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A Brief Discussion on the Innovation and Practice of the "Two Integrations and One Migration + AI" Teaching Model in Environmental Design Courses of Application-oriented Universities

Qiwei Liu

School of Art and Design, Changchun Guanghua University, Changchun, Jilin, 130031, China

ABSTRACT
Driven by the dual forces of digital transformation and industrial reform, environmental design courses in application-oriented universities are confronted with such pain points as the disconnection between practical teaching and industry needs, insufficient cultivation of cultural innovation, and a single evaluation system. Based on the teaching practice of the Environmental Design major at Changchun Guanghua University, this paper proposes an innovative "Two Integrations and One Migration + AI" teaching model. By deeply integrating "integrating projects and competitions into classrooms, and migrating classrooms to practice sites" with AI technology, a three-dimensional teaching system featuring "digital empowerment, cultural soul-casting, and evaluation-feedback linkage" is constructed. Practice has shown that this model effectively improves students' professional skills, cultural innovation capabilities, and sense of social responsibility, realizing a qualitative change in talent training from "skill output" to "value creation". It provides a replicable practical paradigm for the teaching reform of design courses in application-oriented universities.

KEYWORDS
Application-oriented universities; Environmental design; Two Integrations and One Migration; AI empowerment; Teaching model innovation

1 Introduction

With the issuance and implementation of the "Planning Outline for Building an Educational Power (2024—2035)", the digital transformation of education has become a strategic direction for higher education reform. As an interdisciplinary subject integrating artistry and practicality, the development of the environmental design industry presents prominent characteristics of digitization, intelligence, and culturalization. According to the 2023 industry report by MyCOS Research Institute, 73% of design enterprises require practitioners to proficiently master AI design tools. However, traditional environmental design courses have problems such as lagging iteration of practical content, weak cultivation of cultural inheritance, and rigid evaluation and feedback mechanisms, leading to a serious mismatch between talent training and industry needs.

The Environmental Design major at Changchun Guanghua University has been deeply engaged in teaching reform for more than ten years. On the basis of the practice of the "Two Integrations and One Migration" teaching model, it has innovatively constructed the "Two Integrations and One Migration + AI" teaching system by integrating AI technology. It has successively obtained a number of teaching and research achievements such as teaching research projects of the Jilin Provincial Department of Education and industry-university cooperation collaborative education projects. The relevant talent training model won the third prize of Jilin Provincial Teaching Achievements in 2023. Combining the teaching practice of core courses such as "Landscape Design Methods" and "Interior Space Design", this paper systematically expounds the innovative concepts, implementation paths, and application effects of this model, providing reference for the teaching reform of design courses in application-oriented universities.

2 Current Situation and Pain Points of Environmental Design Course Teaching

2.1 Disconnection between Practical Teaching and Industrial Digital Transformation

The practical teaching of traditional environmental design courses mainly focuses on traditional software operation and virtual projects. The introduction rate of university-enterprise cooperation projects is less than 20%, and the participation rate in construction sites is only 15%. The coverage rate of AI tools is less than 15%, and cutting-edge content such as smart home design and prefabricated decoration is lacking, which is quite different from the industry requirement of "30% of new residential buildings adopting prefabricated decoration" proposed by the Ministry of Housing and Urban-Rural Development. Students' digital design capabilities are weak, the adaptation period of graduates to positions is extended to 6-12 months, and the salary gap reaches 2.3 times.

2.2 Insufficient Cultivation of Cultural Innovation and Sustainable Design

In course teaching, the proportion of intangible cultural heritage (ICH) skill translation training is less than 5%, and the integration of low-carbon design ethics is only 17%, resulting in serious homogenization of students' works, with personalized works accounting for less than 25%. Students lack the ability to deeply explore and modernly translate regional culture, and their design schemes are difficult to reflect the value of cultural inheritance. They are less competitive in bidding for cultural and tourism projects, with a 45% low participation rate in cultural innovation projects.

