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Innovative Paths of Integrating Libraries, Archives, and Museums to Empower History Education from the Perspective of Artificial Intelligence——Practical Exploration Based on Communication University of Nanjing

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Abstract: Under the background of the in-depth advancement of the national cultural digitalization strategy and the "Four Histories" education, the integrated development of libraries, archives, and museums (LAM) has become an important path to improve the quality and effectiveness of history education. Taking the practice of "AI Empowering History Education" at Communication University of Nanjing as the research object, this paper constructs an integrated framework of "technology-driven—resource integration—scene reconstruction—ecological collaboration", and systematically analyzes how artificial intelligence technology solves problems such as resource silos, superficial experience, and single mode in history education. Research shows that building historical knowledge graphs, developing immersive virtual scenes, and designing participatory creation tasks through AI technology can realize the in-depth integration of LAM resources and the three-dimensional release of educational value. This model provides a replicable "Nanjing Plan" for the transformation of history education from fragmented resources to systematic integration and from one-way communication to in-depth interaction in the new era, and also offers practical reference for the implementation of the urban cultural digitalization strategy in the field of education.

Keywords: Artificial Intelligence; Integration of libraries, archives, and museums; History education

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1. Introduction: Era challenges and AI opportunities in history education

Currently, history education faces three practical dilemmas: First, fragmented resources. Second, superficial experience. Third, homogenized education.[1].In this context, the development of artificial intelligence technology has provided new possibilities for the innovation of history education. The School of Marxism of Communication University of Nanjing has taken the course "History Around Us——Approaching Nanjing" as a test field to

explore a trinity model of "AI technology + local historical culture + ideological and political education". Through measures such as building dynamic knowledge graphs, developing virtual teaching scenes, and designing AI-assisted creation tasks, it has realized the organic integration of LAM resources and significantly improved educational effects. This practice puts forward a core proposition: from the perspective of artificial intelligence, how to promote the cross-border integration of LAM resources through technological empowerment and build a more attractive and effective.

2. Heoretical exploration: A three-dimensional model of AI-driven LAM integration

2.1. Technology-driven: AI as the "Digital Nerve" of integration

With its powerful functions, artificial intelligence technology has re-established a solid technical foundation for LAM integration, which is specifically realized through the following three functions [2].

First, resource connection: Building historical knowledge graphs based on Natural Language Processing (NP) technology has become a key link to connect heterogeneous resources scattered in LAM institutions. In this process, NLP technology can conduct in-depth analysis of various text information and mine the semantic relationships contained therein [3]. Then, using knowledge graph construction technology, these resources from different institutions are closely connected with "figures—events—spirit" as the dimensions [4].

Second, experience enhancement: The use of VR/AR technology can effectively break through the limitations of physical space and build "digital twin" scenes [5]. At the same time, by simulating environmental sound effects and the conversations of indoor characters, students can feel as if they are personally on the scene, truly experiencing the immersion brought by historical scenes, making the learning of historical knowledge no longer limited to the words in books, but more intuitive, vivid and perceptible.

Third, intelligent teaching entity: With the help of machine learning algorithms, personalized teaching support can be realized to provide students with accurate learning resource recommendations. Through this precise push, it meets the personalized learning needs of students, improves learning efficiency and effectiveness, and realizes the intelligence and precision of the teaching process.

Technology-driven provides the underlying support for LAM integration, while resource integration is a key link to achieve in-depth integration on this basis. The two complement each other and jointly build an AI-driven integration framework.

2.2. Resource integration: From discrete collections to knowledge networks

The core task of LAM integration is to break the barriers between resources and build a dynamically developing knowledge system, which is mainly realized through the following three aspects [6].

First, digital transformation of multi-source heterogeneous resources: Carry out systematic digital collection of historical resources in Nanjing, involving rich resources from multiple institutions such as archives, libraries, and museums. After this series of digital collection work, a digital resource library with a unified format is formed, laying a solid foundation for the subsequent resource integration and utilization [7].

Second, semantic annotation and knowledge graph construction: Establish a "three-level label" annotation system to provide strong support for accurate resource retrieval and in-depth connection [8]. The first-level label is determined as the spiritual core; the second-level label covers historical elements; the third-level label focuses on educational application scenarios. Through the knowledge graph engine, complex algorithms and data mining technologies are used to conduct correlation analysis on the annotated resources. Through this associated retrieval, the organic connection of "from cultural relics to documents, from events to spirits" is realized, which

greatly improves the utilization efficiency of resources.

Third, scene reconstruction and resource reorganization: Develop a visual timeline tool to match Nanjing's historical events with LAM resources in time and space. When students use the visual timeline tool, they can dynamically view documents, archives and cultural relics of different historical periods by sliding the timeline [9]. During the viewing process, the system will display relevant resources reasonably according to the chronological order and event logic, enabling students to form a coherent historical cognition, as if traveling through history along the time context, and comprehensively and in-depth understanding the marks of history in Nanjing.

