From Replacement to Symbiosis: A Grounded Theory Study on AI-Assisted Teaching Models in Secondary School History Classrooms

Ying Li[1], Nian Liao[2*]

[1] Guangzhou Pui Ching Middle School, Guangzhou, 510030, China

[2] Guangzhou Xin ying cai Chinese and English School, Guangzhou, 510440, China

[*] 41828095@qq.com

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Abstract

This study analyzes and explores AI-assisted teaching models in secondary school history classrooms through observations of teaching activities. The research findings reveal a significant evolution in AI's role in history teaching, transitioning from a "replacement" phase to a "symbiosis" phase. In the "replacement" phase, AI primarily undertakes foundational tasks such as chronological ordering and historical data classification. While AI significantly enhances classroom efficiency in this stage, it fails to effectively stimulate students' deep thinking and critical analysis. With technological advancements and evolving educational philosophies, AI in the "symbiosis" phase begins to function as a "critical interlocutor", presenting diverse historical perspectives, fostering students' critical thinking, and forming an interactive synergy among teachers, students, and AI. The study identifies core dimensions of AI-assisted teaching, including historical data processing collaboration and spatiotemporal concept construction collaboration. These dimensions reflect how teachers, with technological support, guide students toward deep learning and critical inquiry.

Keywords AI; Classroom; History; Symbiosis

1 Research Background

1.1 Practical Challenges

Although AI tools serve as powerful auxiliary tools in history classrooms, their application reveals a coexistence of "technological empowerment" and "value conflicts". Regarding historical accuracy, AI's analysis of historical data is influenced by its training datasets and algorithmic biases, often exposing limitations in factual precision. For example, AI-generated descriptions of historical events may oversimplify details or misinterpret information, directly affecting students' comprehension of historical facts and thereby undermining the objectivity of instruction. Furthermore, different ideological influences significantly impact historical narratives. While AI can present multiple perspectives, if its training data are shaped by specific ideological biases, the generated content may unconsciously adopt a particular stance, posing potential risks to students' critical thinking and objective judgment.

1.2 Dual Challenges Faced by History Teachers

AI, as an emerging educational technology, provides history teachers with rich classroom resources and interactive methods. For example, through big data analysis, teachers can use AI to quickly retrieve diverse historical materials, enhancing the depth of classroom discussions [1]. At the same time, AI's active feedback mechanism can encourage students to participate in interactions, thereby increasing their learning motivation and classroom engagement. However, history classroom teachers face increasingly severe dual challenges: on the one hand, teachers need to effectively integrate AI technology into the classroom to enhance student interaction; on the other hand, they must adhere to the core educational functions of history education.

1.3 Transformation Path from "Replacement" to "Symbiosis"

In the strategic context of current educational informatization, the transformation of classroom teaching models has become a key issue in educational research [2]. Especially in the field of history education, the transformation mechanism and path from "replacement" to "symbiosis" have gradually attracted increasing attention from scholars [3]. The traditional teacher-led model implements limited interaction in the classroom, mainly relying on teachers' oral lectures and students' passive acceptance [4]. In this model, artificial intelligence is usually regarded as an auxiliary tool, namely a "knowledge transmission tool", and its application is mainly limited to the realization of basic tasks, such as historical data retrieval and simple data analysis.

2 Research Significance

In the context of today's educational informatization, exploring feasible models for the deep integration of AI and history disciplines has important disciplinary value for enhancing the effectiveness of history teaching and students' learning experiences. The introduction of AI technology can promote the cultivation of a "grand historical perspective" in history disciplines, enabling students to understand the development of human society in a broad spatiotemporal dimension [5].

By exploring innovative practical strategies for teacher-AI collaborative teaching in history classrooms, it is possible to effectively improve teaching quality and minimize the various risks that may arise from the abuse of technology. By introducing "human-machine collaboration" theory into classroom practice, history teachers can design targeted strategies in the teaching process, thereby creating a good learning environment [6]. Enhancing students' vivid understanding of historical events and their backgrounds not only provides a dynamic learning experience but also encourages students to critically analyze historical materials.

3 Current Status of Research at Home and Abroad

Globally, the application of artificial intelligence in history education has received widespread attention and research. In particular, the rise of virtual historical scenario simulations and multi-modal historical data analysis has not only promoted the transformation of history teaching methods but also enhanced students' learning experiences and historical cognitive abilities.