2.3 Single and Lagging Teaching Evaluation System

The existing evaluation system is mainly based on teachers' one-way scoring, with 90% of universities adopting a single scoring system, lacking the participation of enterprise experts and users. The evaluation dimension focuses on technical indicators, ignoring core industry standards such as cultural expression and sustainability. The feedback cycle is as long as 3.8 months, and the optimization efficiency of students' works is low. This model leads to students' weak sense of social service, with the commercial conversion rate of design schemes less than 30%, which is difficult to meet the industry's demand for compound talents.

3 Innovative Concepts and Construction Logic of the "Two Integrations and One Migration + AI" Teaching Model

3.1 Core Innovative Concepts

(1) Digital Empowerment: Supported by AI technology, build a digital teaching environment, and make up for students' digital capability shortcomings through AI-assisted design, VR virtual training and other means, so as to synchronize teaching content with industrial technological development.

(2) Cultural Soul-Casting: Dig deep into ICH, regional characteristics and low-carbon ethics, integrate cultural elements such as wood structure construction techniques and traditional color aesthetics into teaching, reconstruct design values, and enhance the cultural connotation of works.

(3) Evaluation-Feedback Linkage: Introduce enterprise evaluation, user feedback and AI diagnosis, construct a multi-dimensional dynamic evaluation system, realize the accurate connection between teaching evaluation and market demand, and strengthen students' service awareness and market responsiveness.

3.2 Model Construction Logic

Taking the integration of production and education as the core, the "Two Integrations and One Migration + AI" teaching model forms a trinity teaching closed loop of "theory-practice-actual combat" through the deep integration of the three-dimensional practical path of "integrating projects, integrating competitions, and migrating classrooms" with AI technology. Its construction logic is as follows:

(1) Content Reconstruction Logic: Establish a "elimination-upgrade-addition" mechanism for course content based on industry needs, eliminate traditional modules with employment matching degree < 60%, upgrade core modules such as AI-assisted design, and add cutting-edge content such as smart home interaction.

(2) Scene Expansion Logic: Break the classroom boundary, build real teaching scenes by "migrating classrooms to practice sites", and combine VR virtual training platforms to realize dual-track practice of "real scenes + virtual simulation".

(3) Technology Integration Logic: Integrate AI technology into the whole teaching process, assist concept generation in the design conception stage, optimize scheme presentation in the practical operation stage, and realize accurate diagnosis in the evaluation and feedback stage.

(4) Ideological and Political Integration Logic: Construct a curriculum ideological and political case database of "spatial narrative and cultural decoding", integrate ideological and political elements such as cultural confidence, ecological civilization and social responsibility into all links of teaching, and realize the organic unity of value guidance and knowledge transmission.

4 Implementation Path of the "Two Integrations and One Migration + AI" Teaching Model

4.1 Curriculum Content Innovation: Dynamic Optimization Driven by Industry Needs

(1) Construction of Modular Curriculum System: Integrate core courses such as "Landscape Design Methods" and "Interior Space Design" to build four modules: "theoretical foundation + technical application + cultural innovation +

practical combat". The theoretical foundation module integrates scientific research achievements such as cold-region village and town ecological planning; the technical application module systematically teaches AI tools such as Midjourney and D5Render; the cultural innovation module develops a case collection of "spatial translation of ICH elements"; the practical combat module introduces real enterprise projects and industry competitions.

(2) Transformation of Scientific Research Achievements into Teaching Content: Transform the achievements of 4 provincial-level and above scientific research projects such as "Research on the Ecological Planning and Construction of Tourism-Oriented Villages and Towns in Jilin Province" into teaching cases, refine the design system of "ecology as the foundation, culture as the soul, and industry as the driving force", form teaching resources such as cold-region plant configuration tables and rural landscape ecological evaluation indicators. 90% of students can independently complete rural landscape ecological evaluation and cultural element extraction.