Of course, this kind of scene reconstruction is not a simple superposition of technologies, but a learning experience design based on cognitive science [10], realizing "the same scene, diverse experiences", and making technical tools a conversational medium supporting diverse cognitive styles.

3. Practical exploration: The innovative integration path of the Communication University of Nanjing

In the previous history education and teaching of the Communication University of Nanjing, there were many practical dilemmas. On the one hand, the traditional teaching model was dominated by knowledge indoctrination, and students lacked learning interest and in-depth experience, making it difficult to truly understand the connotation of history. On the other hand, as a city with rich historical resources, Nanjing failed to fully tap and utilize local historical resources. Teaching resources were scattered and single in form, unable to form a systematic teaching system.

3.1. Innovative measures

3.1.1. Concept and idea innovation: Trinity collaborative education

Break the single dimension of traditional history education and put forward the trinity collaborative education concept of "AI technology + local red culture + ideological and political education". Organically combine the advantages of AI technology, the unique charm of Nanjing's local red culture and the goals of ideological and political education. With the help of AI technology to break the limitations of time and space, take local red culture as teaching materials, realize the multi-dimensional, scene-based and personalized expression of ideological and political education, and cultivate new-era talents with both a historical sense of mission and technical literacy.

3.1.2. Method and approach innovation

3.1.2.1. Integration of AI technology into teaching models

Intelligent teaching assistance: For the "online-offline blended teaching" model of the course "History Around Us", build AI-driven teaching functions. By analyzing student online discussion data, push relevant e-book and VR tour links. Application of virtual scenes: Combine the eight red themes in the course to develop immersive teaching scenes.

3.1.2.2. Integration and digitization of historical resources

Construction of red resource library: Fully integrate Nanjing's red cultural resources. Dynamic resource display: Establish resource-associated course video materials, record original texts and academic paper abstracts to form a "knowledge graph". In teaching, generate a visual timeline according to time nodes. For example, in the teaching

of “Glorious Trials and Tribulations——Wang Hebo”, mark key events and historical impacts to assist students in sorting out the character’s life.

3.1.2.3. Design of course textbooks and practical activities

Compilation of characteristic textbooks: Compile history textbooks integrating local red resources with AI elements. Incorporate local cultural resource guidelines into textbooks and add virtual scene expansions. Students can scan the textbooks and ask questions through a mobile APP to obtain answers based on the characters’ life experiences. Design of innovative practical tasks: Design practical tasks from “small” to “large”. Organize students to carry out historical short video creation, requiring groups to shoot micro-videos focusing on “history around us”, and using AI tools to automatically generate background music, subtitles and historical video clips. At the same time, encourage students to use professional knowledge combined with course content to design virtual characters to tell historical stories. Improvement of teachers’ AI teaching capabilities: Design a hierarchical training plan, carry out introductory training on AI tools, and teach basic skills such as VR equipment operation and intelligent teaching platform management. Establish an interdisciplinary collaboration mechanism, form a joint teaching and research team, and hold regular case seminars. Dynamically adjust training content according to teachers’ logs, students’ teaching evaluation data and AI platform analysis reports, forming a closed-loop improvement model of “learning—practice—reflection”.

3.1.3. System and mechanism innovation

Establish a special course management mechanism, form a team composed of college leaders, ideological and political teachers, and counselors, and clarify the responsibilities of each member. At the same time, formulate incentive mechanisms, such as giving teaching achievement awards and bonus points for professional title evaluation to teachers who actively participate in the teaching reform of AI-empowered history education, so as to improve teachers’ enthusiasm for participating in the reform. Main Achievements:

(1) The teaching effect has been significantly improved: According to the research data, it is known that, after introducing AI technology and local red cultural resources, students’ satisfaction with history courses has increased from 60% to 85%. At the cognitive level, online test results show that students’ average mastery of historical knowledge points has increased from 70 points to 80 points. For example, their understanding of knowledge points such as “the background of the Nanjing Negotiations” and “the deeds of Yuhuatai martyrs” has become more in-depth. At the emotional level, the Likert scale survey found that students’ recognition of “revolutionary spirit” and “cultural confidence” has been significantly enhanced, and the proportion of choosing “strongly agree” and “agree” has increased from 65% to 80%.

(2) Students’ comprehensive quality has been improved: In participating in practical tasks such as historical short video creation and virtual character design, students’ innovative thinking and practical ability have been exercised. Up to now, students have created more than 180 historical creative works, some of which have been spread on social media, effectively improving students’ practical and innovative abilities and cultivating their family and country feelings.

(3) The influence of the course has expanded: After achieving good teaching results, it will continue to form a brand of history elective courses recognized by students, and further promote it as a selective compulsory course to help popularize “Four Histories” education.

