalized support, thereby playing a unique role in interdisciplinary learning (Iku-Silan et al., 2023). Existing research has shown that AI can serve as a learning assistant, an assessment tool, an interaction mediator, and even a teacher support system, significantly enhancing students' learning performance and interdisciplinary competence in STEM education (Ouyang et al., 2023).

However, current research on the application of AI in interdisciplinary learning remains heavily concentrated in STEM fields, with notably insufficient attention to non-STEM disciplines (Cai et al., 2025; Xu & Ouyang, 2022). STEM refers to the integration of science, technology, engineering, and mathematics, whereas non-STEM areas encompass a range of disciplines such as social sciences, language studies, communication and cultural studies, and history and archaeology. As a discipline, history possesses an inherent interdisciplinary nature, involving fields such as politics, economics, culture, geography, and art, making it an ideal context for exploring students' interdisciplinary learning processes. Yet, the application of AI in history teaching, particularly how it shapes middle school students' interdisciplinary learning processes, still lacks in-depth empirical investigation.

To this end, this study adopted a qualitative research approach to conduct an in-depth investigation in middle school history classrooms and document the impact of AI applications in history education on middle school students' interdisciplinary learning processes. Focusing on students' knowledge integration processes, problem-solving strategies, changes in learning motivation, and teachers' instructional reflections, the study aimed to reveal how AI shapes interdisciplinary learning processes within history education. It sought to deepen the understanding of the relationship between AI and history education, unpack how AI shapes students' interdisciplinary knowledge integration and inquiry processes, provide references for history teachers in designing effective AI-integrated instructional activities, and promote the high-quality development of history education in the AI era.

2. Literature Review

2.1 Interdisciplinary learning

Some scholars contend that interdisciplinary learning is not a novel concept, with its conceptual roots dating back to antiquity (Klein, 1990, 2006). However, it was not until the late 19th and early 20th centuries—when university research and education grew increasingly specialized and discipline-oriented—that disciplinary boundaries were gradually delineated, and interdisciplinary thought alongside associated pedagogical practices began to garner explicit scholarly attention (Markauskaite et al., 2024). Scholars have conceptualized interdisciplinary learning from varying perspectives. Self et al. (2018) defined it as a teaching and learning paradigm that integrates knowledge, competencies, and methods across disciplines to explore complex issues or address real-world problems. Novis-Deutsch et al. (2024) framed it as an integrative learning activity that meaningfully connects learners to the broader human condition, culture, history, ideas, and artifacts, while drawing on multiple fields of inquiry and knowledge within the humanities. Building on these conceptualizations, this study operationalizes interdisciplinary learning in history education as an integrative learning practice where students, centered on a specific research topic, integrate knowledge, competencies, and methodological approaches from history and other disciplines (e.g., geography, politics, literature, art, and science) to conduct in-depth inquiry and problem-solving.

In terms of disciplinary combination patterns, interdisciplinary learning is generally classified into three types: STEM, non-STEM, and trans-STEM, the latter referring to the integration of at least one STEM and one non-STEM discipline (Uddin et al., 2020). As a discipline with inherent interdisciplinary attributes, history spans a wide range of research domains, including politics, economics, culture, geography, and science and technology, among others. It can be deeply integrated not only with non-STEM disciplines such as language studies and philosophy but also with STEM-related content such as science, making it a typical dual learning context with both non-STEM and cross-STEM characteristics. In history learning, interdisciplinary integration enables students not only to understand what happened but also to explain why it happened by incorporating factors such as geographical environment, economic structure, and cultural traditions, thereby developing deep causal reasoning and critical analytical competencies.

2.2 Application of AI in Interdisciplinary Learning

AI applications in education manifest in diverse forms, including intelligent tutoring systems, educational robots, learning analytics models, and virtual reality-enabled learning environments, among others (Wang et al., 2024). Leveraging its unique technological strengths, AI holds great potential to mitigate the aforementioned multifaceted challenges in interdisciplinary learning, with preliminary empirical evidence lending support to this proposition. For instance, Lee et al. (2023) found that image-generating AI models effectively foster creativity and learning motivation in STEAM curricula; Yang et al. (2026) further verified that knowledge-base-integrated AI chatbots with scaffolding designs significantly boost primary students' interdisciplinary comprehension in ancient poetry learning; and Hu (2025), from the lens of humanities-technology integration, argued that embedding Taoist art principles into AI technology can construct an interdisciplinary learning environment featuring both humanistic depth and technological interactivity, paving new avenues for the deep integration of art, philosophy, and technology.

Although the studies above demonstrate the potential of AI in interdisciplinary learning, their disciplinary coverage remains concentrated in STEM fields. History, as a typical non-STEM discipline, has not yet received sufficient attention regarding the unique value of its interdisciplinary learning and the potential of AI applications. History learning inherently requires students to integrate multidisciplinary perspectives from geography, politics, economics, culture, and science and technology to develop a deep understanding of historical events. Through technologies such as knowledge graphs, natural language processing, and intelligent recommendation, AI can automatically link historical events with relevant contextual information, helping students construct interdisciplinary explanatory frameworks during the inquiry process. However, empirical research on AI in promoting interdisciplinary learning in history education remains notably scarce, with the vast majority of studies still focused on STEM fields (Li et al., 2020; Novis-Deutsch et al., 2024; Takeuchi et al., 2020). As a result, the practice of AI-enabled interdisciplinary learning in history education lacks sufficient theoretical guidance and empirical support.

Furthermore, extant research also displays imbalances in participant groups and methodological approaches. In terms of educational stage, the majority of studies have focused on higher education, with relatively limited empirical research targeting the middle school level (Kidron & Kali, 2015; Spelt et al., 2009). This bias may partly arise from the fact that higher education gives curriculum designers greater autonomy to develop interdisciplinary courses (Zhu & Burrow, 2022), whereas middle school education is constrained by standardized curricula and examination systems, leaving relatively little room for implementing interdisciplinary learning. However, middle school students are at a critical period of cognitive development and disciplinary thinking formation, and their developmental pathways of interdisciplinary learning competencies differ significantly from those of university students, making external structural support even more essential. Therefore, a qualitative study that deeply investigates how AI shapes middle school students' interdisciplinary learning processes in history education is of both theoretical value and practical urgency.

