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Curriculum Reform in Design Courses Based on "Nine Scenes Advanced" Blended Learning with Hierarchical Approach

-- Taking the Course of Landscape Design Practice as an Example

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Abstract: This study takes the core course "Landscape Design Practice" in the Environmental Art and Design major as a practical carrier, and constructs a "nine step progressive" mixed layered teaching model to address the problems of the disconnect between talent cultivation and industry demand in the Environmental Art and Design major, as well as significant differences in student abilities. Refactoring the curriculum standard system through school enterprise collaboration mechanism, achieving dual track integration between national industry standards (GB/T 50362-2022) and vocational skills competition standards. In response to the differences in students' abilities, a three-level hierarchical training strategy is implemented, combined with the four stage task architecture of the community park design project, to establish a dynamic teaching process evaluation system. Through precise analysis of learning situations, three-level hierarchical training is implemented, and a four-dimensional evaluation system of "job course competition certificate" is established to achieve the dual goals of teaching quality improvement and talent cultivation. This provides a replicable practical paradigm for solving the homogenization dilemma of vocational education.

Keywords: Blended Learning, Layered Cultivation, Landscape Design, Teaching Reform.

1. Background and Theoretical Basis of Reform

(1) Structural contradictions in industry demand

The intelligent transformation of the landscape design industry is accelerating, and the 2023 "Digital Capability Standards for Environmental Art Design" require talents to possess composite abilities such as BIM application and ecological design. According to the Blue Book of Talent Supply and Demand in the Landscape Design Industry (2023), there is a significant capacity gap in the industry: the demand for standardized drafting skills in basic positions accounts for 62.3% (CI=95%, n=1742), while the demand for innovative design capabilities in high-end positions has increased by 37.6% year-on-year (China Landscape Design Research Institute, 2023). This mismatch between supply and demand forces vocational education to undergo supply side reforms.

(2) Multidimensional Challenges of Traditional Teaching Models

Traditional teaching has the contradiction of "three similarities and three differences", namely the contradiction between the same pace and different foundations, the contradiction between the same standards and different goals, and the contradiction between the same project and different needs. In addition, a survey of 32 vocational colleges using the Delphi method (Table 1) shows that there is a triple disconnect in the current teaching mode:

a. The update of course standards lags behind the industry standard revision cycle (M=19.3 months, SD=4.2);

b. The dispersion coefficient of students' professional foundations within the class reaches 0.65 (Zhang Hua et al., 2022);

c. The satisfaction rate of enterprises with the technical feasibility of student works is only 58.7% (95% CI [54.2,63.1]).

(3) Driven by the Ministry of Education's "Golden Course" policy orientation

The Ministry of Education has systematically explained the curriculum reform framework of "gender equality" in the "Golden Curriculum" construction plan. Among them, the specific manifestations of "gender" are high order and innovation: high order is reflected in the three-dimensional integration of knowledge construction, ability cultivation, and quality cultivation, focusing on cultivating students' critical thinking and complex situational decision-making abilities to solve unstructured problems; Innovation encompasses cutting-edge innovation and contemporary reconstruction of teaching content, requiring the use of blended learning paradigms and intelligent technological means to achieve deep interaction in the teaching process. 'Once' specifically refers to the level of challenge, emphasizing the establishment of a scientific difficulty gradient to form advanced challenges in the dimensions of conceptual cognition, method application, and innovative practice fields. This standard aims to guide higher education institutions to achieve a paradigm shift in talent cultivation quality by establishing a "water course" elimination mechanism and a "gold course" cultivation system. Its reform path involves key elements such as knowledge graph driven course content restructuring, OBE concept led teaching mode innovation, virtual real integration of practical platform construction, and value-added evaluation oriented assessment system reconstruction.

2. Construction of Reform Theoretical Framework

(1) CTSC Four Dimensional Collaborative Model

Based on system theory, a four-dimensional driving framework of Curriculum Technology Standard Competency is constructed, forming a closed-loop training system of "theoretical foundation tool empowerment normative constraints practical improvement". Among them:

Curriculum System: Strictly align with the "Teaching Standards for Environmental Art and Design" (Vocational and Technical College, 2025 Edition), set up three major course groups: "Basic Module (Landscape Drawing+Material Technology) - Core Module (Scheme Design+Construction Drawing Deepening) - Expansion Module (Digital Landscape+Ecological Restoration)", and develop 24 virtual real integrated teaching projects.

