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# "Cultural Reflection and Enrichment": Innovation and Practice in Teaching the Course of Chinese and Foreign Architectural History Based on the Cultivation of Digital and Intelligent Talents

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**Abstract:** As a local applied undergraduate university, our institution adheres to the characteristic of "Information Technology +" and cultivates applied talents for the Environmental Design major. In response to obstacles in cognitive transfer, setbacks in theoretical and practical application, and challenges in fostering digital and intelligent thinking, the course "Chinese and Foreign Architectural History" is grounded in the integration of learning and application, practical orientation, and the application of learned knowledge. Through the study of architectural historical and theoretical knowledge, the course strengthens key propositions and design techniques related to architectural theories, cultivates historical thinking abilities, enhances humanistic qualities, and guides students in shaping correct outlooks on life, the world, and values. Starting from teaching objectives, the course has formed a "Cultural Reflection and Enrichment" teaching model for architectural history and theory based on the cultivation of digital and intelligent talents. Through reforms, remarkable results have been achieved, with high goal attainment and student satisfaction, as well as abundant construction achievements. The course has guided students to win over 50 awards in competitions, secured national-level innovation and entrepreneurship project approvals, and obtained two provincial-level scientific research project approvals, among other accomplishments.

**Keywords:** Curriculum ideological and political education; AI teaching; Digital and intelligent

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## 1. Basic course information: Precise positioning and anchoring digital and intelligent cultivation needs

"Chinese and Foreign Architectural History" is a foundational course for sophomores majoring in Environmental Design, consisting of 2 credits and 32 class hours of pure theoretical instruction. The course

utilizes the "13th Five-Year Plan" textbook compiled by Zhang Xinyi, with core objectives centered on "sorting out the development trajectory of architecture, exploring cultural connotations, and cultivating awareness of heritage protection." The course has undergone three stages of iterative development: "traditional lecture—digital assistance—integration of digital and intelligent technologies." Relying on platforms such as Chaoxing Learning Pass, virtual reality platforms, and AI tools, it has constructed the "Cultural Mirror Nourishment" teaching system, forming a distinctive model that "empowers historical cognition through digital and intelligent technologies and nurtures design thinking through cultural inheritance" [1]. Aligned with the requirements of the "New Liberal Arts" initiative, the course addresses the challenges of "abstract concepts that are difficult to understand, cultural heritage that is hard to pass on, and skills that are tough to translate" in architectural history theory through digital and intelligent tools. It cultivates students' comprehensive abilities to "analyze stylistic evolution, apply traditional elements, and inherit cultural spirit", thereby producing innovative talents with both cultural heritage and digital and intelligent skills for the field of environmental design.

Since its inception in 2019, the course has undergone gradual iterations. The course offered to students of the 2020 cohort was titled "History of Chinese Architecture", while students from the 2019, 2021, and 2022 cohorts were taught "History of Chinese and Foreign Architecture." This course has been offered five times on the Chaoxing Learning Pass platform, marking a transition from traditional courses to those deeply integrated with information technology and then to digital and intelligent technology courses.

## 2. Course teaching objectives: Strengthening knowledge connection and cultural penetration

Based on the talent cultivation program for environmental design majors and precise learning situation analysis, this course, starting from Bloom's cognitive theory, helps students bridge the gap between theory and visual cognition [2]. Although students possess basic knowledge of architectural history, they face three challenges: first, their knowledge foundation is "not well-established", with a weak theoretical framework; second, their cognitive abilities struggle with "knowing but finding it hard to act", making it difficult to translate historical theory into design thinking; third, their learning characteristics are marked by "difficulty in believing and comprehending", relying on intuitive teaching and showing weak willingness for active learning. To address these issues, the course has established teaching objectives centered on a "knowledge + skills + literacy" three-dimensional framework. In terms of knowledge, students should be able to elaborate on the historical context of Chinese and foreign architecture and analyze case studies from the perspectives of aesthetics, layout, and characteristics. In terms of skills, they should be able to integrate design specifications and translate architectural history knowledge into design expressions. In terms of literacy, they should strengthen their awareness of cultural heritage protection and cultural confidence. The teaching focuses on Chinese and foreign architectural systems and stylistic evolution, with an emphasis on the Chinese wooden architectural system and the evolution of foreign architectural styles. The challenges lie in understanding "the cultural logic of the wooden architectural system" and "the relationship between style and socio-cultural contexts"—areas where digital and intelligent means are primarily employed to achieve breakthroughs. Particular emphasis is placed on the ability to apply digital and intelligent tools and the literacy of cultural inheritance, enabling students to analyze ancient architectural materials using AI and sort out the logic of architectural evolution through digital platforms.

