

Article

Constructing an AI-Driven "Learning-Research-Application" Integrated Teaching Model for University History Courses: Innovation in *Modern World History* Based on Knowledge Graphs

Qidong Zhao ^{1,*} and Wei Deng ¹¹ Guangdong University of Petrochemical Technology, Maoming, Guangdong, 525000, China

* Correspondence: Qidong Zhao, Guangdong University of Petrochemical Technology, Maoming, Guangdong, 525000, China

Abstract: Integrating artificial intelligence (AI) technology into the entire teaching and learning process is an essential requirement for local universities to cultivate high-quality, application-oriented talents in teacher education programs. To align the curriculum with the needs of educational reform and development in the AI era, the teaching team has addressed students' pain points related to learning content, methods, and environments by constructing an AI-empowered "Learning-Research-Application" integrated learning system based on the "Objectives–Resources–Models–Activities–Assessment" framework. This system enhances the curriculum's higher-order thinking, challenge, and emotional engagement. By employing knowledge graphs and practical teaching methods empowered by intelligent digital technologies, the course improves students' participation, inquiry skills, and practical abilities. Additionally, a three-dimensional, five-component assessment system covering "Knowledge Mastery–Competence Development–Process Performance" activates students' autonomous learning, provides personalized evaluation of higher-order thinking, and achieves a virtuous cycle of "Learning–Research–Application". This study explores a new approach to fully integrating AI into the teaching process of knowledge graph-based courses, offering an innovative model for connected teaching and learning.

Keywords: AI-driven teaching model; knowledge graph; autonomous learning; teaching innovation; university history courses; scenario-based learning

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1. Introduction

The integration of artificial intelligence (AI) into education is revolutionizing teaching methods, particularly in university-level history courses. In response to the evolving demands of modern education, the development of an AI-driven teaching model, underpinned by advanced technologies such as knowledge graphs, is reshaping how historical content is delivered. This innovative approach emphasizes autonomous learning, fostering critical thinking and problem-solving skills in students, while also leveraging scenario-based learning to create immersive and engaging historical experiences. By reimagining traditional teaching methods, this model enhances both the quality and accessibility of education, empowering students to actively engage with complex historical themes and develop the skills necessary for their future careers in teaching and beyond.

2.. Course Overview

2.1. Course Positioning and Development

Modern World History is a 56-hour compulsory foundational course for students majoring in History (Teacher Education), offered in the second semester of the first academic year. As a core course in the History (Teacher Education) program, it serves as a crucial link between ancient and modern world historical understanding. The course focuses on key issues in modern world history, such as the establishment of the capitalist system and the transformation and development of classical civilizations in the modern era.

Since 2021, the course has been developed as a blended online-offline module on the Chaoxing Fanya platform. In 2024, it was approved as a university-level Smart Course featuring a knowledge graph for *Modern World History*.

2.2. Teaching Objectives

Based on the university's goal of cultivating application-oriented talents and the departmental objectives for the History (Teacher Education) program, this course aims to achieve the following objectives in three dimensions—knowledge, competence, and quality—as shown in Figure 1.

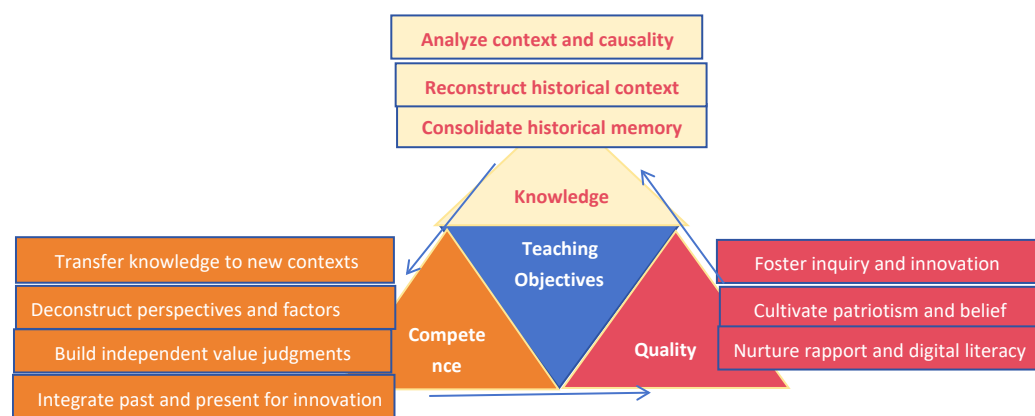


Figure 1. Teaching Objectives of *Modern World History*.

3. Student Situation Analysis and Teaching Pain Points

3.1. "Three Aspects" Analysis

3.1.1. Student Situation

First, the knowledge framework is fragmented. According to a survey of Class 24-1 History majors, 80.4% of students can only occasionally remember key historical dates, and 87% report that their greatest challenge is systematically organizing the knowledge framework.

Second, there is a lack of critical thinking and insufficient multi-perspective analysis. Data from a questionnaire on the Chaoxing platform show that 68.2% of students remain at the level of simple cause-and-effect analysis, with higher-order thinking (such as multi-factor interactive analysis) accounting for less than 10%. Only 22% of students can explain historical phenomena from multiple perspectives.