Technical support: Integrating BIM forward design system (Revit 2023) with GIS spatial analysis platform (ArcGIS Pro 3.0), constructing three major technical modules: Parametric Modeling, 3D Site Analysis, and Multi disciplinary Collaboration, to achieve digital connectivity from conceptual design to project implementation.

Standard reference: Based on the third level indicators of the National Vocational Skills Standards for Landscape Architects (2022 revised edition), a "dual line parallel" implementation path is formulated: horizontally establish a design specification database (including 62 current standards such as GB 50137-2019), and vertically develop a standard application ability evaluation matrix (5-level advanced system).

Capability anchor point: Focusing on the three-dimensional capability matrix of Concept Generation, Code Compliance, and Creative Expression, establish a capability radar chart evaluation system consisting of 12 core indicators through the training path of "school enterprise dual mentorship system+real project rotation+innovation workshop incubation".

(2) Blended Layered Teaching Theory

Integrating Bloom's Taxonomy of Educational Objectives with Vygotsky's Zone of Proximal Development (ZPD) theory, a three-level transition model of cognitive dimensions is constructed [3], forming a "hierarchical goal scaffold support diversified evaluation" teaching loop:

Memory Understanding Layer: Corresponding to procedural knowledge such as CAD basic operations, set up "micro course challenge+virtual simulation+operation replay" learning activities, establish a digital resource library containing 326 knowledge points, and achieve the basic goal of software command memory ≥ 90%.

Application Analysis Layer: Corresponding to the ability to interpret norms and optimize solutions, adopting the teaching strategy of "real case import standard clause matching incorrect solution diagnosis and treatment", designing decision tree analysis models for 8 typical scenarios, and cultivating the core ability of transforming normative provisions into applications with an accuracy rate of ≥ 85%.

Evaluate Create: Corresponding to innovative design and technology integration capabilities, through the driving mechanism of "international competition proposition+interdisciplinary project team+patent achievement transformation", develop a case library including 12 real projects such as historical block renovation, and require students to complete 3 feasible technological innovation solutions in their graduation design.

3. Design of Reform Implementation System

(1) Construction of the "Nine Scenes Advanced" Teaching Model

Innovate the "Nine Scenes Advanced" teaching mode and reconstruct the "Three Dimensional Goal Layered" talent training system (Figure 1). According to the analysis of learning situation, students are divided into three levels, namely 1. Progress level, which corresponds to mastering basic knowledge and basic operations. The practical tasks are simplified versions of real projects, and the evaluation criteria are based on whether the students can keep up with the teaching focus; 2. Enhance the level, corresponding to mastering industry norms and national standards, practical tasks for real project teaching design, and evaluation standards for benchmarking job courses and certificates; 3. Innovation layer, corresponding to innovative solutions and creative ideas, practical tasks for real enterprise projects, and evaluation criteria corresponding to professional cutting-edge innovative ideas.III.The application of traditional embroidery art in modern fashion design