Drawing on the aforementioned research gaps, this study focuses on middle school students' interdisciplinary learning in the context of history education, adopts a qualitative research approach, and addresses the following research questions:

RQ1. How does the application of AI tools shape middle school students' interdisciplinary learning processes during history inquiry activities?

RQ2. What interdisciplinary learning behaviors and cognitive strategies do middle school students exhibit when using AI to conduct history-themed inquiry?

RQ3. How do students and teachers perceive the role of AI in interdisciplinary history learning?

RQ4. What advantages does AI offer in supporting interdisciplinary integration, and what limitations does it present?

By answering these questions, this study seeks to address the gaps concerning AI in non-STEM disciplines, at the middle education level, and from a qualitative research perspective, thereby providing empirical evidence and practical implications for the application of AI in history teaching and interdisciplinary learning.

3. Method

3.1 Research Design

This study adopted a qualitative research paradigm, focusing on the impact of AI applications in history education on middle school students' interdisciplinary learning processes. It sought to delve deeply into the changing processes and underlying mechanisms of students' interdisciplinary knowledge integration, application of multidisciplinary perspectives, and explanatory framework construction during AI-assisted history-themed inquiry activities. A purposive sampling strategy was employed to select 20 eighth-grade students and one history teacher from a regular middle school in Beijing as key participants for interviews and classroom observations. Eighth-grade students were chosen because this grade represents a critical transitional period for cognitive development and disciplinary thinking formation within the middle school phase, and students at this level already possess a certain foundation of historical knowledge and multidisciplinary learning experience. Data were collected primarily through semi-structured interviews, supplemented by classroom observation records, student learning journals, student artifacts, teacher instructional journals, and researcher reflective journals, together forming a rich qualitative dataset. Thematic analysis was subsequently applied to code and analyze the data, so as to elicit students' authentic perceptions and cognitive shifts in interdisciplinary integration during AI-supported history learning.

This study strictly adhered to ethical research principles. Prior to the research, official approval was obtained from the school administration. The research purpose, procedures, data usage, and potential risks were fully explained to the participating teacher, the 20 students, and their parents/guardians. Written informed consent was obtained from all students and their legal guardians. All participants' personal information was anonymized, with students coded as S01-S20 and the teacher coded as T. All research data were stored in encrypted form and used solely for this study. Participants were explicitly informed that their participation was entirely voluntary, had no bearing on their academic performance, and that they could withdraw unconditionally at any time without incurring any adverse consequences. All participant information was kept strictly confidential; original interview recordings and identifiable raw transcript materials were securely and permanently destroyed after data transcription and anonymization were completed, to protect participants' privacy and uphold the ethical integrity of the research.

3.2 Participant Sample Characteristics

This study systematically compiled the demographic characteristics of the 20 students and one teacher. Student characteristics covered dimensions such as gender, history academic performance level, interdisciplinary learning experience, and frequency of AI use. Teacher characteristics focused on professional background, teaching experience, and interdisciplinary teaching experience. The specific characteristics are as follows:

Table 1. Demographic and Background Characteristics of Student Participants(n=20)

Characteristic Categories	Subcategories	Number of Participants (n)	Percentage (%)
Gender	Male	10	50.0
	Female	10	50.0
Level of Interest in the Subject of History	High Interest	6	30.0
	Medium Interest	10	50.0
	Low Interest	4	20.0
Interdisciplinary learning experience	relatively rich experience (≥3 interdisciplinary projects)	8	40.0
	some experience (1-2 interdisciplinary projects)	9	45.0
	limited or no experience	3	15.0
Academic Performance of history	High (≥85 points)	7	35.0
	Medium (70-84 points)	8	40.0
	Low (<70 points)	5	25.0
Prior AI Usage Frequency	High (>3 times/week)	7	35.0
	Medium (1-3 times/week)	10	50.0
	Low (Less than once/week or never)	3	15.0

Note. In this study, academic performance in history was operationalized as the mean of the standardized scores from the first unit test, the midterm exam, and the final exam in the first semester of Grade 8. Interdisciplinary learning experience was categorized into three levels by participation frequency (zero times, one to two times, and three or more times), based on the number of times students had participated in the school's comprehensive practice courses and interdisciplinary thematic activities in the previous academic year.

Table 2. Background Characteristics of the Teacher Participant (n=1)

Characteristic Categories	Subcategories
Gender	Male
Educational Background	History Major
Teaching Experience	More than 5 years of middle school history teaching experience
Familiarity with AI Tools	Having some experience with AI tools in teaching
Interdisciplinary teaching experience	Independently designed and implemented more than three interdisciplinary thematic inquiry activities, and skilled at integrating multidisciplinary content such as geography, art, and science into history teaching

The 20 student interviewees selected for this study had a relatively balanced gender distribution, which helped reduce potential gender-related biases in the description of interactions to a certain extent. Their history academic performance, subject interest, AI use frequency, and interdisciplinary learning experience spanned high, medium, and low levels. During the sampling process, the study prioritized diversity across these dimensions to incorporate a wide range of individual experiences. This ensured that subsequent qualitative analysis could fully capture the diverse responses and thinking processes of students from different backgrounds when engaging in AI-assisted interdisciplinary history inquiry.

It is particularly noteworthy that students' prior interdisciplinary learning experience may vary considerably. Some students had participated in interdisciplinary projects in comprehensive practice courses and possessed a certain awareness of multidisciplinary integration, whereas others were accustomed to single-discipline learning and rarely drew on knowledge from other disciplines spontaneously. This variation is likely to influence their initial starting points, learning strategies, and learning outcomes in AI-assisted interdisciplinary knowledge integration, thus justifying its explicit reporting in the sample characteristics.Additionally, the study included the class history teacher as an interviewee. The teacher was male, had a professional background in history, and possessed extensive frontline teaching experience in middle school history, along with a working familiarity with AI tools in educational practice. Crucially, the teacher demonstrated solid interdisciplinary teaching competence, skillfully integrating multidisciplinary content such as geography, art, and science into history lessons, and had independently designed and implemented interdisciplinary thematic inquiry activities. This background enabled him to provide effective scaffolding for interdisciplinary integration for the students during the study.

