

Artificial Intelligence Empowers the In-depth Integration of AI into Commercial Space Design Courses

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Abstract:

The research on the in-depth integration of artificial intelligence into commercial space design courses aims to strengthen students' professional foundations, enhance their aesthetic abilities, improve human-AI collaboration skills, and meet the needs of personalized learning. It also seeks to improve students' design efficiency and innovation, provide multiple digital solutions, broaden design thinking, and help them adapt to the digital era and succeed in future work. Three main research methods were employed: literature review, teaching experimental research, and action research to support the realization of the teaching research. Under the empowerment of AI tools throughout the entire process and all elements of the course, both the speed of plan generation and the quality of drawings have significantly improved. In the context of digital education, reforming the teaching model of commercial space design courses helps optimize course content and structure, promoting related curriculum reforms. Ultimately, the constructed teaching model and proposed implementation path can be extended to other courses or institutions.

Keywords:

Artificial Intelligence, Commercial Space Design Courses, Teaching, In-depth Integration

1. Introduction

To embrace the opportunities and challenges brought by digital technologies, countries around the world have successively introduced a series of AI development strategies and plans, focusing on promoting AI transformation in education. The European Commission issued the *Digital Education Action Plan (2021-2027)*. The UK government launched the "Digital Talent Program" to enhance citizens' AI capabilities. The German government emphasizes digital capacity building in vocational education and launched the "Learning Factory 4.0" initiative. The United States focuses on AI talent cultivation, digital infrastructure construction, and the development and utilization of digital resources as key areas of action for AI transformation in education.

The *2024 Government Work Report* particularly emphasized the need to "vigorously develop digital education," a new addition to this year's report. The *14th Five-Year Plan for National Economic and Social Development and the Long-Range*

Objectives Through 2035 calls for accelerating the development of AI and building a Digital China. Therefore, integrating AI education into classroom teaching and accelerating the construction of Digital China and the national AI education strategy is imperative.

A review of extensive literature and cases reveals that there are few practical studies on educational AI cases in China. Most related AI education research analyzes necessity and construction ideas from a macro perspective but lacks implementation paths. In terms of digital design practice: In April 2024, Professor Cai Xinyuan's team at Huazhong University of Science and Technology independently developed the first AI supercomputing platform for higher art education in China, which can generate interior design drawings through AI large models. This can support the practical reform of commercial space design courses in the context of AI in education.

2. Research Objects and Content

This paper focuses on the core course cluster of commercial space design for senior students majoring in environmental design, concentrating on the practice of integrating AI tools into the teaching of commercial space design.