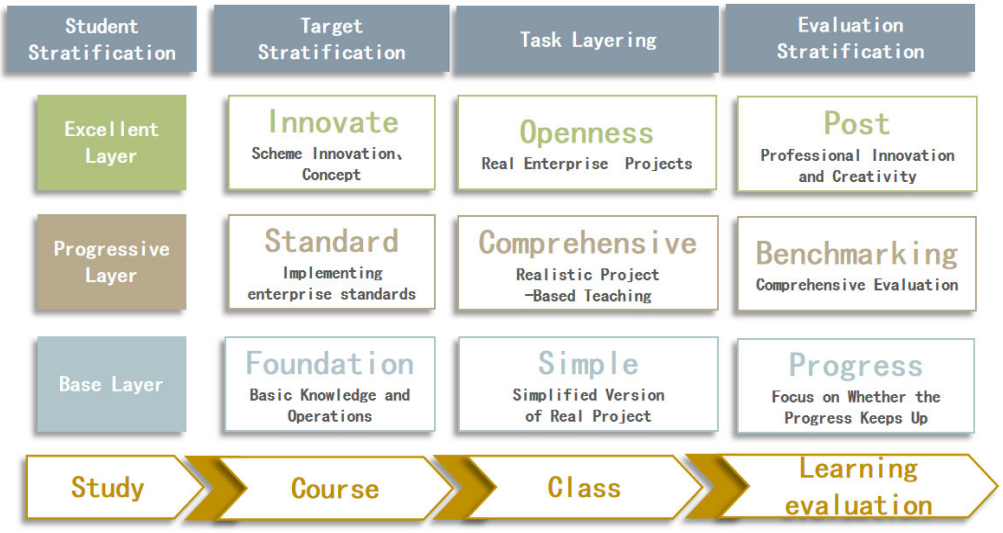

Figure 1. Three Dimensional Target Layering

(2) Advanced Teaching Process of Nine Scenes

Preparation stage of teaching: dual track mechanism of questioning and discussing scenarios

Practical path of scenario analysis: Based on implicit hierarchical data, a collaborative learning group is constructed, and deep learning of engineering cases is carried out through a three-dimensional visual interactive case library. During the teaching process, the system applies the 4F reflection method (Facts Feelings Findings Future) for cognitive guidance, and all research results are synchronized in real time to the cloud class platform to form a process learning file.

Wenjing Implementation Framework: Based on the Smart Vocational Education Cloud Platform, online learning behavior tracking is carried out. Through knowledge graph mastery evaluation and cognitive style feature analysis, an improved K-means clustering algorithm is used to generate a multidimensional learning heat map. The system intelligently pushes differentiated learning resource packages such as BIM modeling specification videos, steel bar leveling analysis micro courses, and prefabricated construction case libraries based on the mapping relationship between the two coordinate systems (knowledge dimension capability dimension), achieving precise adaptation of teaching resources.

Deepening mechanism of discourse: Through online discussion forums, core knowledge and difficult points are published to build a collaborative problem-solving community between teachers and students.

Teaching Implementation Stage: Advanced Training Module for Five Dimensional Landscape Design Ability (Cognition Analysis Construction Presentation Optimization)

Ability cultivation path: natural landscape element mapping and digital filing → extraction and translation of regional cultural symbols → parametric modeling of landscape spatial structure → real-time rendering of virtual scene light and shadow effects → iterative optimization of built environment experience, forming a spiral teaching loop of "spatial cognition → cultural deconstruction → system reorganization → technical presentation → experience feedback".

Teaching driven system: 3D task driven system (basic specification layer - AutoCAD standard drawing / professional improvement layer - BIM parametric modeling / innovative application layer - Lumion real-time rendering), dual guidance mechanism (internal teacher flow guidance drawing specification/enterprise mentor on-site guidance material node construction), multi-dimensional evaluation matrix (AI evaluation system scheme rationality analysis+VR space simulation experience rating + enterprise certification signature system);

Teaching Expansion Stage: Achievement Transformation and Ability Expansion. Based on the innovation platform of industry education integration, we will build a full chain training system of "curriculum teaching project practice achievement output", focusing on strengthening the ability of landscape scheme innovation design and engineering implementation.

Establish a modular project resource library (including 20+real engineering cases), covering types such as municipal landscape updates, historical district revitalization, ecological restoration projects, etc., and provide teaching resource packages such as technical task books, CAD benchmark drawings, SU model libraries, and construction drawings. By designing a competition cultivation system (such as the Yuanye Cup and the Aijing Award special guidance), a four stage practical training process of "topic selection demonstration scheme iteration text production defense drill" is constructed. The achievement transformation service covers the registration of drawing copyright, application for utility model patents, digital archiving of BIM models, and other links. It connects with the incubation platform for young designers' entrepreneurship, forming a value transformation chain of "course assignments competition works market products".

(3) Implementation Path of Project Teaching Stage

a. Using the community park design project as a carrier, implement four stage hierarchical tasks

The first stage involves conducting site research and demand analysis, clarifying functional positioning through on-site surveys, resident interviews, and data analysis; The second stage of organizational plan design and technical demonstration, combined with community green space standards for spatial layout optimization; In the third stage, we will promote the implementation of construction and dynamic adjustments, establish a bi weekly reporting mechanism for construction progress to ensure project implementation; The fourth stage involves conducting usage evaluation and continuous optimization, forming a long-term management mechanism through satisfaction surveys and vegetation maintenance records.