Course Objective 1: Students will be able to elucidate the historical context of Chinese and foreign architecture, analyze specific cases from perspectives such as aesthetic value, spatial layout, and architectural features, and possess a high level of architectural cultural literacy as well as the aesthetic ability to recognize, understand, and appreciate Chinese and foreign architecture.

Course Objective 2: Students will understand the theories and methods of construction in Chinese and foreign architecture, be capable of analyzing case design techniques and concepts, express designs according to design specifications while incorporating architectural characteristics, and possess innovative awareness and spirit.

Course Objective 3: Students will focus on interdisciplinary integration, possess comprehensive knowledge capabilities across multiple disciplines such as architecture, history, philosophy, and art, be able to analyze and evaluate the application of ancient architectural materials, and have an awareness of cultural heritage preservation and protection.

## 3. Background of teaching innovation and breakthrough of "pain points"

This course is designed for sophomore undergraduate students majoring in environmental design. These students are enthusiastic about expression and enjoy teamwork; most of them have a positive attitude towards learning and strive for excellence; they possess a certain degree of self-learning ability but are relatively weak in analyzing and solving problems, often feeling intimidated by difficulties and lacking the craftsmanship spirit of relentless pursuit of truth; students hope to master relevant theoretical knowledge through this course and apply it in combination with other practical courses to participate in academic competitions.

### 3.1. Core pain points

Pain Point 1: Insufficient visualization of knowledge. Traditional lectures struggle to present the spatial relationships and technical details of ancient architecture. For instance, students lack an intuitive understanding of the mechanical principles behind the 54 types of dougong brackets in the Yingxian Wooden Pagoda and have a one-sided understanding of the relationship between Greek column styles and polis culture.

Pain Point 2: Disconnection in cultural inheritance. Students passively memorize elements such as "upturned eaves" and "caisson patterns" but fail to grasp the underlying philosophical concept of harmony between humanity and nature, let alone translate it into modern design language.

Pain Point 3: Weak digital and intelligent capabilities result in students lacking the ability to utilize AI tools to analyze architectural styles and simulate spatial scales, creating a disconnect from the industry's demands for digital design and cultural IP transformation.

### 3.2. Innovation positioning

With "digital and intelligent tools as the bridge and cultural heritage as the soul", we aim to establish a teaching model that integrates "AI throughout the entire process and interdisciplinary practice", achieving three major breakthroughs:

Breakthrough 1: Visualizing abstract knowledge by using VR and AI modeling to restore the spatial and technical details of ancient architecture;

Breakthrough 2: Contextualizing cultural connotations by establishing connections between architecture,

history, and spirit through digital resource libraries and ideological and political case studies;

Breakthrough 3: Practicing skill development in real-world scenarios by combining AI design tools to achieve a closed-loop practice of "modern translation of traditional elements."

# 4. Innovative approaches and measures to address the "pain points" in course teaching

## 4.1. Constructing a "three-dimensional digital and intelligent knowledge graph" to strengthen knowledge connection and cultural infiltration

### 4.1.1. Knowledge graph linkage

Collaborate with courses such as "Introduction to Architectural Design" and "Digital Environmental Design Representation Techniques" to build a three-dimensional graph of architectural styles, technical characteristics, and cultural contexts. For example, when inputting the Tang Dynasty's Foguang Temple, AI automatically associates it with wooden beam-raising structures, the spread of Buddhist culture, and the case study of Japan's Toshodaiji Temple drawing inspiration from it; for Shanxi's cave dwellings, the graph simultaneously presents the geographical features of the Loess Plateau, the insulation principles of earth architecture, and case studies of traditional residential renovations in rural revitalization efforts [3].