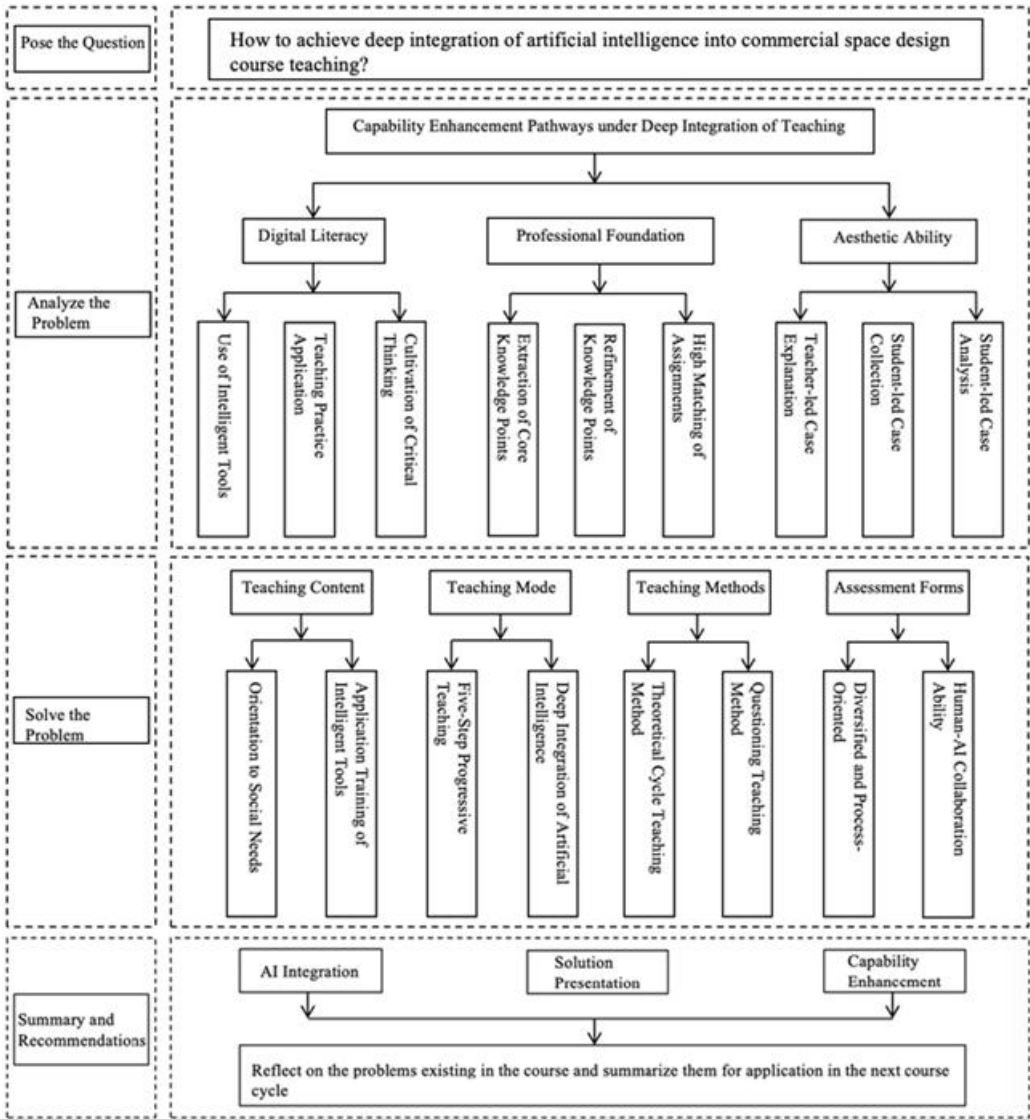


Figure 1. Research Framework.

The starting point is the current lack of effective integration of AI in commercial space design teaching and classrooms. From the perspective of AI, the course structure is built considering the project-based teaching characteristics of the environmental design major. The reform mainly covers teaching content, teaching mode, teaching methods, and assessment forms (see Figure 1).

Under the AI empowerment orientation, the teaching model construction of commercial space design courses follows the action research of “project-driven, technology-empowered, evaluation-led”. A “five-step progressive” teaching model is established. Through “learning by doing and doing by learning”, students' reflective abilities are cultivated, achieving the comprehensive training goals of improving AI literacy, professional foundation, and aesthetic ability.

2.1. Constructing a Project-Based Teaching Model for AI-Empowered Commercial Space Design Courses

Existing literature and practice lack a specific application framework for AI technology in commercial space design, which is a prerequisite for realizing AI-empowered teaching. Therefore, this project will reconstruct an AI-empowered technical application framework for commercial space design, considering the context of the AI transformation of education and the characteristics of project-based teaching. It will define the use of various AI tools in commercial space design and clarify that AI-empowered teaching reform is not simply the superimposition of AI technology (see Figure 2).