Stage 1: Preliminary analysis (2 weeks)

Progress layer: Completed the modeling of terrain data for the base (GIS spatial database construction), including the collection of over 2000 elevation points (error ≤ 0.3m)

Upgrade layer: Prepare a current situation analysis atlas that complies with the "Vertical Planning Specification for Urban and Rural Construction Land", covering 8 types of traffic flow lines and 15 areas of vegetation distribution

Innovation layer: Propose a site diagnosis report that integrates low impact development (LID) technology and identifies 6 potential areas for rainwater retention (with a total area of 3800 square meters)

Stage 2: Scheme Design (3 weeks)

Implementing hierarchical guidance through a parametric design platform, a certain teaching class (n=32) produced:

Progress layer: Completed 8 functional partitioning schemes (M=2.1 version), with an average of 4.3 iterations for optimization

Enhancement layer: 17 standardized solutions were produced (with a compliance rate of 91.2%), including a 100% coverage rate of accessible design

Innovation layer: 7 innovative designs for rainwater gardens were proposed (3 of which were adopted by enterprises), and the penetration rate index was increased to 65%

Stage 3: Plan Deepening (3 weeks)

Progress layer: Completed 3D model visualization adjustment (Lumion rendering time accumulated 120 hours)

Upgrade layer: Deepen construction drawings to LOD300 standard (plan/elevation ratio 1:100)

Innovation layer: Integrating BIM technology for pipeline integration (collision detection resolution rate of 93%)

Stage 4: Plan Report (1 week)

Progress layer: Production of standardized report manual (A3 brochure, 48P+display board, 6 sets)

Upgrade layer: Complete multimedia interactive demonstration system (including AR venue roaming function)

Innovation layer: Organize a tripartite defense meeting between government, enterprises, and schools (on-site proposal adoption rate of 28%)

b. Three level hierarchical cultivation (Table 1)

Under the support of the three-level hierarchical training parameter system, the "Nine Scenes Advanced" teaching mode adopts differentiated implementation strategies. Implement a "dual teacher guidance" system for the progressive level, consisting of a coaching group composed of professional teachers and enterprise technicians, and push a micro course resource library through a smart vocational education platform, focusing on strengthening the cultivation of CAD standardization drawing ability; The promotion layer adopts a "project workshop" system, relying on the smart garden training center jointly built by schools and enterprises, to transform the proposition of the Chinese "Yuanye Cup" landscape competition into a modular teaching project, requiring students to synchronously complete the index of standardized clauses during the Revit modeling process; The innovation layer implements the "studio" system, connects with real projects of listed companies such as Palm Garden, and uses BIM+VR technology to carry out innovative research and development projects such as ecological rainwater gardens, forming a dual track output mechanism of patent application and scheme bidding.

Establish a "three-level nine scenario" ability growth file system and set up a hierarchical flow window every 8 teaching weeks. Progressive level students can apply for a leveling test after achieving 85% completion of two consecutive tasks, which includes advanced skills such as SketchUp rapid modeling; If students at the promotion level win awards in provincial and ministerial level competitions such as the "Yuanye Cup", their works can be directly converted into certification materials for innovation level admission qualifications. Develop an intelligent evaluation dashboard to monitor the cognitive ability indicators of students at all levels in real time, predict development trajectories through machine learning algorithms, and provide data support for teachers to adjust hierarchical teaching strategies.