(3) Integration of Cutting-Edge Technology into Teaching: Offer special courses such as "AI + Landscape Design" and "Smart Home Interaction Design", build a work chain of "AI concept generation → manual optimization → intelligent rendering". The coverage rate of AI tools has increased from 15% to 92%, and the efficiency of students' scheme presentation has increased by 45%.

4.2 Teaching Method Innovation: Four-Dimensional Linkage Practical Teaching

(1) Integrate Projects into Classrooms: Implement the "real project practice + double tutorial system", and build a dynamic project database with enterprises, updating more than 10 real projects annually. Decompose projects such as commercial space renovation and rural landscape improvement into subtasks. Students work in groups to complete the whole process of site investigation, scheme design and construction drawing drawing, with teachers and enterprise tutors providing full guidance. In the past three years, students have won 3 national design awards for projects such as "Qianshan Muyun Leisure Resort", and some schemes have been adopted and implemented by local governments.

(2) Integrate Competitions into Classrooms: Connect with the standards of 8 major industry competitions such as the National 3D Digital Innovation Design Competition, transform competition requirements into teaching tasks, and carry out simulation competitions such as "Rural Tourism Ecological Landscape Design". Invite industry experts to participate in the evaluation, and excellent works directly participate in real competitions. The students' award-winning rate has increased by 300%, winning 2 national first prizes and 7 provincial first prizes in 2023.

(3) Migrate Classrooms to Practice Sites: Establish 6 practical teaching bases with Changchun Maan Village, Qianwan Village, etc., and organize students to carry out field teaching such as topographic mapping, villager interviews and construction connection. Build a virtual construction site with VR technology, allowing students to observe the construction process in 360 degrees. The qualified rate of construction technology mastery has increased from 65% to 92%, and the drawing error rate has decreased by 55%.

(4) AI-Enabled Teaching Implementation: The application of AI technology in various teaching links is as follows: in the design conception stage, generate multiple sets of concept schemes through Midjourney to broaden creative horizons; in the scheme optimization stage, use Deepseek + CAD to assist the drawing of construction drawings and improve drawing accuracy; in the achievement presentation stage, use D5 intelligent rendering system to improve the quality of renderings; in the process management stage, generate personalized learning reports through AI learning situation analysis system and push special training resources.

4.3 Evaluation System Reconstruction: AI-Enabled Multi-Dimensional Dynamic Evaluation

(1) Diversification of Evaluation Subjects: Construct a five-element evaluation subject of "teacher evaluation + enterprise review + peer mutual evaluation + user feedback + AI diagnosis". The participation rate of enterprise experts has increased from 20% to 78%, and the evaluation results are more in line with industry needs.

(2) Comprehensiveness of Evaluation Dimensions: Establish a five-dimensional evaluation index of "knowledge + ability + quality + culture + sustainability". The knowledge dimension assesses the mastery of theories, the ability dimension focuses on design software operation and scheme implementation capabilities, the quality dimension pays attention to team cooperation and communication skills, the cultural dimension evaluates the effect of regional cultural translation, and the sustainability dimension examines the implementation of low-carbon design concepts.

(3) Dynamism of Evaluation Methods: Adopt a combination of "process evaluation (50%) + summative evaluation (50%) ". Process evaluation includes in-class tests, phased works, and classroom interaction. Summative evaluation adopts the form of "design works + scheme report + on-site defense". AI technology participates in process diagnosis throughout the whole process, automatically marks problems such as substandard handrail height in barrier-free design, and generates a comprehensive report including service awareness score and sustainability index.

(4) Instantaneity of Feedback Mechanism: Build a digital feedback platform, integrate enterprise review opinions, user experience data and AI diagnosis results, shorten the evaluation feedback cycle from 3.8 months to 4 hours, and improve

the optimization efficiency of students' works by 60%.