Next, we will strengthen cooperation with red cultural venues, provide AI guide systems and digital exhibition schemes, promote the dissemination and inheritance of red culture, and provide practical cases and

data support for educational departments to formulate policies related to AI + ideological and political education.

4. Integration strategy: From practical experience to theoretical construction

4.1. Technological integration: Building an AI-empowered resource collaboration chain

Establishing a hierarchical annotation standard system is the basic project to realize technological integration. Following the principles of "historical authenticity—educational adaptability—technical operability", LAM resources are scientifically divided into a three-layer structure [11].

(1) The core layer: focusing on original documents and cultural relics directly related to historical events. This level adopts the "five elements + spiritual anchor" annotation method; NLP technology is also needed to extract mental kernel labels, forming the annotation of "historical event—value connotation".

(2) The associated layer: covering research literature and oral history, adding the dimension of "academic context—method origin" on the basis of basic annotations. This annotation method forms a traceable knowledge production chain from scattered academic research.

(3) The extended layer: including derivative cultural works such as historical novels and films, focusing on annotating the dimension of "reception history—social impact". It is necessary to extract keywords from readers' comments of different eras through sentiment analysis algorithms, and construct an influence graph of "text creation—mass communication—value internalization" combined with data such as circulation and adapted film and television versions.

Through the correlation analysis of three-layer annotation data, the AI system can automatically generate a knowledge recommendation chain of "original historical materials—academic research—cultural communication". For example, when a user queries "Yun Daiying", the system simultaneously pushes his letter manuscripts (core layer), relevant research papers (associated layer), and excerpts from the adapted drama "Youth China" (extended layer).

4.2. Educational innovation: Creating a participatory learning ecology

Construct a "three-dimensional and four-subject" evaluation system, with evaluation subjects including teachers, AI systems, and the public (through online voting). In the knowledge graph drawing link, students need to use visualization tools to connect events, characters, and spiritual elements. Emotional dimension: emotional identity survey + participation analysis. Set 5-level scoring questions, such as "revolutionary spirit and contemporary value", track the duration of independent learning and participation after class, complete the online questionnaire after class, and analyze and judge the degree of emotional investment. Behavioral dimension: quality of practical works + social communication effect. Establish a dual-index system of "creation quality—social radiation". The micro-videos of "history in objects" created by students need to pass the dual review of "historical accuracy" and "expression innovation". At the same time, capture communication data such as forwarding volume and comment keywords through social media.

The multi-subject collaboration of evaluation subjects ensures the objectivity of evaluation: teachers are responsible for the qualitative analysis of the learning process, AI systems provide quantitative data modeling, and the public evaluates communication appeal through online voting. This "professional review + public feedback" mechanism makes the evaluation results in line with academic norms and close to the actual needs of education.

4.3. Innovation of cross-border collaboration mechanism under institutional guarantee

LAM breaks cross-institutional barriers through standard consultation, resource co-construction, and benefit sharing [12]. At the resource construction level, archives are responsible for the digitization of revolutionary documents, libraries are responsible for the indexing of academic resources, museums complete the 3D scanning of cultural relics, and finally realize cross-database connection through the knowledge graph engine [13].In terms of copyright management, resource usage scenarios are divided into three categories: teaching and research (non-commercial authorization), exhibition and display (source indication required), and public communication (paid authorization required). In the interdisciplinary collaboration case, broadcasting majors, programming majors, and animation majors cooperate, and the final digital exhibits are not only used for classroom teaching but also included in the virtual exhibition hall by the memorial hall, realizing a virtuous cycle of "learning output—social application—resource feedback".

5. Conclusion

The essence of LAM integration empowering history education is to realize resource integration, scene innovation, and educational ecological collaboration through technological reconstruction [14]. The practice of Communication University of Nanjing has proved that AI technology as a "technical adhesive", virtual and real scenes as a "perception enhancer", and cross-border mechanisms as a "system guarantee" can promote history education from fragmented resources to systematic integration and from one-way indoctrination to in-depth interaction. In the future, further exploration can be carried out, such as building a centralized platform for regional historical and cultural resources. Formulate unified semantic annotation standards, integrate LAM historical resources, form a dynamically updatable database, and provide standardized resource interfaces for primary and secondary schools and grass-roots educational institutions [15]. Establish a creative achievement feedback mechanism, improve the chain of "teacher-student creation—institutional certification—social circulation". For example, include AI red short videos produced by students into the LAM digital resource library, and through the closed loop of "learning—creation—communication", realize the innovative inheritance of red genes in the digital age.

Only by making the documents in libraries "come alive", the historical materials in archives "move", and the cultural relics in museums "speak", can history education truly rise from knowledge transmission to life dialogue, continue the red blood in the wave of digitization, and cultivate new-era talents who are responsible for national rejuvenation.

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