In the context of domestic basic education reform, educators and researchers have recognized that the "smart classroom" model in secondary school history classrooms is gradually becoming a key research area, especially with the rapid development of artificial intelligence technology [7]. Through in-depth analysis of "smart classroom" implementation cases, its potential and limitations in enhancing history teaching effectiveness can be seen. As Huang Muhang pointed out, although "smart classrooms" excel in personalized learning and optimal allocation of teaching resources, the combination of traditional teaching concepts and modern technology does not always present the expected synergistic effects.

4 Definition of Core Concepts

4.1 "Replacement" and "Symbiosis"

In the field of education, especially in history classrooms, the definition of the two core concepts of "replacement" and "symbiosis" is particularly important [8]. "Replacement" emphasizes AI as a single knowledge transmission tool, providing the functions of memorizing and retelling subject knowledge. "Symbiosis", on the other hand, refers to a deeper level of collaborative relationship, in which AI not only assists teachers in transmitting knowledge but also forms a cooperative relationship with teachers and students at the thinking level, achieving common learning and innovation. This shift in concept directly reflects the new trend in the development of educational technology, that is, the evolution from one-way information transmission to a multi-faceted interactive model.

4.2 Collaborative Teaching in History Disciplines

In the context of the rapid development of educational technology, the concept of "collaborative teaching in history disciplines" is receiving increasing attention, especially with the help of artificial intelligence technology, the collaboration between teachers and machines has become an important way to improve the quality of history classroom teaching. The collaborative mechanism of historical data processing provides students with diversified learning methods. AI can quickly analyze and integrate a large amount of historical data, and use "big data analysis" technology to provide teachers with data-based lesson plan design, thereby helping students form a clearer context in the understanding of historical facts [9]. For example, using natural language processing technology, students can more efficiently obtain and analyze historical texts, thereby enhancing their critical thinking skills.

4.3 History Teaching Theory

In the in-depth discussion of history teaching, it is necessary to clarify the connotation of the core literacy of history disciplines, among which historical materialism and historical data verification are important theoretical supports. Historical materialism emphasizes the dominant role of the mode of material production in social development, which in turn affects the process of human history [10]. Therefore, in history teaching, this should be used as a guide to guide students to understand the dialectical process of history and cultivate their critical thinking skills and historical practice abilities, so that they can conduct in-depth analysis and comprehensive evaluation in complex historical environments.

4.4 TPACK Framework

In secondary school history classrooms, teachers, through the intervention of artificial intelligence, have formed new teaching collaborative models, among which the TPACK framework provides a systematic approach to analysis and understanding [11]. The TPACK framework emphasizes the organic integration of subject content knowledge, pedagogical knowledge, and technological knowledge, thereby providing theoretical support for understanding the interaction between teachers and AI [12]. Research shows that when implementing the teacher-AI collaborative teaching model in history classrooms, teachers not only need to have solid subject content knowledge, that is, a deep understanding of historical events, figures, and backgrounds, but also need to have a comprehensive understanding of the teaching methods suitable for the subject.

Specifically, subject content knowledge covers the basic theories and development context of related history disciplines, which in turn affects teachers' strategies for using AI technology to teach historical knowledge. For example, when teaching modern Chinese history, if teachers use AI to analyze historical materials, they can use the analytical perspectives generated by algorithms to guide students to think about the causal relationships behind historical events, thereby achieving a deep understanding of knowledge. At the same time, pedagogical knowledge emphasizes that teachers consider students' learning needs and cognitive development when designing teaching activities. In this process, the auxiliary role of AI is indispensable, especially in providing personalized learning and immediate feedback.

In terms of technological knowledge, teachers need to understand and master the functions and application skills of AI tools. For example, when teachers introduce data analysis tools in the classroom, they need to have certain AI usage skills in order to effectively use AI's deep learning algorithms to process and analyze historical data, thereby enhancing the interactivity and interest of classroom teaching, and then strengthen students' enthusiasm and autonomy in history learning. The introduction of technology is not only the use of tools but also the transformation of teachers' thinking modes. Teachers should also play the role of innovators and guides to promote the comprehensive development of students' historical literacy.

In this teacher-AI collaborative teaching model, teachers are not only the transmitters of knowledge but also more transformed into the organizers of knowledge and the guides of learning. Using the TPACK framework as a guiding ideology, to achieve effective collaboration between teachers and AI and promote students' more comprehensive history learning, it is necessary to start from the integration of teachers' knowledge to ensure that a truly meaningful collaborative teaching experience is provided in history classrooms, so as to achieve the improvement and innovation of education quality. Through specific case analysis and data support, we can more deeply explore the application effectiveness and

potential challenges of this model in actual classrooms, thereby providing a more solid theoretical foundation and practical reference for future educational research.