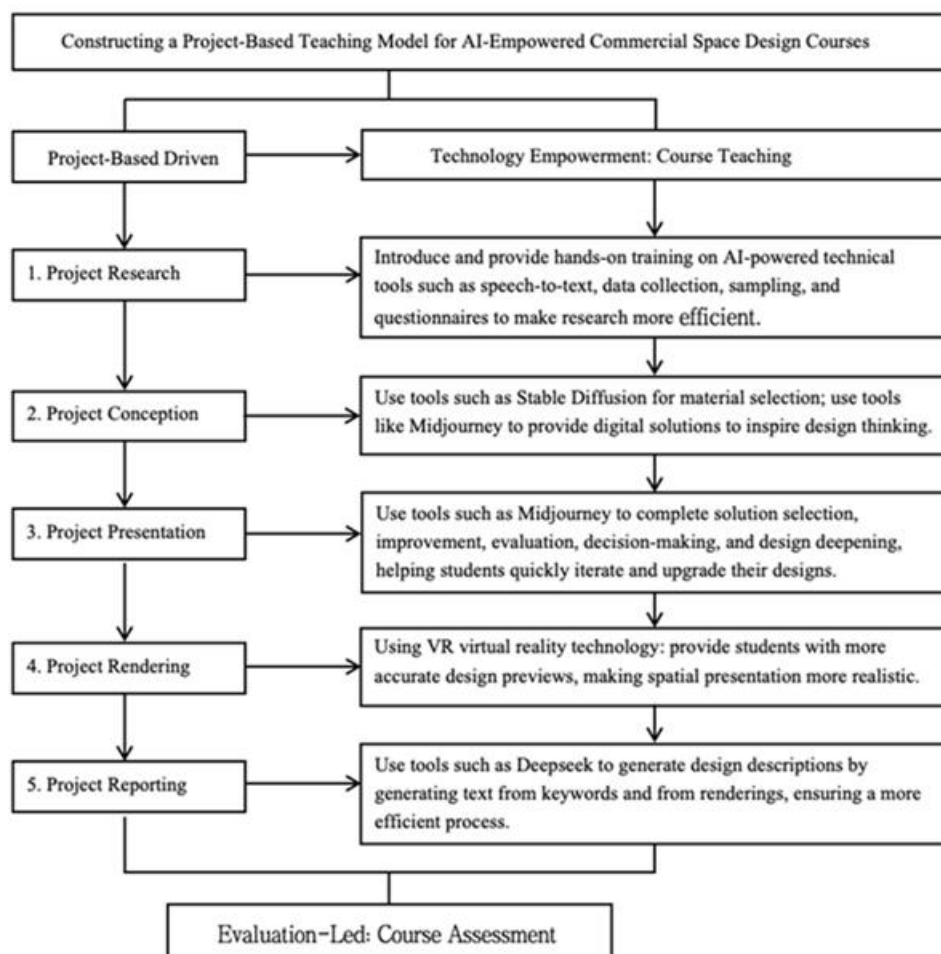


Figure 2. Technology Roadmap.

2.2. Innovating the Teaching Content of AI-Empowered Commercial Space Design Courses

Explore the competency requirements for commercial space design courses in the context of educational AI transformation, and adjust course content according to the course's competency goals and industry needs.

First, identify the core theories most relevant to the industry based on social needs. Decompose and refine the important theories involved in the course into required knowledge points, explaining them in a simple and in-depth manner in class, enabling students to absorb, internalize, and apply the knowledge. This ensures they can rely on a solid professional foundation to meet work needs and possess the ability to correct design drawings. Second, incorporate cutting-edge design video cases to attract students' attention and generate strong interest in the major. Numerous excellent design cases broaden students' horizons and design thinking, cultivate their creative thinking, and enhance their aesthetic literacy, enabling them to select methods generated by AI tools based on aesthetic judgment during the subsequent draft design phase. Finally, integrate the application of AI tools into the course, including concept generation and scene generation, to help students master the use of AI tools.

2.3. Clarifying the Emphasis of AI Tool Requirements at Different Stages of the Teaching Process

Identify the key points at each stage of the commercial space design course and guide students to reasonably apply AI tools in the project process based on these emphases (see Figure 3).

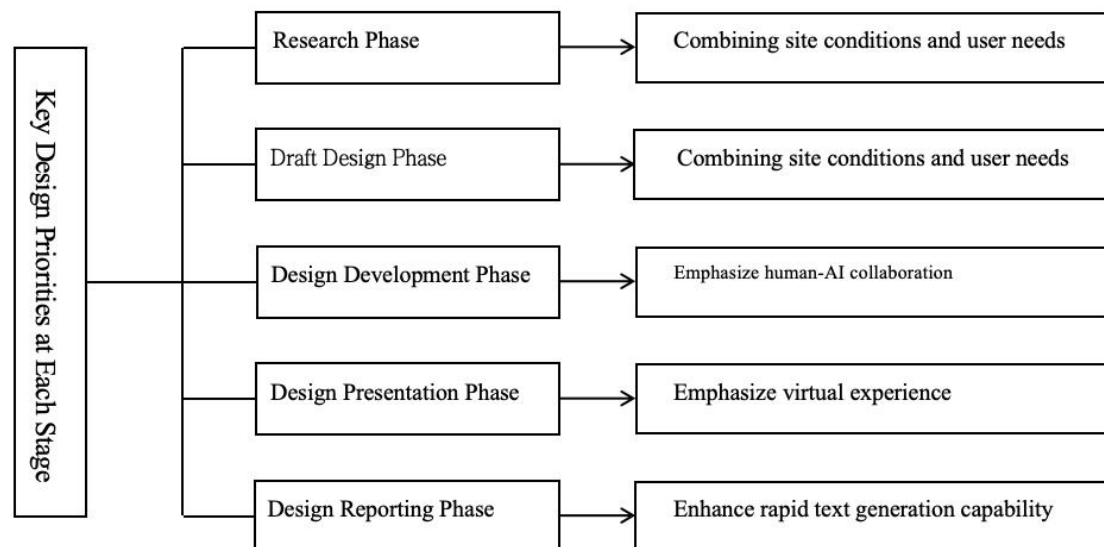


Figure 3. Key Points at Each Design Stage.