3.1.2. Course Situation

The course is strongly discipline-oriented, with classroom teaching overly focused on factual information delivery and theoretical instruction, while neglecting the cultivation of teaching practice skills for pre-service teachers. This theory-heavy, practice-light

approach is seriously misaligned with the core competence requirements for teacher education, overlooking the cumulative practical experience needed to develop professional teaching skills.

3.1.3. Teaching Situation

The course employs a single, less effective teaching method that has not successfully shifted away from one-way knowledge transmission. The application of intelligent digital technologies lags behind, making it difficult to meet the demands of modern basic education for well-prepared history teachers.

3.2. Analysis of Teaching Pain Points

3.2.1. Insufficient Student Motivation and Ability for Autonomous Learning

The cultivation of high-quality, application-oriented talents requires students to master active, inquiry-based, and deep learning. However, survey results show that while freshmen are willing to watch videos for self-study before class, only 26.8% participate in classroom discussions, 9.8% engage in debates role-playing historical figures, and only 12.2% complete small group historical research projects. In contrast, as many as 82.9% of students prefer lecture-based classes. The existing assessment and evaluation systems fail to motivate students to shift from passive to active learning.

3.2.2. One-Way Knowledge Transmission Hinders the Development of Higher-Order Thinking

Students' preference for lecture-based teaching encourages teachers to cater to this demand, resulting in students' continued dependence on teachers for systematic explanations. This cycle leads students to passively accept textbook content or the teacher's standard answers, with little multi-dimensional exploration of historical events. As a result, students tend to memorize conclusions rather than question logical chains, making it difficult to transfer knowledge to new contexts, develop independent analytical skills, or cultivate historical empathy.

3.2.3. Outdated Classroom Model: Imbalance in Efficiency and Lack of Technological Empowerment

Traditional lecture-based models face a fundamental contradiction between the efficiency of knowledge transmission and the effectiveness of competence development. They lack effective strategies for active learning, fail to achieve desired learning outcomes, and limit students' choices for self-directed learning. Surveys show that 75.6% of students expect AI-enabled big data analysis of historical materials, while 48.8% and 68.3% expect cross-temporal dialogue simulations and virtual historical scenario construction, respectively. Without practice-based learning empowered by intelligent digital technologies and smart education platforms, it is impossible to fully stimulate students' learning potential.

In terms of research on the application of the "Learning-Research-Application" teaching model in higher education, scholars have explored it in the education of military postgraduate students, general postgraduate training, university theory courses, and the cultivation of teaching practice skills for pre-service teachers [1]. However, there is a lack of research applying the "Learning-Research-Application" model specifically to theoretical courses for history teacher education majors [2]. From the perspective of smart technology empowerment in higher education, existing research mainly focuses on science and engineering courses, business and management courses, English courses, ideological and political education courses, and Chinese language and literature courses [3,4]. Although some scholars have discussed the systematic reconstruction of new liberal arts teaching models driven by intelligent digital technologies, there is still little research on applying smart technologies to empower history courses at universities [5]. Therefore, this study aims to integrate digital technologies with the "Learning-Research-Application"

approach—combining learning (theoretical study), research (teaching research topics), and application (applying theoretical knowledge to junior high school history classrooms)—to address the above teaching pain points and provide a practical case for an AI-driven integrated teaching model for university history courses [6].

4. Innovative Measures and Practices to Address Teaching Pain Points

To address the above issues, the teaching team, based on constructivism, sociocultural theory, and multiple intelligences theory, adopted an AI-empowered “Learning–Research–Application” integrated course design approach. They developed a comprehensive course learning system combining “Objectives–Resources–Models–Activities–Assessment” (as shown in Figure 2). This system creates an active learning ecosystem empowered by intelligent digital technologies, organically integrates digital empowerment with humanistic care, and helps teachers shift from being “authoritative lecturers” to “architects of the learning ecosystem.”