### 4.1.2. Dynamic optimization of problem graphs

Generate a problem chain of high-frequency errors, case analyses, and extended resources based on the AI question bank of Chaoxing Learning Platform. For example, in response to typical incorrect answers regarding why a large number of ancient buildings are preserved in Shanxi, AI automatically delivers supplementary materials on the role of geographical barriers and the protection efforts of Shanxi merchants during the Ming and Qing dynasties, and visualizes the core viewpoints using word clouds. For confusing points about the differences between Baroque and Rococo styles, AI generates a comparative chart, highlighting differences in the degree of decorative complexity, color preferences, and social backgrounds.

### 4.1.3. Deep integration of the ideological and political spectrum

Three key ideological and political elements—cultural confidence, craftsmanship spirit, and heritage protection—are explored to form an infiltration pathway of "case—tool—practice." By leveraging the case of the translation and protection of Shikumen buildings in Shanghai on the Xuexi Qiangguo platform, combined with an AI-generated timeline of ancient Chinese architectural protection, students' awareness of living heritage transmission is enhanced. When analyzing the 900-year earthquake-resistant case of the Yingxian Wooden Pagoda, a documentary about contemporary engineers restoring the dougong (interlocking wooden brackets) is simultaneously delivered to cultivate a professional spirit of striving for excellence.

## 4.2. Innovate the AI-empowered teaching model throughout the entire process, achieving a closed loop from pre-class to in-class to post-class

### 4.2.1. Pre-class: AI-guided learning for precise doubt resolution

VR Preview: Students can virtually explore the Mogao Caves through the digital resource library of the Dunhuang Academy, use AI to annotate architectural elements in the murals, and automatically generate reports on their personal knowledge gaps. Smart Assessment: The Chaoxing platform delivers AI quizzes on

identifying ancient Greek column styles, with incorrect answers automatically linked to remedial resources such as animations on column proportions and analyses of temple functions. Cultural Warm-Up: Using "Ji Meng AI", students generate variations of caisson ceiling patterns. By entering keywords such as "Tang Dynasty + geometric patterns", they can gain a preliminary understanding of the modern translation logic of traditional patterns.

#### 4.2.2. In-class: Digital and intelligent interaction to deepen understanding

Immersive Analysis: Through a virtual reality platform, students can "disassemble" the Yingxian Wooden Pagoda, observe the hidden-layer structures at 360 degrees, and use AI to calculate in real-time the dispersion effect of bamboo joint principles on seismic forces, visualizing structural aesthetics. AI-Assisted Discussion: Around the relationship between the layout of the Acropolis of Athens and citizens' lives, the Chaoxing platform initiates group discussions, with AI summarizing viewpoints in real-time and generating a spectrum of associations between religious spaces, public activities, and democratic spirit. Cross-Temporal Comparison: AI digital avatars simulate a dialogue between Vitruvius and Li Jie, comparing the technical records in "De Architectura" and the "Yingzao Fashi" through virtual scenarios, highlighting differences in architectural thought between the East and West [4].

#### 4.2.3. After-class: Interdisciplinary practice transformation

Digital Modeling Practice: In conjunction with the course "Digital Environmental Representation Techniques", students use SketchUp (SU) to model "Bayu Stilted Houses." AI plugins automatically verify the proportions of cantilevered structures and mortise-and-tenon wooden joints, and generate reports on the extraction of traditional elements. Cultural IP Design: Using AI tools, students transform the dome of the ancient Roman Pantheon into modern lamp designs, requiring the retention of core elements such as the dome's geometric proportions and lighting effects, and submit explanations of cultural translation. Heritage Protection Simulation: Students participate in the restoration of grotto architecture on the Digital Cave Scriptures Platform, with AI comparing the work to the original and scoring it, focusing on the accuracy of the restoration of architectural elements in murals.

### 4.3. Developing a "BOPPPS" teaching process to bridge "cognitive-practical-innovative" competencies

Using the BOPPPS blended teaching model as a framework, our core innovation lies in the full integration of AI and the linkage of digital and intelligent resources. The focus is on constructing an AI-empowered BOPPPS blended teaching model. We don't just deliver micro-lectures; we also have AI serve as a preview guide. In terms of teaching methods, AI empowers "six-dimensional interaction", breaking through the limitations of traditional lecture methods. We integrate six methods and embed digital and intelligent tools [5].