3.3 Research Tools

This study employed a range of qualitative research instruments to support data collection and analysis.

The primary technological tools were two widely adopted Chinese AI-assisted learning platforms: DeepSeek and DouBao. Both are large language model (LLM)-based conversational systems with a chat-style interface, where users interact by typing questions and receiving generated responses in a multi-turn, natural-language dialogue. This format allows students to pose an initial historical query, then progressively refine or broaden their questions.

These two tools were selected for three reasons directly tied to the study's history-themed interdisciplinary inquiry. This iterative questioning process mirrors exactly the kind of interdisciplinary inquiry the study aimed to facilitate. First, they exhibit strong Chinese-language comprehension and context-synthesis capabilities across history, politics, geography, and literature, which is well-suited to a project centred on the history of the People's Republic of China. Second, unlike static databases or search engines, they generate dynamic, context-aware responses that can draw connections across disciplinary boundaries in real time, thereby scaffolding students' attempts to build multi-causal historical explanations. Third, both tools were freely accessible and already familiar to a portion of the students, reducing the technical learning curve and allowing the research to focus on the pedagogical rather than the technical dimension of AI integration.

In addition to AI tools, the study employed a semi-structured interview guide, a classroom observation record form, student reflective journals, a standardized evaluation framework for student artifacts, as well as teacher instructional journals and researcher reflective journals. All students used the same version of the AI tools and engaged in learning under identical classroom settings and task requirements. Students interacted with the AI system through a conversational interface to obtain disciplinary materials related to specific history topics, such as those from language, art, and physics domains. The interview guide underwent two rounds of expert review and pilot testing, and was revised based on feedback to ensure content validity. Together, these instruments supported a systematic data collection and analysis process, ensuring methodological rigor and reliability.

Table 3. Semi-structured Interview Outline

Research Questions	Core questions for student interviews	Core questions for teacher interviews
RQ1. How does the application of AI tools shape middle school students' interdisciplinary learning processes during history inquiry activities?	1. Can you talk about how it felt to use AI for this history project? What parts did you find useful, and what parts didn't work well for you? 2. Compared with not using AI, what differences do you experience when integrating knowledge from different disciplines? Could you provide an example?	1. From your classroom observations, what visible changes have you noticed in students' ability to integrate knowledge across disciplines when using AI? 2. Compared with your earlier teaching without AI, have you observed any improvement in the depth and breadth of students' historical explanations? Could you describe the specific aspects?
RQ2. What interdisciplinary learning behaviors and cognitive strategies do middle school students exhibit when using AI to conduct history-themed inquiry?	3. When you have to analyze the different causes behind a historical event, how do you use AI to help you with that? 4. What would you do if the information you get from AI doesn't match what you learned from the textbook? How would you determine which one is more trustworthy? 5. When you use AI, do you take the initiative to ask for information from a particular discipline, or do you tend to wait for the AI to automatically send you something relevant?	3. While students were engaged in classroom inquiry, how did you see them using AI to find and bring together knowledge from various subjects? What common patterns or strategies did you notice in their approach? 4. When students find contradictory information from different disciplines in what AI provides, how do they usually deal with it? 5. Have you noticed any clear individual differences in how students draw on and combine knowledge from different subjects?
RQ3. How do students and teachers perceive the role of AI in interdisciplinary history learning?	6. What benefits do you see in using AI for your interdisciplinary learning? And were there any things that you felt dissatisfied with or found inconvenient? 7. If you had to do a history inquiry task independently, do you think using AI would make it harder or easier for you? 8. Do you trust the interdisciplinary information that AI gives you? Why?	6. Overall, what do you see as the value of using AI to facilitate interdisciplinary teaching in history? 7. How do you think students understand the role of AI in their history learning? Are there cases where they rely on it too much or are overly skeptical?
RQ4. What advantages does AI offer in supporting interdisciplinary integration, and what limitations does it present?	9. In your opinion, what are the good points about AI when you combine knowledge from different subjects? 10. In terms of interdisciplinary integration, what shortcomings do you think AI has, and what could be improved? 11. What suggestions do you have for designing better AI tools to support interdisciplinary learning in history?	8. In your teaching practice, what are the advantages of AI in supporting students' interdisciplinary integration? 9. From your perspective, what are the current limitations or problems of AI when it comes to interdisciplinary learning? 10. Based on this teaching practice, what suggestions do you have for the future design of AI tools or the implementation of interdisciplinary teaching?

Guided by the four core research questions, this study developed separate semi-structured interview guides for students and the teacher. The student interview explored aspects such as authentic experiences of AI-assisted interdisciplinary knowledge integration, information retrieval strategies, information verification behaviors, and perceptions of AI's strengths and limitations, while the teacher interview examined observations of student learning behaviors, practical difficulties in teaching implementation, evaluations of AI application effectiveness, and suggestions for improvement. Both interview guides were reviewed by two experts and pilot tested, after which adjustments were made to the suitability, openness, and relevance of the questions.

The classroom observation protocol was used to systematically document students' level of engagement during human-AI dialogue, their interdisciplinary information retrieval behaviors, their application of multidisciplinary knowledge, and diverse interactional details. The protocol outlined predefined core observation dimensions while also reserving space for open-ended field notes. In addition, to help students systematically record their own cognitive changes, a structured template for student reflective journals was provided. This template ensured standardized documentation while allowing students to freely express their reflections, questions, and information evaluation processes that emerged after interacting with AI.

3.4 Data Collection Process

Prior to the formal initiation of the study, the researcher explained the research purpose, study procedures, data management protocols, and potential risks in detail to the participating school, the history teacher, the 20 eighth-grade students, and their parents. After confirming that all participants fully understood the research content, written informed consent was obtained from all parties. Concurrently, the previously developed semi-structured interview protocols, classroom observation protocol, and student reflective journal template were pilot tested, and revised and refined based on feedback.