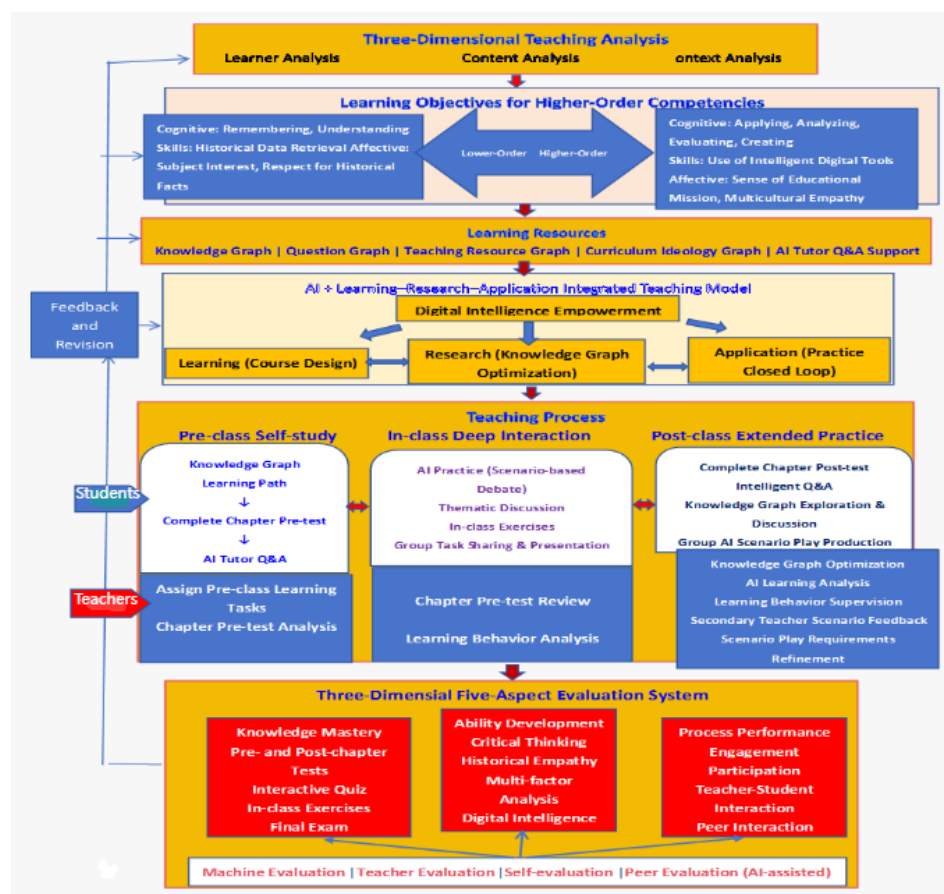


Figure 2. Overall Teaching Innovation Framework Integrating AI with “Learn-Research-Apply”.

4.1. Constructing an Active Learning Ecosystem Empowered by Digital Intelligence Technology

This initiative centers on the Chaoxing platform, leveraging the collaborative empowerment of curriculum knowledge graphs, problem graphs, teaching resource graphs, and AI teaching assistants to build an active learning ecosystem characterized by "panoramic cognition — progressive thinking — resource adaptation." This approach helps address students' challenges of fragmented knowledge and passive learning.

4.1.1. Curriculum Knowledge Graph: A Panoramic Cognitive Framework

In education, a knowledge graph is a network that visually represents the relationships within curriculum knowledge. Based on the syllabus, the knowledge graph highlights key points, difficulties, and examination focuses, while providing brief explanations of knowledge points to present the complete logical flow of the course content [7]. The graph also constructs interconnections among knowledge points and visually displays them, facilitating students' understanding and mastery of the course knowledge system [8]. Students can engage in adaptive learning according to paths recommended by the knowledge graph. Additionally, personalized learning paths can be generated based on students' incorrect problem sets, helping them identify weak areas and achieve better learning experiences and outcomes [9].

4.1.2. Problem Graph: Guiding Progressive Thinking

The problem graph is designed as a three-level hierarchical chain comprising complex problems, combined problems, and basic problems. Its purpose is to support students in engaging in problem-oriented learning, stimulate their interest, and assist in cultivating specific disciplinary thinking and skills. Among these, complex problems are designed around the chronological and thematic clues of modern world history (as shown in Figure 3), enabling students to grasp the overall development framework of the course from a macro perspective and build a systematic knowledge structure.

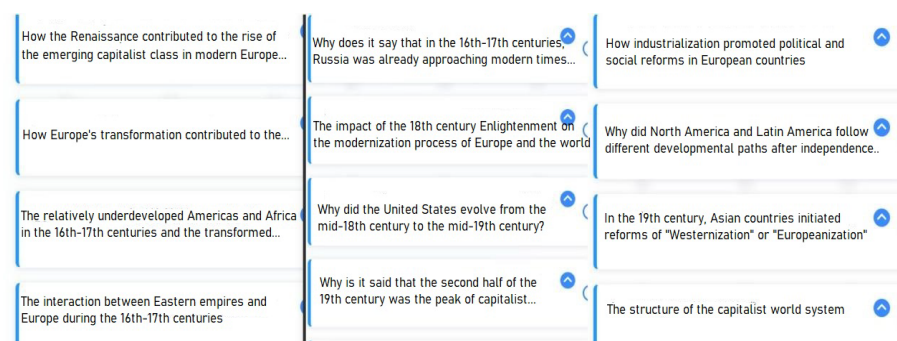


Figure 3. Complex Issues in the Problem Map.

4.1.3. Teaching Resource Graph + AI Teaching Assistant: Precise Support and Immediate Feedback

Teaching resources accumulated in the course—including video materials, website links, academic papers (especially cutting-edge research), courseware, and test questions—are systematically categorized and stored in the Chaoxing platform's resource database. These resources are linked to each knowledge point in the knowledge graph, supporting students in completing autonomous learning tasks such as thematic discussions and group assignments. The AI teaching assistant's real-time interaction further provides companionship and support for students during self-directed learning.

4.2. Innovation in Practice Teaching Methods Empowered by AI

This initiative employs the "AI Practice" tool developed on the Chaoxing platform, which covers diverse teaching scenarios, along with other large AI models, to implement innovative practice teaching methods focused on cultivating pre-service teachers' higher-order thinking and teaching practice abilities.