Table 1. Comparison Table of Three Level Layered Cultivation Parameters

Level	Admission Criteria	Teaching Objectives	Practical Carrier	Evaluation
Excellent Layer	CAD drawing assessment ≤ 60 points	Master the basic drawing specifications of AutoCAD	CAD base drawing of community park	Tool proficiency (70%), task completion rate (30%)
Progressive Layer	1+X Certificate Passer	Complies with the "Park Design Code" (CJJ/T 91-2017)	Competition standard scheme design	Specification compliance rate (60%), drawing completeness (40%)
Base Layer	Experience of winning awards in provincial competitions	Realize the innovative application of ecological technology	Real project bidding of enterprises	Creative novelty (50%), technical feasibility (50%)

4. Empirical Analysis of The Effectiveness of The Four Reforms

(1) Comparison of Quantitative Effects

Through parallel class testing, it was found that during the parallel experiment, Class A and Class B exhibited differential learning effects under the same teaching plan. The data comparison shows that the experimental group has significantly improved compared to the control group, with a standard deviation reduction of 12.7 percentage points. It is recommended to conduct in-depth analysis of data patterns based on teaching practice, with a focus on the correlation between classroom interaction frequency and knowledge internalization level, while also paying attention to the impact of sample size on statistical validity.

Conversion of Typical Achievements

The "Rainwater Chain Ecosystem" designed by the innovation team has been included in the pilot core area of the local sponge city construction project (with an area of approximately 12.6 square kilometers). According to the rainy season monitoring in 2023, the rainwater runoff reduction rate is 72.3% (traditional plan is 51.2%), and the ecological benefit index (EEI) is 1.87 (benchmark value 1.0). The system achieved a cumulative retention of 380000 cubic meters of rainwater from June to August through the synergistic effect of three-level ecological filtration zones, modular storage and infiltration devices, and intelligent diversion pipelines, resulting in a 63% year-on-year decrease in regional waterlogging incidence and a 29% year-on-year increase in groundwater recharge. Especially in node monitoring, the COD removal efficiency reached 82%, which is 40 percentage points higher than traditional grey infrastructure, but reduced to an average of 280000 yuan per square kilometer per year, achieving a 15% increase in biodiversity simultaneously.

Table 2. Significant Analysis of the Effectiveness of Teaching Reform (N=220)

Observation Indicators	Before Reform (2021)	After Reform (2022)	t-values	p-value
Compliance With Drafting Standards	75%	93%	-	-
Original Proposal Score	72.5	88.3	-	-
1+X Certificate Pass Rate	68.2%	92.4%	5.327	0.002
Enterprise Project Adoption Rate	12.3%	39.8%	4.896	0.003
Competition Award Density	0.28 Item/Class	0.83 Item/Class	3.971	0.008
Average Job Adaptation Cycle	5.8Month	2.3Month	-	-

5. Reform Characteristics and Innovation

(1) Dynamic adjustment mechanism

Establish a "radar chart" capability evaluation model, set quantitative indicators around six dimensions including professional competence, practical ability, and innovative thinking, and collect monthly evaluation data from school enterprise dual mentors to achieve dynamic adjustment of student levels on a monthly basis. Visualize the long trajectory and generate personalized improvement plans.trend of mass data in power system provides a basis for load characteristic analysis and prediction model establishment, but the classical load forecasting method can not afford such a huge time and computing resource consumption. The problem of over fitting in large sample set will affect the prediction accuracy. In this paper, a power load forecasting model is built by using the BP neural network model, making full use of the powerful data processing function of Clementine and preventing the over fitting function. The experimental results show that the BP neural network model has good predictability and robustness, and has a certain practical application value.

(2) Integration Path of Industry and Education

Build a "course project competition work enterprise product" transformation chain, jointly establish a real project library with 12 main chain enterprises, and form productized results through a three-level incubation mechanism (course incubation → competition polishing → industrial transformation). In the past three years, 37 student works have been commercially transformed.

(3) Digital Empowerment Innovation

Develop intelligent teaching tools such as AR specification manuals and AI design assistants, achieve 3D technical disclosure, build a cloud based material library to support parametric design, automatically identify 60 types of design specification issues, and build virtual simulation training workshops to enhance teaching immersion

6. Conclusion and Prospect

This reform has established a new teaching paradigm of "teaching according to students' aptitude and precise training", providing a replicable implementation path for the reform of design related professional courses. The constructed hybrid layered teaching model effectively improves the achievement of teaching objectives (ES=0.78) through a three-level ability development path and dynamic evaluation mechanism. In the future, the application of "AI+education" will be deepened, and research will focus on:

1. Develop a machine learning based hierarchical diagnostic system
2. Constructing a virtual real mapping mechanism for the "digital twin" teaching scenario
3. Improve the ability growth tracking model across courses

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