The researcher was present for all class lessons, completed observation records, and documented students' classroom performance and interactional details, but took no part in the design, execution, or adjustment of the AI-assisted history inquiry activities. Teacher instructional journals were kept by the history teacher to record the design rationale, implementation procedures, and teaching reflections of the AI-based interdisciplinary inquiry lessons. The entire teaching cycle lasted four weeks and consisted of four lessons of history-themed inquiry activities. The 20 focal students were required to submit reflective journals each week, continuously documenting their actual experiences of integrating multidisciplinary knowledge, their information evaluation and verification processes, cognitive changes, and affective experiences during their AI dialogues. After the teaching intervention, semi-structured interviews were conducted individually with each of the 20 focal students, each lasting approximately 30 to 40 minutes, focusing on their overall perceptions of AI-assisted interdisciplinary learning, multidisciplinary knowledge integration strategies, information verification behaviors, and views on the advantages and limitations of AI. Simultaneously, one in-depth interview (approximately 45 minutes) was conducted with the history teacher to explore classroom observation findings, implementation difficulties, teaching effectiveness evaluations, and suggestions for improvement. All interviews were fully audio-recorded and transcribed verbatim within 24 hours.

After all data collection was completed, the researcher categorized, screened, and systematically organized all classroom observation records, interview transcripts, student reflective journals, student artifacts, teacher instructional journals, and researcher reflective journals, established a unified coding and indexing framework, and ultimately formed a comprehensive and standardized qualitative dataset.

3.5 Data Analysis Methods

This study adopted thematic analysis as its core qualitative data analysis strategy, ensuring the standardization and rigor of the analysis through systematic coding and thematic refinement. The researcher first engaged in repeated close reading to familiarize themselves with all organized data—including interview transcripts, student reflective journals, classroom observation records, teacher instructional journals, researcher reflective journals, and pre- and post-intervention student artifact comparison materials. Key content, typical viewpoints, and representative cases closely related to the four research questions were marked, a preliminary data index was established, and all textual data were consistently formatted for formal analysis. After achieving full familiarity with the data, the researcher proceeded to the initial coding stage. No a priori thematic framework was imposed at this stage; instead, all texts were read line by line based on the raw data to extract initial codes relevant to the core research questions.A detailed list of initial codes was generated, with each code assigned a clear label and supplemented with specific operational definitions.

After the completion of initial coding, sub-theme development was conducted to systematically categorize, merge, and organize the initial codes. The internal logical connections among different codes were examined in depth, similar codes were integrated, and sub-themes that accurately reflected the core features of the data were distilled. During this process, the researcher consulted relevant concepts from the literature review, but the refinement of themes remained grounded in the data itself rather than being imposed by pre-existing theories.

Building on the sub-themes generated through the previous step, core theme refinement was further carried out to integrate and abstract the sub-themes at a higher level. This process ultimately led to the formation of core themes that addressed the four central research questions of this study and the establishment of a relatively complete and systematic thematic analysis framework. After the initial theme framework was formed, the researchers repeatedly compared the themes with the original data to verify their internal consistency and coverage. No new core categories emerged when coding the last 3 interview transcripts, indicating that the data reached thematic saturation.

To ensure the rigor of the coding process, this study adopted an inter-coder reliability procedure. Two researchers familiar with qualitative research methods coded the data independently and then compared their results. The computed Cohen's kappa coefficient for the coding was 0.86, indicating a high level of coding consistency. Coding discrepancies were resolved through in-depth discussion until full consensus was reached, and the finalized coding scheme was applied to the entire dataset. During the theme interpretation and analysis stage, the researcher integrated multiple sources of data for analysis and achieved data triangulation through cross-validation of four types of materials: interviews, observations, student artifacts, and journals. This approach effectively reduced potential bias from any single data source and ensured the reliability and relevance of the analytical findings.

4. Findings

Based on multi-source data, this study adopted thematic analysis to identify sthree core themes: students' interdisciplinary learning behaviors and cognitive strategies during human-AI interaction, the impacts of AI on students' interdisciplinary learning processes in inquiry tasks, and teachers' and students' perceptions of AI application and its strengths and limitations.

Table 4. Themes

Main Themes	Sub-themes	Description
Students' Interdisciplinary Learning Behaviors and Cognitive Strategies During Human-AI Interaction	Awareness of AI Tools and Information Acquisition Behaviors	This section elaborates on the formation of students' role positioning and functional perceptions of AI tools in interdisciplinary learning, along with their behavioral patterns of acquiring multidisciplinary information (physics, geography, art, etc.). It highlights students' cognitive shift from viewing AI as a mere question-answering tool to an interdisciplinary learning assistant, and variations in their retrieval goal orientation and content preferences.
	Multidisciplinary Knowledge Utilization and Integration Pathways	This section systematically delineates the specific pathways, temporal sequencing, and integrative logic through which students mobilize multidisciplinary knowledge in history-themed inquiry activities. It further examines students' processing strategies for AI-generated interdisciplinary information, as well as the hierarchical variations and construction patterns underlying the meaningful connections they form between historical events and multidimensional contextual elements.
	Academic Performance Differences and AI Use Behavior Divergence	This section comparatively analyzes the systematic differences among student groups at varying academic achievement levels with respect to AI utilization depth, information processing strategies, and the degree of interdisciplinary thinking. It specifically reveals the qualitative differentiation exhibited by students of different proficiency levels during human-AI interaction, rather than superficial differences in usage frequency.
Impacts of AI Use on Students' Interdisciplinary Learning Processes	Knowledge Integration and Transfer Application Processes	Following the integration of AI tools, this section examines changes in students' competency to break down disciplinary boundaries between history and other academic domains and achieve organic interdisciplinary knowledge synthesis, as well as their competencies to forge meaningful links between historical knowledge and contemporary reality and apply such knowledge to analyzing and addressing real-world social issues.
	Problem Inquiry and Comprehensive Problem-Solving Processes	Following the integration of AI tools, this section examines changes in students' competency to formulate open-ended, extended inquiry questions from multidisciplinary and cross-stage perspectives, as well as their competencies to comprehensively apply multidisciplinary research methods, explore multiple potential solutions, and make comparative selections among available options.
	Practical Operation and Resource Utilization	Following the integration of AI tools, this section examines changes in students' competency to explore, integrate, and utilize diverse history learning resources in a multidimensional manner, as well as their competencies to