4.2.1. Scenario Dialogue System of the Chaoxing "AI Practice" Tool and the Enhancement of Pre-service Teachers' Higher-Order Thinking

The scenario dialogue system within the Chaoxing "AI Practice" tool can intelligently construct debate scenarios and assign role positions based on teachers' input tasks and

requirements. After the teacher inputs the scoring criteria, the system can provide real-time evaluations of students' performances, offering immediate feedback on areas such as logical coherence (e.g., alignment between arguments and historical evidence) and depth of reasoning. The AI-powered role-playing and debate not only stimulate student interest but also cultivate higher-order thinking skills such as multi-perspective analysis and historical empathy.

4.2.2. AI-Empowered Historical Scenario Play Creation

The course assigns after-class group tasks involving the basic workflow of AI + historical scenario play creation. First, identify major historical events rich in contradictions within the course knowledge points; second, consult primary archival materials, and utilize AI tools to analyze secondary sources to collect primary historical data; third, clarify which historical issue the scenario play addresses and determine the theme of the script; fourth, input the timeline for plot enactment, reference historical materials, and the script theme into AI tools to generate an initial draft of the script, which students then refine; finally, produce the scenario play video. Group members can either perform and record the video themselves or use AI tools such as text-to-video, image-to-video, and video dubbing for synthesis.

Aligned with the current emphasis on scenario-based teaching in secondary education, AI-enabled historical scenario play creation helps students deepen and expand their understanding of key and difficult course content after class. It also fosters students' ability to apply digital intelligence technology to transform theoretical knowledge into teaching resources.

4.3. Reconstruction of the "Three-Dimensional Five-Aspect" Evaluation System

To promote the AI + "Learn-Research-Apply" integrated teaching model, the course reconstructs a data-driven dynamic evaluation system based on three dimensions—knowledge mastery, ability development, and process performance—and integrates five evaluation entities: AI intelligence, machines, teachers, self, and peers (see Figure 2). This system guides students in developing autonomous learning capabilities and higher-order thinking.

Knowledge mastery evaluation mainly relies on the Chaoxing Xuexitong platform. Through chapter pre-tests and post-tests linked to the knowledge graph, it provides real-time diagnostics of knowledge point mastery, helping teachers implement targeted teaching and enabling personalized learning paths for students.

Ability development is quantitatively assessed through thematic discussions, virtual debates, and group tasks (such as historical scenario play creation). Newly added virtual debates and historical scenario plays realize the quantitative evaluation of ability development in practical contexts. The scenario play creation involves various AI tools, allowing assessment of digital intelligence usage, while the script quality assesses application skills. Notably, virtual debates promote the explicit development of critical thinking. AI intelligence evaluation in virtual debates also achieves precise and personalized evaluation and feedback on learning data.

Process performance evaluation, besides relying on classroom performance recorded by the Xuexitong platform, incorporates students' electronic portfolios of weighted assignments, including online notes on chapter tasks, AI Q&A interaction logs, and reflections on reading materials. This encourages students' habits and abilities for autonomous learning.

4.4. Emotional Experience Care in AI-Empowered Teaching

While AI-enabled teaching demonstrates rich practical forms, it also presents a lack of emotional connection in technology. This requires teachers to comprehensively attend

to learners' emotional experiences to compensate for technological deficiencies. The teaching team focuses on cultivating a sense of educational mission in the emotional experience dimension. For example, the course requires students to propose optimization suggestions for the problem graph in the discussion forum. Teachers publicly adopt high-quality suggestions to update the graph iteratively. Teacher feedback fosters a positive emotional experience of reciprocal teaching and learning.

Based on the teaching appropriateness required for secondary schools where student group historical scenario plays are implemented, frontline secondary school teachers' evaluative feedback prompts pre-service teachers to reflect on their scenario script creation, encouraging iterative teaching design experience in advance. Meanwhile, teachers' public adoption of student suggestions embodies a student-centered educational philosophy and models professional ethics (such as respect, inclusiveness, and collaboration), aligning with ideological education requirements like "dedication to work" and "being a role model." Pre-service teachers must consider teaching appropriateness in script creation, addressing ethical issues like educational equity and student needs, thereby cultivating social responsibility and professional ethics among educators.

4.5. Case Study of the AI + "Learn-Research-Apply" Integrated Teaching Model — Taking the "English Bourgeois Revolution" as an Example

Since *Modern World History* knowledge graph course is still under development, this section uses the content on the English Bourgeois Revolution to further elaborate the AI + "Learn-Research-Apply" three-dimensional integrated teaching model.

4.5.1. Teaching Objectives of the English Bourgeois Revolution

Combining the course goals with the content of the English Bourgeois Revolution chapter, the teaching objectives for this section are formulated (see Figure 4).

Knowledge Objectives	Remember the Puritan Movement, the Glorious Revolution, the Bill of Rights, and the execution of Charles I; Understand the economic contradictions, political despotism, and religious struggles underlying the English bourgeois revolution; Comprehend the relationship between parliamentary legislation and the establishment of constitutional monarchy after the Glorious Revolution.
Ability Objectives	Analyze the capitalist nature of the Independents' policies; Apply the principle that the economic base determines the superstructure to outline a mind map of the background of the English bourgeois revolution.
Quality Objectives	Master the basic analytical methods of historical materialism; Cultivate pre-service teachers' sense of educational mission.