Specifically in the course: (1). Research phase: Combine site survey results and user needs, transform the content and methods of research using AI tools, and add sessions explaining AI research techniques and tool usage, along with practical training. (2). Draft design phase: Enhance individual creativity, use AI tools to select new materials and techniques, and propose personalized design requirements. (3). Design development phase: Focus on human-AI collaboration, using AI tools to complete design iterations and upgrades. (4). Design presentation phase: Emphasize virtual experience, using VR technology to present a more intuitive design experience.

5.Design reporting phase:Apply AI tools to generate a draft design description, improving the ability to quickly complete documentation.

2.4. Attempting to Apply New Course Assessment Methods and Evaluate Their Effectiveness

Based on the above teaching reform strategies, explore new assessment content and forms for related courses. Assessment content: Try to assign homework that closely matches the course content so that knowledge points can be digested, implemented, and mastered in time. Assessment forms: Emphasize diversification and process-oriented assessment, try to add practical assessment components such as comparative case analysis and keyword extraction to improve design integration, analysis, and human-AI collaboration abilities. Grading: During the CAD drawing and SU modeling stages, allow students to first use AI to self-check the accuracy and standardization of their drawings, then have the teacher review them, cultivating students' sensitivity to standards.

After the course concludes, hold a summary meeting in time to discuss problems remaining after the reform. Propose modifications based on these problems and optimize them in the next course iteration.

3. Content and Form of Curriculum Reform

Based on the above teaching reforms, adjust the corresponding course assessment content and forms. Explore effective paths and transform students' thinking and learning styles. Try to appropriately increase practical assessment components such as case comparative analysis and case keyword extraction.

3.1. Exploring Effective Paths for AI-Empowered Commercial Space Design Teaching to Enhance Students' AI Literacy

Through the exploration and research of the project, provide a set of feasible and effective teaching strategies to cultivate students' ability to use AI empowerment to solve problems. Guided by AI and combined with AI tools, enhance students' abilities in commercial space research, rational material selection, precise keyword writing, personalized design scheme development, case analysis, and copywriting modification.

3.2. Transforming Students' Thinking and Learning Styles

AI thinking is characterized by creativity and imagination. Commercial space design should fully utilize these characteristics, using AI tools to provide inspiration for design solutions. Improve students' ability to use AI tools to solve problems, stimulate learning interest, and form the habit of flexibly using AI tools to solve commercial space design problems (see Figure 4).

Guide students to gradually shift from “learning with technology” to “learning from technology”; design capability from “informatization” to “AI”; scheme output from 2 to 4 or more sets; presentation from “drawings” to “visualization”; and scheme characteristics from “functionalization” to “personalization”.

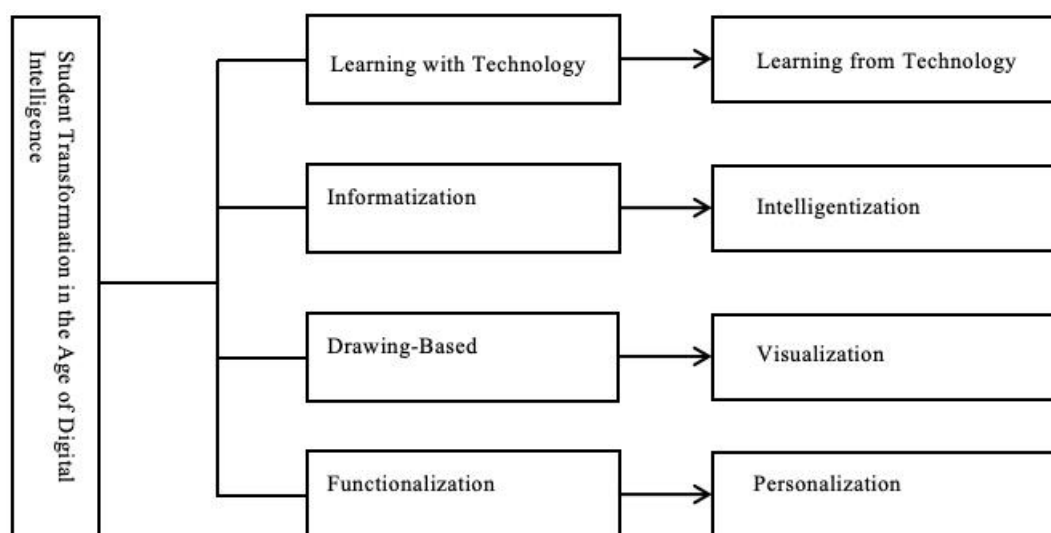


Figure 4. Student Transformation in the Digital Age.