	Processes	organically combine historical source study with social practice and select appropriate activity pathways tailored to authentic contexts to complete inquiry tasks.
	Learning Approaches and Outcome Generation Processes	Following the integration of AI tools, this section examines changes in students' competency to actively engage in self-directed, collaborative, and inquiry-based learning, as well as their competencies to translate inquiry processes and outcomes into formal research-based learning outputs and clearly present and communicate their findings.
	Engagement in Holistic Competency Practices	Throughout the interdisciplinary learning process, this section examines the concurrent fostering of students' sound value orientation, essential character traits, and key competencies, as well as their multifaceted development achieved through engagement in diverse, multidimensional learning activities embedded in problem-solving contexts.
Teacher and Student Perceptions of AI and Their Judgments on the Advantages and Limitations of AI Application	Teacher and Student Perceptions of the Role of AI in Interdisciplinary Learning	This section delineates the participating teacher's and students' subjective perceptions and attitudes toward the functional positioning, educational value, and potential risks of AI in interdisciplinary history learning. It focuses on analyzing between-group differences in AI role perceptions and the underlying reasons for such divergence.
	Core Advantages of AI Support for Interdisciplinary Integration in History	This section synthesizes the unique value and functional role of AI in supporting interdisciplinary history learning. It centers on distilling educational outcomes that are hardly attainable via conventional instruction yet can be effectively delivered with AI technology.
	Limitations of AI in Interdisciplinary Applications in History	This section analyzes the deficiencies of AI, particularly the unique challenges tied to the disciplinary characteristics of history. It focuses on unpacking the potential adverse impacts of AI technical constraints on students' interdisciplinary history learning.

4.1 Students' Interdisciplinary Learning Behaviors and Cognitive Strategies During Human-AI Interaction

Given the varied prior interdisciplinary learning experiences among participants, students held diverse foundations for cross-disciplinary thinking at the outset. Students' functional perceptions of AI constituted the logical starting point of their interdisciplinary inquiry throughout the project. The majority of students experienced a gradual shift in cognition as the project unfolded. As one student frankly recounted, "At first, I only saw AI as a simple question-answering tool. I would input random queries and expect it to provide direct, ready-made answers" (S03). With growing human-AI interactions and deepening project exploration, students progressively recognized AI's distinctive value for interdisciplinary knowledge integration. Another student commented, "AI can link the founding ceremony to the political, economic and military backdrop of the period, and even compare state-building processes across different countries. This offers far deeper insights than merely watching video clips" (S11). The teacher's classroom observational records further corroborated this gradual cognitive evolution: "Eighth-grade students are highly curious about intelligent tools, yet their attitudes toward AI diverged sharply in the early phase. Students lacking prior experience with generative AI often resisted using it due to unfamiliarity. Additionally, a few students with relevant experience held the view that relying on AI for learning amounted to cheating. While some accepted AI-generated content unconditionally, others stayed skeptical. Most students required two or three full cycles of hands-on project practice to form a rational understanding of AI and develop standardized routines for retrieving interdisciplinary information" (T).

Once students developed stable functional perceptions of AI, they adopted distinct strategies for multidisciplinary knowledge integration. An analysis of 20 student learning artifacts reveals a clear hierarchical gradient in their knowledge integration proficiency: Four students (20%) merely copied and collated AI-generated content without reflecting on or interpreting the logical links between different materials. As S08 noted in their reflective journal: "I separately pasted the AI-provided content about the founding ceremony and the political significance of New China's founding into my learning handbook. They just looked like two separate parts." Twelve students (60%) could attach relevant historical context to discrete historical events to achieve superficial formal integration, yet failed to construct causal connections across dimensions. S04 illustrated this pattern: "I listed national development phases and landmark achievements alongside each video clip." The remaining four students (20%) proactively built causal linkages between historical events and cross-disciplinary contextual factors, reaching advanced, organic knowledge integration.

The revision rate, defined as the proportion of student-adjusted content in the final artifact relative to the original AI-generated text, was calculated to reflect the depth of students' cognitive processing. Distinct disparities existed in students' human-AI interaction behaviors across varying academic achievement levels. Statistical breakdowns of dialogue rounds grouped by academic proficiency revealed clear group divergences: Students with lower academic standing averaged merely 2 to 4 isolated single-turn dialogues, predominantly asking straightforward factual queries, with a revision rate of AI-generated content falling below 10%. Mid-level learners averaged 6 to 10 dialogue rounds, capable of posing relatively targeted interdisciplinary questions, and posted a content revision rate ranging from 30% to 50%. High-achieving students engaged in an average of 12 to 15 iterative dialogue turns. They could raise sequential follow-up questions to address logical gaps within AI outputs, with their revision rate surpassing 70%.

A closer qualitative analysis of the prompts documented in student chat logs and reflective journals revealed three qualitatively distinct cognitive strategies underlying the quantitative differences in dialogue rounds and revision rates.

The low-achieving students' interactions were characterized predominantly by direct retrieval prompts; these were short, fact-oriented queries typically focusing on isolated historical details, such as asking the AI to provide a specific date, the name of a policy, or a definition of a political concept. These prompts were almost always single-turn; once the AI generated an answer, the dialogue ended. Correspondingly, these students' subsequent artifacts preserved the original AI phrasing almost entirely, suggesting that they approached the AI primarily as a search engine for discrete facts rather than as a dialogic partner for knowledge construction.

By contrast, the middle-achieving students exhibited what can be described as an incremental connection pattern. Their initial prompts frequently anchored the inquiry in a specific disciplinary lens. For instance, they asked the AI to explain the economic conditions surrounding a historical event or to describe the geographical factors influencing a political transition. Follow-up prompts often sought to add another disciplinary perspective, such as inquiring about cultural or artistic dimensions of the same event, though these probes tended to accumulate adjacent viewpoints rather than probe deeper causal mechanisms. Their higher revision rate (30% to 50%) largely reflected a process of re-organizing AI-generated materials under self-created thematic sub-headings, indicating an emerging but not yet fully integrated awareness of cross-disciplinary linkage.