Figure 4. Teaching Objectives of the English Bourgeois Revolution.

4.5.2. Teaching Key Points, Difficulties, and Integration of Ideological and Political Education

Table 1 summarizes the core teaching points, challenges, and the integration of ideological and political education within the section on the English Bourgeois Revolution. It highlights key historical interactions, analytical difficulties, and approaches to embedding ideological education through problem-based discussions and practical teaching methods.

Table 1. Teaching Key Points, Difficulties, and Integration of Ideological and Political Education in the English Bourgeois Revolution Section.

Category	Content
Key Points	The interaction of economic, political, and religious factors in the English Bourgeois Revolution; the nature of the Independent Party’s policy practices; the execution of Charles I; the Bill of Rights and the Act of Settlement.
Difficulties	The relationship between parliamentary legislation and the establishment of the constitutional monarchy.
Ideological and Political Education Integration	Apply the principle that the economic base determines the super-structure to analyze the background of the English Bourgeois Revolution; Cultivate pre-service teachers’ sense of educational mission through problem graph discussions and practice teaching methods.

4.5.3. Teaching Design and Implementation

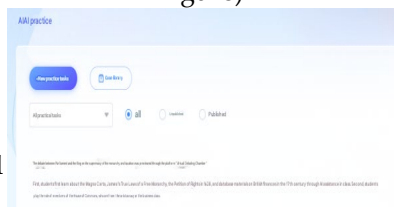
The key teaching points, challenges, and integration of ideological education are summarized in Table 2, which provides a clear overview of the course content and teaching strategies.

Table 2. Pre-Class, In-Class, and Post-Class Activities in the English Bourgeois Revolution Lesson.

Teach- ing Pro- cess	Teacher Activities	Student Activities	Design Inten- tion
Pre-class (Digital Intelli- gence- Empow- ered Self- learning and Data Di- agnos- tics)	Release pre-class learning tasks Analyze chapter pre-test data in Xuexitong to identify students’ potential weaknesses (see figure)	Students use the knowledge graph model to understand the knowledge points, de- scriptions, and structure re- lated to the English Bour- geois Revolution section; watch the courseware and the video of the English Rev- olution timeline; read course resources linked in the knowledge graph, including The Finances of England in the 17th Century, Magna Carta of Liberty, the 1628 Pe- tition of Right, and The True Law of Free Monarchies, and use AI tools to create a mind map; use the AI tutor to an- swer seven questions on the programs and policy prac- tices of the Independents, Presbyterians, and Levellers during the English Bour- geois Revolution; and com- plete the chapter pre-test.	The knowledge graph and AI empower stu- dents’ autono- mous learning, enabling them to address the essential knowledge re- quirements at the cognitive level and gather historical sources for the in-class virtual debate and the- matic discus- sion. This also allows for the assessment of students’ self- learning out- comes, provid- ing teachers with data to



			carry out targeted instruction.
In-class (Deep AI Inter- action and Problem Chain Guid- ance)	Play the video clip of the execution of Charles I and emphasize that Charles I was the first king in modern European history to be publicly tried and executed by beheading, with the second being King Louis XVI of France. Question: How did the Stuart monarchy fail to maintain the “harmonious relationship” between the king and Parliament established during the Tudor period in England?	Watch the video, reflect, and answer questions.	The video format helps create classroom atmosphere and bring students closer to history, laying the groundwork for understanding the background of the English Bourgeois Revolution.
1.Scenario In- troduc- tion			
	Release the AI Practice — Virtual Scenario Debate (as shown in the figure)	Complete the AI Practice— Virtual Debate; Review the textbook and the course materials linked to the knowledge points cited in the virtual debate to generate the answer to the question: The first two Stuart monarchs, James I and Charles I, upheld the doctrine of the divine right of kings, while Parliament insisted that the king was subject to Parliament and the law. Ultimately, both sides contested the supreme authority of the state.	The AI Practice— Virtual Scenario Debate empowers students to engage in autonomous learning within historical contexts, leveraging AI to stimulate their learning potential and cultivate critical thinking and historical empathy. The debate also prepares students for answering subsequent questions and deepening thematic understanding.
2.AI- Powered Virtual Debate	Display the evaluation comments of the student who scored 100 in the debate. Question: What was the ultimate issue contested between Parliament and the monarchy in the struggle over financial matters?		
3. His- torical Source Analysis and Col- labora- tive In- quiry	Provide two historical sources and answer the following questions: Source 1: 65,000 Puritans fled abroad between 1630 and 1640 — Liu Zuochang & Wang Juefei (eds.), World History: Modern History Volume I	Learning groups review the advocacy of the divine right of kings by the Church of England and, through textbooks, understand the Puritans’ demands that initiated the Puritan Movement. They discuss the political effects of the Puritan Movement	Strengthen students’ historical materialism and empirical source literacy, cultivate their ability to analyze issues comprehensively, and, by



Source 2: Among the 574 members elected to the 1640 Parliament's House of Commons, 161 were first-time members, and 167 were short-term parliamentarians. Of these, 330 were local gentry, i.e., the new aristocracy. Most were merchants or descendants of small landowners, with one-third supporting the Royalist faction. — Li Qirong (ed.), *World History: Modern Volume*

and conclude that the establishment of a democratic church threatened the monarch's supreme status at the top of the ecclesiastical hierarchy pyramid. Outstanding mind maps from groups are presented, and other groups evaluate their logical coherence.

combining known historical facts, teacher explanations, and tiered questioning, help them understand the background of the outbreak of the English Bourgeois Revolution.