### 4.4. Constructing a diverse digital and intelligent evaluation system to achieve comprehensive "process + outcome" assessment

#### 4.4.1. Process evaluation (50%)

AI Tracking: Chaoxing Learning Platform records VR preview durations, AI assessment accuracy rates, and discussion contributions, automatically generating learning behavior analysis reports. Practical Tasks: These include AI-generated caisson patterns (10%), VR spatial scale simulations (15%), and interdisciplinary

modeling (25%), with a focus on assessing cultural understanding and the application of digital and intelligent tools.

#### 4.4.2. Summative evaluation (50%)

Comprehensive Case Analysis: Using AI, students generate buildings in ambiguous styles, such as neoclassical facades, and are required to analyze their historical origins and innovative points. Cultural Translation Design: Students submit modern design proposals for traditional elements, which must include the AI-assisted element extraction process and explanations of cultural connotations.

#### 4.4.3. One-vote veto system for moral education

Attitudes towards heritage conservation and teamwork spirit are incorporated into the evaluation criteria. Students who approach virtual restoration perfunctorily or deny the value of traditional culture during discussions will be disqualified from merit-based evaluations.

## 5. Teaching innovation achievements and characteristics: Digital and intelligent innovation with continuous optimization

### 5.1. Highlights of achievements

Student Competence Enhancement: Over the past three years, students have won 31 awards related to "integrating traditional elements into project design outcomes" in the National College Digital Art and Design Competition. Additionally, two research topics related to "digital conservation of ancient architecture" have been selected for university-level innovation and entrepreneurship projects.

Resource Development Breakthroughs: A digital and intelligent resource library of Chinese and foreign architecture has been established, containing 20 VR models, over 30 AI case analyses, and 30 ideological and political cases. This library has been referenced and utilized by one sister institution. Expanded Social Impact: In collaboration with local cultural and tourism departments, a public welfare project titled "Digital Conservation of Bayu Folk Houses" has been launched. Students have completed indoor and outdoor landscape design drawings for four traditional folk houses, receiving coverage from local media.

### 5.2. Innovative characteristics

Deep Integration of Digital Intelligence and Culture: Rather than simply using technology to display history, AI and VR are employed to establish connections between architecture, culture, and spirit. For example, when analyzing the dougong (interlocking wooden brackets) structure with AI, scenes of craftsmen planing wood and interpretations of the harmony between humanity and nature are simultaneously presented.

The Educational Logic of "Cultural Nourishment": Through a pathway of "cognitive tradition—understanding spirit—transformation and innovation", students are guided to evolve from learners of architectural history into cultural inheritors. For instance, when analyzing the "Forbidden City's central axis", students are encouraged to translate symmetrical aesthetics into sequential design for modern exhibition halls.

Interdisciplinary Collaborative Practice Model: Collaborating with the course "BIM Application and Project Management", the "Digital Documentation of Historical Buildings" project is jointly completed, demonstrating the cross-disciplinary advantages of "New Liberal Arts + New Engineering."

## 6. Future outlook

People will integrate into the China Architectural Heritage Database to expand digital and intelligent case studies of regional architectures, such as Chongqing's stilted buildings and Fujian's earthen buildings, thereby strengthening local cultural identity. People will develop AI tools for architectural style transformation, enabling the automatic matching of traditional elements based on modern design requirements to provide intelligent assistance. Additionally, people will establish a dual-mentorship system combining "corporate mentors" and "inheritors of intangible cultural heritage", aligning students' "cultural translation proposals" with practical projects such as rural revitalization and cultural and creative development.

The digital and intelligent innovation practices in the History of Chinese and Foreign Architecture have demonstrated that technology can serve as a "magnifying glass" and "converter" for cultural inheritance. The course will continue to center on "cultural enrichment through reflection", transforming architectural history and theory from rote learning into immersive experiences, and from knowledge memorization into design DNA. This approach will provide a replicable paradigm for cultivating design talents with cultural roots and innovative capabilities.

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