The high-achieving students demonstrated a third, more sophisticated pattern: iterative critique and reconstruction. These students initiated dialogue with open-ended prompts that explicitly called for multi-factor explanations spanning political, economic, technological, and cultural dimensions, and they routinely followed up with evaluative prompts that identified gaps, contradictions, or biases in the AI's responses. For example, they prompted the AI to address a previously omitted factor or to reconcile conflicting information from different disciplinary sources. They then engaged in a deliberate re-synthesis process, integrating the AI's responses with evidence from textbooks, teacher feedback, and self-selected supplementary sources. Their high revision rate (over 70%) was not primarily stylistic editing; it reflected substantive conceptual restructuring aimed at constructing a coherent, multi-causal historical narrative.

It should be noted that some overlap across categories was observed. For instance, a few middle-achieving students occasionally attempted evaluative prompts while some high-achieving students began with simple retrieval. Nevertheless, the dominant patterns remained clearly distinguishable across the three achievement groups.

4.2 Impacts of AI on Students' Interdisciplinary Learning Processes in Inquiry Tasks

When supported by AI tools, students engaged in broader interdisciplinary knowledge integration during their history inquiry tasks. Of the 20 student inquiry artifacts completed with AI support, 16 (80%) included connections between political institutions, economic development, scientific and technological advancements, and the historical trajectory of the People's Republic of China. As reflected by one student, they previously regarded the atomic bomb explosion merely as a discrete historical event; however, through teacher instruction and extended explanatory support from AI, they constructed a more comprehensive account of the multidimensional influences of this technological achievement (S05). Meanwhile, AI appeared to support real-world knowledge transfer during the project. A total of 16 out of 20 students (80%) reported in reflective journals and interviews that they were able, during the project, to relate China's developmental experience since 1949 to contemporary social conditions and evolving characteristics of the times. However, identifying cross-disciplinary connections did not necessarily translate into causal explanations in students' project output. The findings indicate that most students' knowledge integration remained at a superficial level. Fourteen of the 20 artifacts (70%) failed to establish in-depth causal relationships across disciplinary domains, including four works characterized by simple copy-and-paste compilation and ten with only formal contextual annotation. These students merely accumulated multidisciplinary content without constructing a complete and coherent logical framework, rendering them unable to synthesize fragmented information into systematic historical interpretations (S07).

Beyond quantitative descriptions of integration levels, excerpts from student artifacts vividly demonstrate the qualitative differences between superficial and deep interdisciplinary integration. The distinction between superficial formal integration and advanced organic integration can be further illustrated through comparative examples drawn from students' inquiry handbooks. One typical instance of superficial integration came from S04's artifact on the theme of "The Founding Ceremony and the Establishment of the New China." In the final submitted handbook, the student arranged AI-generated content under three separate headings—"Political Background," "Economic Conditions," and "The Ceremony Itself"—but the sections remained disconnected blocks of text. The political background section described the establishment of the Chinese People's Political Consultative Conference; the economic section listed pre-1949 industrial and agricultural output figures; and the ceremony section recounted the sequence of events on October 1, 1949. No connecting sentences or analytical passages linked these disciplinary perspectives together, and the student made no attempt to explain, for instance, how the economic devastation of the preceding decades shaped the political urgency of nation-building, or how the ceremony's symbolic elements reflected the political ideals of the new regime. The artifact functioned as a categorized information repository rather than an integrated historical explanation.

In contrast, S05's artifact on "The Atomic Bomb and the Multi-dimensional Rise of New China" demonstrated what constituted advanced organic integration. Rather than treating the 1964 nuclear test as an isolated scientific achievement, the student wove together political, economic, technological, and international dimensions into a single coherent narrative. One passage read: "The successful detonation of China's first atomic bomb cannot be understood purely as a scientific breakthrough. Politically, it occurred in the context of the Sino-Soviet split and the escalating Cold War, which made independent nuclear deterrence a matter of national security. Economically, the project drew resources from the planned economy's concentrated allocation system, reflecting the developmental logic of 'concentrating forces to accomplish large undertakings' under resource-scarce conditions. Technologically, it relied on the prior establishment of a comprehensive industrial base during the First Five-Year Plan period, connecting the event to a longer developmental trajectory rather than a single moment." This extract shows that S05 not only identified the relevant disciplines but actively constructed causal and contextual links between them, producing a genuinely interdisciplinary historical account.

In terms of inquiry awareness and comprehensive problem-solving competencies, AI strongly stimulated students' willingness to question and prompted them to raise open-ended inquiry questions from multidisciplinary and long-term historical perspectives. Rather than focusing merely on memorizing historical dates and events, many students extended their thinking based on film narratives and analyzed the historical drivers of cultural spirits and social ethos by situating phenomena within their respective historical contexts (S06). In the project task of designing a 2026 sequel segment for the film *My People, My Country*, 15 students (75%) evaluated alternative design proposals across multiple dimensions, including historical inheritance, thematic connotations, social concerns, and audience experience, before making deliberate selections, which reflected broader problem-solving approaches during the task (S03). Even so, several students displayed excessive reliance on AI-generated solutions, directly adopting AI-designed frameworks without being able to articulate the rationales behind their choices (S08). Regarding practical operation and resource utilization, AI significantly expanded students' access to learning resources, breaking the traditional limitation of relying solely on textbooks and teacher-provided supplementary materials. AI enabled students to efficiently obtain diverse learning resources, such as historical footage, eyewitness oral histories, social statistical data, and documentary records, thereby enriching the content and presentation forms of their inquiry outputs (S07). It also supported the integration of historical source analysis and practical design practice, further enhancing the rationality and feasibility of students' overall inquiry plans.

In terms of learning modes and outcome generation, AI empowered students to engage in self-directed, collaborative, and inquiry-based learning. Under teacher guidance, students worked in divided groups and leveraged AI to collect supporting materials including historical contexts and social evaluations, collaboratively completing thematic inquiry and film unit design tasks (S09). With instructional scaffolding and AI assistance, students further polished their textual content, adjusted layout formats, and refined structural frameworks, rendering their final learning outcomes more standardized and coherent. Regarding the coordinated development of comprehensive literacy, the instructional design integrated with affective experience derived from film viewing deepened students' affective experience of national identity and national pride during the inquiry process. By examining the arduous developmental trajectory and remarkable achievements of the nation, students developed a profound appreciation for the value of contemporary life (S12). Meanwhile, the inquiry process provided opportunities for students to practice teamwork, oral communication, and rational critical thinking. Notably, teachers played an irreplaceable guiding and scaffolding role throughout the AI-assisted learning process. By designing structured inquiry tasks, teachers clarified the goals and orientation of interdisciplinary learning, preventing students from engaging in aimless information browsing during AI interaction. Through in-class discussions and group sharing activities, teachers guided students to conduct critical examination and in-depth processing of AI-generated content. Targeted instructional guidance and timely feedback also assisted students in resolving practical difficulties encountered in interdisciplinary knowledge integration. In particular, when AI produced factual errors or biased perspectives, teachers intervened promptly to correct students' misconceptions and facilitate the formation of rigorous and objective historical perceptions.