Question 1: What were the political reasons behind the English king's suppression of the Puritans?

Question 2: Using the principle that the economic base determines the superstructure, analyze the background of the English Bourgeois Revolution and create a mind map.

Display the chapter pre-test statistical results;

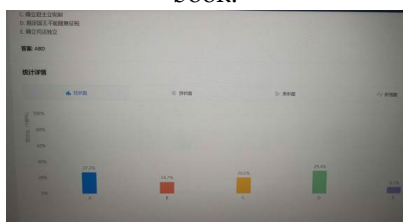
Commend that 88.1% of students efficiently resolved doubts by consulting knowledge points with the AI tutor;

Briefly outline the execution of Charles I and the establishment of the English Commonwealth, teaching the Independent Republic period's land reform policies from the perspective of the transition from feudal land ownership to a capitalist land system; Present the statistics of answer choices for the question with a 16.7% accuracy rate (as shown in the figure), and pose the question: Why were options C and E not chosen? Please answer based on the content in the second paragraph on page 110 of the textbook.

4. Chapter Pre-test Review and Explanation

The textbook emphasizes that the Bill of Rights and a series of parliamentary acts established the principle of Parliament's supremacy over the monarchy and the independence of the judiciary from royal authority, thereby consolidating the outcomes of the English Revolution as a bourgeois constitutional monarchy. Based on AI-assisted inquiry results, it can be summarized that the Bill of Rights and the Act of Settlement laid the foundational framework for judicial independence in England.

Precisely identify learning difficulties and optimize teaching strategies; Strengthen positive learning behaviors, highlight role models, and foster a healthy competitive atmosphere; Address problems through a "textbook + AI" approach, promoting students' shift from passive reception to active knowledge construction.



Question: Which laws initially established the independence of the British judiciary from the monarchy?

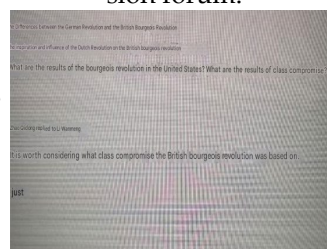
Students are required to use AI to consult the Act of Toleration and the Act of Settlement.

Guide students to construct logical chains of historical event development and identify weak links within these chains.

Teacher feed-
back at the end
of and after class
— their com-

In this lesson, we studied the English Bourgeois Revolution through the framework of “background – measures by revolutionary factions – revolutionary outcomes.” What additional questions do you think should be included to better help students construct a comprehensive knowledge system of this section on the English Bourgeois Revolution?

Students express their views in the problem graph discussion forum.



ments will be incorporated into the optimization of the problem graph — helps students experience the positive emotional interaction of teaching and learning, further stimulating their motivation and supporting a virtuous cycle of “learning and research”.

The virtuous cycle of learning, research, and application: Feedback from frontline teachers on students' ability to transfer historical knowledge enables pre-service teachers to experience teaching design iteration

Assign chapter post-test

Post-class Extended Practice

Group tasks

AI+Creation of Historical Drama

Task Intent: The complex ideological conflicts behind the execution of King Charles I shaped the contemporary perception of the monarchy and influenced the establishment of the British constitutional monarchy. Therefore, it is necessary to deepen the understanding of this event while

Showcase of Outstanding Group Results

	<p>preliminarily cultivating the ability to transform historical knowledge into teaching resources for secondary school history education.</p> <p>The event also preliminarily cultivates the ability to transform historical knowledge into teaching resources for secondary school history education.</p> <p>Feedback from frontline master teachers:</p> <p>Strengths: The script has a clear framework and a well-defined historical mainline, effectively reconstructing the core conflict of the trial. It is suitable as a draft for a junior high school history educational scenario play.</p> <p>Areas for improvement:</p> <p>Historical accuracy: Consistency in the naming of characters is required.</p> <p>Language expression and character portrayal: Dialogue style should align more closely with the historical context; the emotional tension of Charles I's speech before execution is insufficient, and it is recommended to enhance the script by incorporating first-hand legal references to reinforce the legitimacy of the court.</p> <p>Dramatic structure: It is suggested to add the opposing stances of the Parliamentary faction and the Royalists.</p> <p>Guided by the AI-powered "Learning-Research-Application" integrated teaching model, this lesson fully harnessed students' active learning agency. Autonomous learning enabled by digital intelligence technology before and after class was a key factor, transforming the classroom into a space for students to reconstruct their understanding based on their learning progress and to enhance their critical thinking</p>	<p>in advance, and also prompts the course team to optimize group tasks and improve the resource development of the knowledge graph course.</p>
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skills. One area for improvement is to encourage students to increase the efficiency of their autonomous learning and their ability to solve essential knowledge-based questions.