5 Research Data Collection and Analysis

To explore the symbiotic collaborative relationship between teachers and artificial intelligence in history classrooms, the research objects selected include 36 history teachers from 8 secondary schools. The selection of locations takes into account the actual use area of the Ministry-Compiled textbooks to ensure the representativeness and scientificity of the sample. In the selection of teachers, special consideration is given to the proportion of novice teachers and backbone teachers to present the application differences of teachers with different experience levels in the AI collaborative teaching model.

5.1 Classroom Observation

In order to deeply explore the collaborative model of AI and history classroom teaching, this research adopts a rigorous empirical research method. First, the online version of Deepseek-R1 is used to generate teaching plans for 10 history lessons. These 10 history lesson teaching plans cover different course content. Then, the teaching status of 10 AI-assisted history lessons is recorded, focusing on the specific performance of teacher-student-AI interaction. This interaction not only involves the collaboration between teachers and AI systems but also includes how students conduct knowledge construction and autonomous learning in this new type of teaching environment. Through the collection and analysis of these data, we aim to explore how AI technology influences teachers' teaching strategies and students' learning effects in history teaching.

5.2 Teaching Design Plans and Post-Class Feedback

In this study, the collection and analysis of physical materials have an important supporting role. These materials include teachers' teaching design plans, AI-generated historical data analysis reports, and students' post-class feedback. First, in terms of course plan design, AI saves a lot of preparation time, and the auxiliary materials provided are richer and more detailed. The specific situation is shown in the figure below.

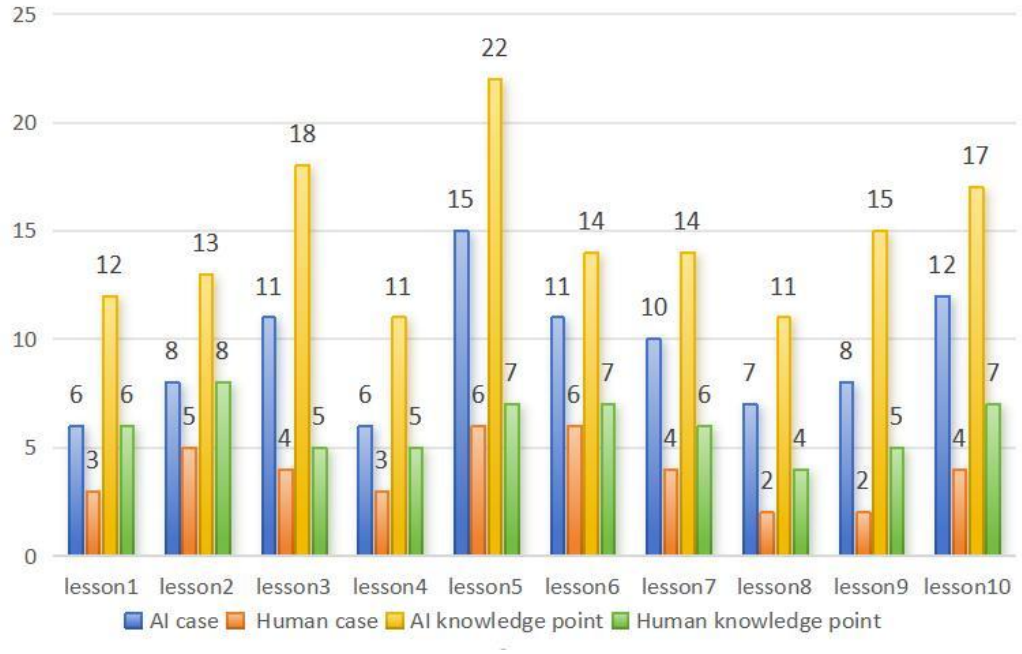

Fig. 1. Comparison of AI Teaching Design Effects

As can be seen, AI teaching design uses far more cases and knowledge points covered by cases than teachers do manually. The teachers' teaching design plans reflect the application strategies and methods of AI in history classrooms, including how to combine AI-assisted tools with traditional teaching to achieve the goal of collaborative teaching. By analyzing these plans, it is possible to clarify the learning objectives, teaching activity links, and how to build interaction with students set by teachers in teaching. This provides strong case support for understanding teachers' teaching decisions under AI assistance.

Through video recording observation, it is found that in terms of classroom effectiveness, using AI to design lesson plans and cases, because the content is richer and the cases are more vivid, students' classroom performance is more active, and teacher-student interaction is more frequent.