Nevertheless, the adoption of technological tools also brought adverse effects. Four students (20%) displayed passive reliance on AI outputs, habitually accepting AI outputs without cross-checking during the observed tasks. As illustrated by participant S04 in their reflective journal, the student took AI-generated content for granted and was unwilling to invest time in validating supporting materials. In stark contrast, several students maintained independent critical thinking. They explicitly refused to let AI replace their own reasoning, persisting in self-directed source collection and rational evaluation of information authenticity (S01). Following the completion of the project, one student reflected that prior historical learning relied solely on rote memorization of dates, figures and incidents. With the support of AI, the student could interpret the nation's developmental trajectory from intertwined political, economic and technological dimensions, leading to notable gains in the comprehensiveness and articulation of their reasoning in project outputs (S13). This evidence suggests that, under effective teacher scaffolding, AI-supported interdisciplinary learning can support positive engagement in competency practices during inquiry task implementation.

4.3 Teacher and Student Perceptions of AI and Their Judgments on the Advantages and Limitations of AI Application

From the perspective of teacher and student subjective perceptions, most participants acknowledged the supportive value of AI in interdisciplinary learning. The teacher regarded AI as a powerful instructional auxiliary tool that compensates for teachers' limited interdisciplinary knowledge reserves and enriches students' learning resources and learning approaches. Nevertheless, the teacher emphasized that AI could never replace teachers' core educational role (T). Meanwhile, both the teacher and several students expressed notable concerns regarding AI application. Six students (30%) worried that prolonged AI use might weaken their competencies for independent thinking, while four students (20%) questioned the factual accuracy of AI-generated historical content. From the teacher's perspective, the primary concern centered on potential historical errors and biased interpretations in AI-produced content related to the history of the People's Republic of China, which may mislead students' historical understanding and value formation. In practical instructional applications, AI exhibits prominent strengths in supporting interdisciplinary history integration. It effectively breaks disciplinary boundaries, assists students in establishing multi-domain knowledge connections, and reduces the entry barriers to interdisciplinary learning. With its robust information retrieval competencies, AI expands historical source resources beyond the scope of textbooks. Furthermore, its conversational interaction and diversified content presentation effectively stimulate students' learning engagement and provide personalized learning support tailored to students with different academic foundations.

Nevertheless, AI's application limitations remain non-negligible. In terms of content accuracy, AI occasionally produces fundamental errors such as chronological mismatches, figure confusion, and statistical deviations, undermining the rigor of historical learning. In terms of learning depth, AI-generated outputs often remain at the level of knowledge enumeration and lack in-depth causal reasoning, failing to support students' high-order interdisciplinary thinking. In terms of interpretive perspectives, AI tends to prioritize mainstream historical viewpoints and rarely facilitates diversified and open-ended historical interpretation. Particularly for the sensitive and specialized theme of the history of the People's Republic of China, AI poses potential value-orientation risks, including distorted historical narratives and biased interpretations that may mislead students' historical cognition.

The practical implementation of AI-integrated interdisciplinary instruction in history faces multiple practical dilemmas. At the student level, a considerable proportion of participants struggled to raise precise and effective interdisciplinary research questions aligned with their inquiry themes. Their unfocused queries often resulted in irrelevant AI outputs and reduced learning efficiency. At the teacher level, AI integration imposes heavy content-review burdens. Substantial instructional time is required to verify the factual accuracy of AI-generated historical content, which significantly increases teachers' workload. From a curriculum implementation perspective, designing AI-embedded interdisciplinary lessons demands solid historical expertise, multidisciplinary literacy, and proficient technological competence simultaneously. Such requirements greatly elevate the difficulty of lesson preparation. Coupled with limited regular class hours, teachers find it challenging to balance routine instructional duties with targeted guidance for interdisciplinary inquiry, further hindering the effective implementation of AI-assisted interdisciplinary teaching.

5. Discussion

5.1 Key Findings

This study reveals that AI exerts differentiated dual effects on middle school students' interdisciplinary learning processes during the themed inquiry project. On the positive side, AI supported students' knowledge integration and resource utilization during the intervention. It breaks the disciplinary boundaries between history, politics, economy, science, and technology, stimulates students' awareness of inquiry, and facilitates a pedagogical shift toward self-directed, collaborative, and inquiry-based learning (Yan & Qianjun, 2025; Schaal et al., 2009; Wu et al., 2026; Naganuma et al., 2026). Nevertheless, the negative impacts of AI are equally noteworthy. Overreliance on AI tools was associated with passive reliance behaviors in a minority of students in this study, who tend to conduct only superficial content splicing rather than constructing coherent, in-depth logical connections across disciplines (Santiago et al., 2023; Zhai et al., 2024). These findings corroborate existing scholarly warnings that, without systematic and targeted instructional design, AI can only support students' surface-level learning engagement and fails to foster their competencies for in-depth analysis and logical reasoning (Sarwanti et al., 2024; Walter, 2024).