5. Innovation Outcomes and Experiences

Based on the school-level knowledge graph course construction project initiated at the end of 2024, the teaching team simultaneously carried out systematic exploration of innovative teaching model practices. The phased outcomes and experiences of the teaching innovation model are summarized below using the content of the English Bourgeois Revolution section.

5.1. Teaching Model Reform Activates Students' Autonomous Learning Ability

- 1) As shown in Figure 5, students submitted excellent electronic portfolios of their autonomous learning.

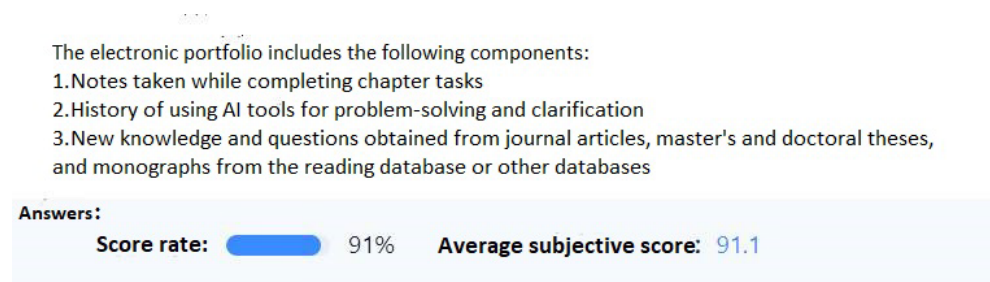


Figure 5. Statistical Review of Electronic Portfolios for Autonomous Learning.

- 2) Students frequently used the AI tutor.

According to Figure 6, from March to early May, the average monthly visitors reached 83, with a total of 643 sessions.

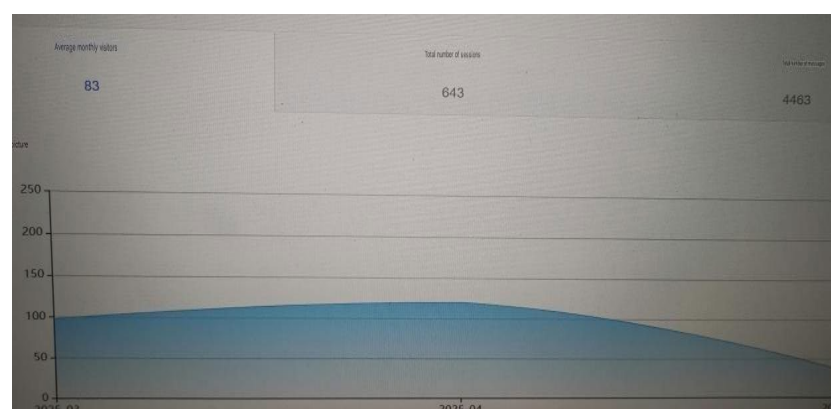


Figure 6. Statistics of Student Usage of AI Tutor from March to May This Semester.

- 3) Good records of teaching resource readership

Compared with the online and offline teaching in 2022 and 2023, the number of times students accessed course resources linked to the knowledge graph has significantly increased under the AI-powered "Learning-Research-Application" integrated teaching model. For example, the readership of various resources related to the English Bourgeois

Revolution in the database was only in the single digits in 2022 and 2023; after the construction of the knowledge graph course in 2024 and the exploration of the AI-enabled integrated teaching model in 2025, the readership of resources associated with key and difficult knowledge points rose to 30–40 times.

5.2. Ai-Empowered Higher-Order Thinking Teaching Stimulates Deep Student Engagement

Although 82.9% of students initially expected the course to be mainly lecture-based, under the guidance of the AI-powered Learning-Research-Application three-dimensional integrated model, AI technology met students' expectations for digital intelligence applications while reducing cognitive load. The reconstruction of the formative assessment system motivated students to participate in virtual debates, discussions in the problem graph forum, and group tasks. Positive feedback from middle school teachers and subject teachers fostered positive emotional interaction between teachers and students. Students are gradually adapting to the transition from "one-way knowledge transmission" to a "multidimensional interactive intelligent learning ecosystem." As shown in Figure 7, the participation rate in classroom problem map discussions reached 76%. Among those in virtual debates, 79% scored above 85, indicating students appreciate the practical teaching methods promoted by their teachers.

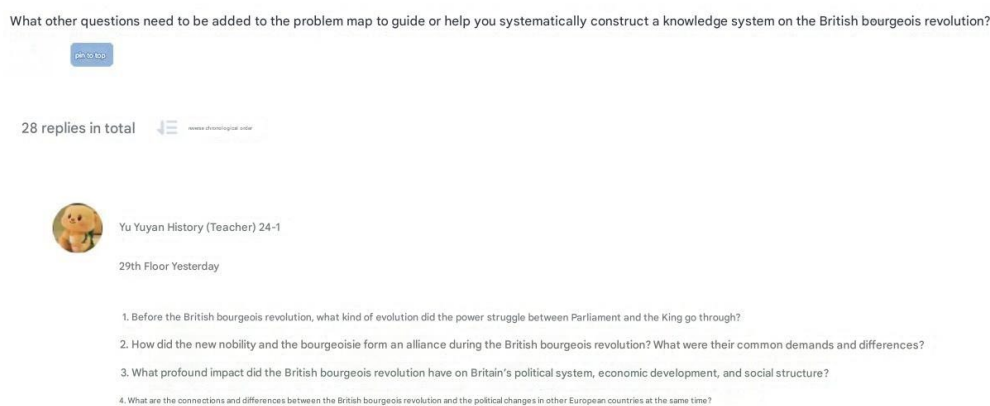


Figure 7. Number of Students Participating in Discussions in the Problem Graph Forum.