4.4 Guarantee System Construction: University-Enterprise Collaborative Support Mechanism

(1) Construction of Teachers' Team: Carry out special training on AI technology, employ enterprise designers as part-time tutors, and form a composite teaching team of "on-campus teachers + enterprise tutors + technical experts". The teachers' team has obtained 4 software copyrights related to AI tools and won 6 awards in provincial and above teaching competitions.

(2) Construction of Practical Platforms: Build "university-integrated factory" training bases with enterprises such as Beijing Jiayue Technology and KUKA Group, establish scientific research and practice bases such as Jilin Provincial Tourism-Oriented Village and Town Landscape Design, and accumulate more than 1 million yuan in social service funds. Build an "AI + design" teaching platform, integrate tools such as SketchUp and D5Render, and store more than 3,000 design cases and material databases.

(3) Collaborative Education Mechanism: Sign the Ministry of Education's supply-demand docking employment and education project, set up special classes such as "commercial interior design" and "home design", and realize the integration of "enrollment-training-employment". Establish a university-local collaborative mechanism, cooperate with local governments to carry out rural micro-renewal practices, and students' design schemes such as village entrance signs and idle homestead transformation have been implemented, achieving good social responses.

5 Application Effects of the Teaching Model

5.1 Significant Improvement of Students' Abilities

(1) Comprehensive Enhancement of Professional Skills: 85% of students proficiently use cold-region plant configuration tables and design software, and can independently complete the whole process from site investigation to scheme implementation. The proficiency of AI tools has increased from 15% to 92%, the qualified rate of construction technology mastery has reached 92%, and the commercial conversion rate of students' works has increased from less than 30% to 76%.

(2) Abundant Innovative Achievements: In the past three years, students have won 11 national design awards and 23 provincial awards, among which "Qianshan Muyun Leisure Resort" won the national first prize in the National 3D Digital Innovation Design Competition. Students have participated in publishing 2 papers related to the course and applied for 5 patents such as "Rural Campsite Landscape Shed".

(3) Improvement of Cultural Literacy and Social Responsibility: 87% of students' schemes reflect attention to villagers' living needs. Students' awareness of local culture has increased by 60%, and they have taken the initiative to integrate the "carbon neutrality" concept and regional cultural elements into their designs, forming a professional consensus of "inheriting culture through design".

(4) Enhancement of Employment Competitiveness: The retention rate of graduates in enterprise internships has reached 68%, the adaptation period to positions has been shortened from 6-12 months to 3 months. Enterprises feedback that the training cost of graduates has been reduced by 40%, and they show strong competitiveness in fields such as cultural and tourism design and rural revitalization.

5.2 Continuous Optimization of Teaching Quality

(1) Remarkable Achievements in Curriculum Construction: "Interior Space Design" was rated as a provincial first-class course, the Environmental Design major was approved as a provincial first-class professional construction site, forming 4 textbooks and auxiliary materials. The curriculum ideological and political case database has been used for reference by 3 universities in the province.

(2) Abundant Teaching Achievements: The research related to the teaching model has won 1 third prize of Jilin Provincial Teaching Achievements, 3 provincial teaching and research projects, and more than 1 million yuan in horizontal project funds. Teachers' teaching satisfaction has increased from 85.6 points to 94.1 points, and students' learning enthusiasm and participation have been significantly improved.

(3) Obvious Demonstration and Radiation Effects: The model has been promoted and applied in 21 courses of 5 art majors in the university, and carried out teaching linkage with design majors of well-known universities in the province. The industry adaptability of students' works has increased by 32%, forming a replicable new liberal arts teaching reform paradigm.

5.3 Prominent Social Service Capabilities

(1) Remarkable Achievements in Rural Revitalization Services: Relying on scientific research projects and practical teaching, it has completed a number of rural landscape design projects such as Qianwan Village and Maan Village. The proposed ecological planning model for tourism-oriented villages and towns has been promoted and applied in many villages in Jilin Province, helping to build ecologically livable villages.