5.3 Historical Data Processing Collaboration

In studying the specific functions of AI as a historical data processing collaboration in history classrooms, the important role of AI's multiple roles in promoting effective historical data analysis and criticism between teachers and students is found. AI technology can instantly complete the retrieval and classification of massive amounts of historical data, thereby significantly improving teachers' teaching efficiency. For example, in the historical data analysis related to the Pearl Harbor incident in World War II, AI can quickly integrate texts from different historical archives and present multi-dimensional perspectives, greatly enriching the materials for classroom discussion.

5.4 Spatiotemporal Construction Collaboration

In the context of spatiotemporal construction collaboration, the application of AI can reshape the spatiotemporal concept of history teaching, thereby enhancing students' historical understanding abilities. In this collaborative model, the interaction between teachers and AI is not only the use of teaching tools but also incorporates rich spatiotemporal dimensions into the transmission and construction of historical knowledge. AI provides students with a visualized historical context by generating dynamic historical maps, enabling students to grasp the causal relationships of historical events in the intertwining of time and space [13]. For example, in the Silk Road course, teachers guide students to use AI-generated simulated routes to analyze the economic and cultural influences of historical transactions through different geographical nodes, thereby understanding the development context of history.

6 Research Conclusions

The intervention of artificial intelligence in secondary school history classroom education is an overall trend, which puts forward new requirements for teachers' abilities and gradually develops from replacement to symbiosis.

In the replacement stage of history education, artificial intelligence plays an important basic task function, mainly reflected in the rapid sorting and classification of historical materials, and the accurate sequencing of years. The implementation of this stage not only provides efficient data processing capabilities for history classrooms but also significantly enhances the organization and structure of teaching. For example, through natural language processing technology, AI can intelligently analyze and classify a large amount of historical data, helping teachers save a lot of preparation time in teaching, thereby focusing more energy on classroom discussion and guidance.

In the symbiotic stage of history teaching, artificial intelligence gradually evolves into students' "critical dialogue partner". This transformation not only subverts the traditional knowledge transmission model but also further promotes the depth of students' thinking and the complexity of historical understanding. Specifically, AI stimulates students to conduct more in-depth thinking and discussion by presenting diverse historical perspectives.

7 Conclusion

The application of artificial intelligence tools in history teaching demonstrates significant technological potential and innovative possibilities, but it is also accompanied by many challenges and complexities. History educators can clearly recognize the advantages and disadvantages of AI in the

classroom, seek a balance between technology application and educational values, and achieve the transformation from "replacement" to "symbiosis" in the process of teaching reform. With the introduction of new technologies such as virtual reality and augmented reality, history teaching is developing towards a more immersive and interactive learning model, providing students with multi-dimensional historical perspectives and deeper thinking experiences. Through dynamic historical maps and multi-modal historical data analysis, AI not only assists teachers in effectively processing historical materials but also becomes students' "critical dialogue partner" in exploring the complex causal relationships behind historical events, changing the traditional teaching model and reshaping the core content and goals of history teaching, making it more in line with the development needs of today's society.

Conflicts of Interest

The authors declare no conflicts of interest.

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Biographies

1. **Ying Li** Senior teacher and master's supervisor of the Political Group at Guangzhou Pui Ching Middle School, with over 20 years of teaching experience and 4 publicly published academic papers.
2. **Nian Liao** graduated from Chinese Language and Literature with a B.S. degree, leader of the History Teaching and Research Group, intermediate teacher, with 20 years of teaching experience.

中學歷史課堂AI協同教學模式的紮根理論研究

李迎　廖念

摘要：本研究通過教學活動觀察，分析和探討了教師與人工智能在中學歷史課堂中的協同教學模式。研究發現，AI在歷史教學中的角色經歷了從“替代”階段向“共生”階段的顯著演變。在“替代”階段，AI主要承擔基礎任務，如年代排序與史料分類，儘管在這一階段，其對教師的輔助作用顯著提升了課堂效率，但仍未能有效促使學生深入思考和批判性分析。隨着技術進步與教育理念的演變，進入“共生”階段的AI開始作爲“批判性對話者”出現，呈現多元歷史視角，激發學生的思辨能力，形成師生與AI之間的互動協同。研究揭示了協同教學模式的核心維度，包括史料處理協同、時空觀念建構協同等，這些維度反映了教師如何在技術輔助下，引導學生進行深度學習與批判性思考。

關鍵詞：AI；課堂；歷史；共生