5.3. Achievement of Course Objectives and Course Development Outcomes

1) Knowledge Objectives

Based on the combined data from the chapter pre-test and post-test, the overall mastery rate of the English Bourgeois Revolution is 82.59%. Notably, as shown in Figure 8, students' mastery of the knowledge point regarding the preliminary establishment of the English constitutional monarchy significantly improved from 16.7% in the pre-test to 98.21% in the post-test.

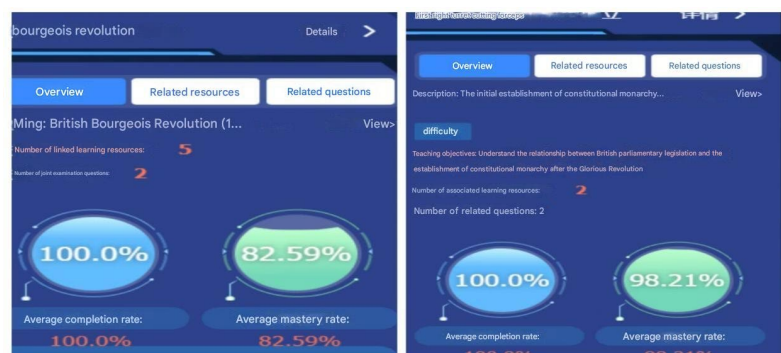


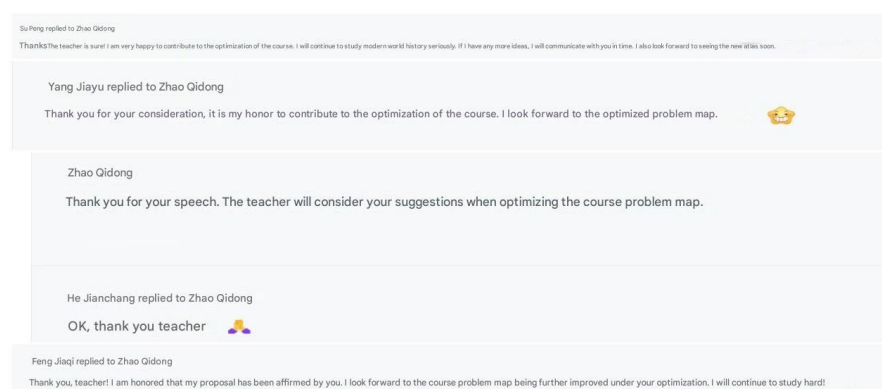
Figure 8. Mastery Rates of Knowledge Points Related to the English Bourgeois Revolution.

2) Ability Objectives

One of the evaluation criteria in AI practice is the ability to analyze the reasonableness and limitations of opposing viewpoints, integrate historical analysis with argumentation to support one's own position, and refute the opposing stance. This assesses higher-order thinking skills such as critical thinking and historical empathy. According to the personalized intelligent assessment results from the AI practice on the Learning Tong platform, 40% of students scored above 80 points in the excellent range, and 60% achieved full marks on this evaluation criterion. This score distribution meets the teaching expectations. Additionally, frontline master teachers gave constructive feedback on students' AI-assisted production of historical scenario plays, noting that the integration of "learning and application" cultivated students' applied abilities.

3) Quality Objectives

Students constructed mind maps of the background of the English Bourgeois Revolution using historical materialism. Only one group achieved excellent results, while other groups performed well overall, indicating that the ideological and political education goals of the course were basically achieved. During the collaborative "learning and research" process between teachers and students, student feedback demonstrated a positive understanding of the sense of educational mission (see Figure 9).

**Figure 9.** Screenshot of Teacher-Student Interaction in the Problem Graph Discussion Forum.

4) Course Development Outcomes

In 2024, members of the course team were awarded the third prize in the AI-Powered Teaching Innovation Competition. Currently, the school-level knowledge graph course led by the team in 2024 has been included as a provincial-level quality engineering cultivation project.

6. Conclusion

In summary, addressing the challenges of insufficient autonomous learning willingness and ability among pre-service history teachers, the course team has been developing a blended online and offline curriculum since 2021. In response to student feedback regarding cognitive overload, the team critically reflected on their teaching model and successfully applied for the 2024 school-level smart course project focused on knowledge graph construction.

Within the development of the knowledge graph course, the team proposed an AI-enabled three-dimensional integrated teaching model encompassing learning, research, and application, which has already yielded promising phased results. Moving forward, the course team aims to actively secure resources to evolve the current teaching model

into an AI-powered collaborative framework that integrates government, industry, academia, research, and application. The ultimate goal is to establish this course as a high-quality intelligent curriculum that effectively supports the comprehensive development of students.

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