(2) Implementation of Social Projects: The projects participated by students, such as the design of the Party History Exhibition Hall of Jiaohe New Era Comprehensive Education Practice Base and the barrier-free transformation of communities, have been implemented. A total of more than 30 social service projects have been completed, covering more than 5,000 people.

(3) Contribution to Industry Development: It has transported more than 300 high-quality applied talents to the design industry. Graduates serve as backbones in major design companies across the country, and some students have set up their own design studios, injecting new vitality into the development of the regional design industry.

6 Problems and Improvement Directions

6.1 Existing Problems

(1) Unbalanced Practical Resources: The number of university-local and university-enterprise cooperation projects is limited, and some students have insufficient opportunities to participate in real projects; the construction level of rural practice bases in different regions is different, affecting the balance of practical teaching effects.

(2) Insufficient Depth of Technology Integration: The development cost of AI teaching resources is high, and the AI application capabilities of some teachers need to be improved; the application of AI technology in cultural element translation and design ethics judgment still needs to be deepened.

(3) Insufficient Personalized Training: There are individual differences in students' professional foundation and learning ability. The existing teaching model is difficult to fully meet the needs of personalized development, and some students struggle in complex projects.

(4) Insufficient Depth of University-Enterprise Cooperation: Enterprises' enthusiasm for participating in curriculum standard formulation and teaching evaluation needs to be improved, and the benefit-sharing mechanism has not been fully established.

6.2 Improvement Directions

(1) Expand Practical Resources: Strengthen cooperation with local governments and industry associations to establish more than 10 stable practical teaching bases; develop lightweight AI teaching plug-ins to reduce the threshold of technology use; build a regional shared AI teaching resource platform to make up for the lack of practical resources.

(2) Deepen Technology Integration: Carry out special training on AI technology for teachers, set up interdisciplinary teaching teams, and explore the application of generative AI in spatial creativity stimulation; develop an "AI + cultural translation" teaching module to improve the intelligent level of students' cultural innovation.

(3) Implement Hierarchical Teaching: Formulate hierarchical teaching goals and tasks based on AI learning situation analysis data, set up innovative practice groups for students with spare capacity to participate in high-difficulty scientific research projects and competitions; provide personalized tutoring and special training for students with weak foundations.

(4) Improve the Collaborative Mechanism: Establish a university-enterprise benefit-sharing mechanism to promote enterprises to deeply participate in curriculum standard formulation, teaching content update and teaching evaluation; set up a university-enterprise joint research and development fund to carry out technical research and project cooperation together.

7 Conclusion

Through the accurate connection of industry needs, technology empowerment and in-depth integration of ideological and political education, the "Two Integrations and One Migration + AI" teaching model has effectively solved the traditional pain points of environmental design courses in application-oriented universities, realizing a significant improvement in talent training quality. The innovations of this model lie in: taking the transformation of scientific research into teaching as a link to realize the organic unity of theoretical teaching and practical application; taking AI technology empowerment as support to realize the dual improvement of teaching efficiency and design quality; taking cultural inheritance and innovation as the core to realize the coordinated development of skill training and value guidance; taking

university-enterprise collaborative education as the path to realize the accurate connection between talent training and industry needs.

In the future, we will continue to optimize the teaching model, deepen the in-depth integration of digital technology and teaching content, improve the university-enterprise collaborative education mechanism, strengthen the cultivation of cultural innovation and sustainable design capabilities, and cultivate more high-quality applied talents with technical capabilities, cultural literacy and social responsibility for the implementation of the rural revitalization strategy and the high-quality development of the design industry. It will provide more valuable practical experience for the teaching reform of design courses under the background of new liberal arts.

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About the Author

Qiwei Liu, male, Han ethnicity, born in Hebei Province, holds a doctoral degree. He is a professor at the School of Art and Design, Changchun Guanghua University. Research Interests: Environmental Design, Landscape Design.

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