3.3. Forming Typical Cases of AI Transformation in Commercial Space Design Courses

Apply “AI tools” to help AI empower commercial space design courses, promoting the deep integration of commercial space design courses, AI technology, and design processes. Optimize the design process, adjust the time required for each design phase, improve design efficiency, complete preliminary design briefs, and develop personalized draft design requirements. Provide a broad source of creative inspiration for design ideas; provide efficient and innovative solutions for design generation; guarantee the implementation of design solutions; and provide students with more accurate data analysis, creative inspiration, decision support, and scheme presentation. Form typical cases of deep integration into teaching.

4. Specific Implementation Paths for Curriculum Reform

Promote the deep integration of digital technology and design processes in commercial space design courses, providing students with more accurate data analysis, creative inspiration, and decision support. The application of ChatGPT and MJ technology helps students quickly generate text content, design solutions, and suggestions, assisting them in exploring new design styles, forms, and materials. Optimize the design process so students can focus on important creative tasks, decisions, and presentations.

4.1. How to Construct a New Course Content System to Solidify Students’ Professional Foundation and Enhance Aesthetic Ability

The AI integration in the course places higher demands on the mastery of professional fundamentals and aesthetic abilities. Within the framework of commercial space design courses, the connotation and expression of knowledge elements need to be redefined. Compared with AI-integrated commercial space design teaching, the current professional basic content is somewhat weak and insufficiently integrated, and students’ mastery is not solid enough.

In terms of aesthetics, students lack the ability to judge good design solutions and do not know how to analyze them. Therefore, the course content focuses on

explaining basic theoretical parts and researching appropriate teaching methods and models to facilitate better student comprehension. Increase excellent case appreciation, analyzing the strengths and weaknesses of cases in depth. This will improve students' mastery of professional fundamentals and their aesthetic judgment of cases.

4.2. How to Control the Generation of Conditional Constraints and Improve Keyword Relevance

Given the complexity of generation based on conditional constraints, providing highly relevant keywords is the second difficulty of this research. Currently, there is little integration of AI tools, which offer convenience and efficiency in design, completing preliminary design briefs and personalized draft design requirements.

AI tools require continuous experimentation and application to grasp patterns. For example, during the draft design process, how to control personalized generation conditions to achieve personalized solutions and continuously iterate upgrades; during the design development phase, how to continuously improve the relevance of keywords to ensure solutions meet requirements. These are key issues to be addressed.

From the student's perspective: enhance professional skills in line with the times. From the teacher's perspective: keep courses aligned with contemporary developments, ensuring high-quality course progression. From the program's perspective: with the rise of the digital era, digitalization of professional teaching is unstoppable. From the institution's perspective: innovation in teaching models under digitalization can provide reference value for related programs within the university, making the institution more competitive among peer institutions.

5. Conclusions

The research is oriented towards digital education, guided by the action of "project-driven, technology-empowered, evaluation-led" in constructing the teaching model for commercial space design courses, aiming to achieve the comprehensive training goals of improving students' digital literacy, professional foundation, and aesthetic ability.

In commercial space design courses, digital tools are integrated throughout the entire process and all elements. The entire process includes research, draft design, design development, design presentation, and design reporting stages. All elements include furniture, lighting, fabrics, accessories, plants, floral arrangements, artwork, etc.

Artificial intelligence is developing rapidly, with increasingly perfect functions, showing a trend of gradually replacing some designer roles. In this context, enhancing students' skills in using AI tools, cultivating their aesthetic judgment, and solidifying their professional foundation are key to preventing them from being replaced by intelligent tools and enabling them to adapt to social development. Therefore, conducting in-depth research on the deep integration of AI tools and course teaching is of great practical significance.

Conflicts of Interest

The author declares that there is no conflict of interest regarding the publication of this article.

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