Meanwhile, students exhibited distinct stratified characteristics in their AI usage behaviors. High-achieving students conducted in-depth learning through iterative, multi-turn human-AI dialogues and were able to screen, restructure, and optimize AI-generated content. In contrast, students with lower academic proficiency were limited to single-turn factual information queries, often adopting AI outputs directly without in-depth cognitive processing. These behavioral divergences were not merely quantitative differences in dialogue frequency but reflected distinct cognitive strategies: a direct retrieval pattern among lower-achieving students, an incremental connection pattern among middle-achieving students, and an iterative critique-and-reconstruction pattern among high-achieving students. These three strategy types suggest that the pedagogical value of AI tools is substantially mediated by students' pre-existing inquiry competencies and their epistemic beliefs about knowledge and knowing, a finding that carries direct implications for how AI-enhanced instruction should be differentiated in classrooms. Teachers and students shared a consensus regarding AI's instrumental value as a learning and teaching aid. They widely recognized AI's strengths in compensating for teachers' limited interdisciplinary knowledge reserves, enriching learning resources, and boosting student learning motivation. Nevertheless, both groups unanimously affirmed that AI cannot replace teachers' instructional guidance. In particular, they cautioned against discipline-specific risks in history learning, including factual errors and biased value orientations embedded in AI-generated content (Chan et al., 2024; Filiz et al., 2025).

This study further observes that students with moderate academic proficiency showed more prominent improvements in interdisciplinary inquiry performance when using AI tools. Drawing on the concept of the zone of proximal development (Vygotsky, 1978), this finding can be interpreted as follows: middle-achieving students possessed sufficient baseline historical knowledge to formulate disciplinary questions but had not yet internalized strategies for independently linking knowledge across domains; the AI thus functioned as a scaffolding mechanism within their zone of proximal development, providing just-in-time interdisciplinary prompts that enabled them to form connections they could not yet establish on their own. In contrast, the direct retrieval pattern of lower-achieving students largely bypassed this zone, as their prompts rarely demanded cross-domain synthesis, while the iterative critique-and-reconstruction pattern of high-achieving students indicated that they were already operating at a level where AI served more as a convenient information aggregator than as a transformative scaffold.

This finding can be partially explained by cognitive load theory. Interview and journal data show that moderate-achieving students reported AI saved considerable time on information retrieval and basic material sorting, allowing them to focus more on organizing logical relationships across disciplines, which aligns with the mechanism of reducing extraneous cognitive load. In comparison, low-achieving students remain confined to factual information acquisition, while high-achieving students already possess mature knowledge integration capabilities, resulting in relatively marginal task-specific gains from AI tools. Furthermore, students' superficial copy-and-paste behaviors are consistent with the concerns raised in tool dependency theory (Zhai et al., 2024). Observation data indicate that students with weaker self-regulation were more likely to directly adopt AI content without processing, suggesting that unguided AI use may reduce students' willingness to engage in deep cognitive processing. Overall, AI offers prominent advantages for interdisciplinary history learning through powerful information integration and personalized learning support. Nevertheless, its in-depth classroom application is constrained by multiple practical challenges, including factual inaccuracies and superficiality in AI-generated content, students' insufficient questioning ability, and the increased workload for teachers (Chounta et al., 2021; Francom, 2019).

5.2 Limitations of the Study and Recommendations for Future

Although this study yields several valuable empirical findings, it contains several limitations that warrant further exploration and refinement in future research. First, the sample lacks sufficient representativeness. The research recruited only 20 students and one history teacher from a single middle school in Beijing. The narrow sampling pool with limited geographical and school-type coverage restricts the generalizability of the findings, which cannot be directly extended to student groups across diverse regions, school categories and educational stages. Second, the instructional intervention adopted a relatively short cycle, making it impossible to fully examine the long-term and sustained effects of AI-supported interdisciplinary history learning on students' learning processes and outcomes. Third, the methodological design is comparatively singular. This study primarily adopts a qualitative inquiry approach, which elaborately documents students' learning behaviors, learning experiences, and cognitive shifts during AI-assisted interdisciplinary learning. However, the absence of quantitative datasets prevents precise measurement of the magnitude and characteristics of changes in students' interdisciplinary learning performance. Fourth, the research tool bears contextual constraints. The teaching practice in this study relied exclusively on one specific AI platform. Given the inherent discrepancies in functional configurations, algorithmic mechanisms and interaction modes across different AI tools, the results cannot fully capture the application effects of all types of artificial intelligence products, which partially undermines the transferability of the research conclusions.

Corresponding to the aforementioned limitations, future research can be expanded from the following five dimensions. First, the sampling scope can be broadened to conduct multi-centered investigations across different regions, school types, and grade levels. Such efforts can verify the external validity of the current findings and systematically compare group differences in students' AI usage behaviors and learning processes. Second, longitudinal tracking studies are warranted to continuously observe students' AI-assisted history learning across multiple semesters. Extended intervention can further unpack the long-term effects of AI tools on students' interdisciplinary learning processes and historical literacy development. Third, future studies can adopt mixed-method research designs. On the basis of qualitative analysis, quantitative assessment tools can be incorporated to conduct pre-test and post-test comparisons, so as to evaluate the instructional effectiveness of AI integration with higher precision. Fourth, subsequent research may compare the practical performance of different AI tools in history teaching. It is necessary to develop discipline-specific AI instructional tools tailored for history education, with targeted optimization in factual accuracy, historical logical construction, and value orientation guidance. Fifth, greater attention should be paid to teacher professional development in AI-enabled teaching contexts. Future research can explore effective teacher training models to enhance frontline history teachers' instructional competencies in interdisciplinary curriculum design and educational technology application, so as to provide solid instructional support for the in-depth integration of AI and history education.

6. Conclusion

This study systematically examined the practical effects of AI application in interdisciplinary history learning. The results demonstrate that AI serves as an effective instructional auxiliary tool for interdisciplinary history teaching. It substantially lowers the entry barriers to interdisciplinary learning, expands learning resources, and stimulates students' inquiry motivation, with notable gains observed in students' knowledge integration and resource utilization behaviors. Nevertheless, AI has certain limitations in educational application. The tool itself cannot automatically achieve deep-level knowledge integration. Without systematic and targeted instructional design, AI is insufficient to support students' higher-order historical thinking within the context of themed inquiry tasks. Uncritical AI use was also associated with passive reliance on AI-generated outputs. Accordingly, teachers occupy an irreplaceable core position in AI-assisted interdisciplinary teaching practices.

This study provides empirical evidence for the integration of artificial intelligence into history education and reveals the specific requirements for AI application within the history discipline. Looking forward, history education should establish a human-AI collaborative teaching model guided by teachers. While embracing technological empowerment, educators should uphold the fundamental essence of educational values and translate the strengths of AI into meaningful support for students' engagement with interdisciplinary learning processes.

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