

# Research on Teaching Model of Generative Artificial Intelligence Empowering Design Thinking in Master of Landscape Architecture Program

Qing Xiao, Ruoyu Li, Xuejuan Wang, Xinbin Liang, Lu Ma

*College of Architecture, Anhui Science and Technology University, Bengbu, Anhui, China*

**Abstract:** In the wave of digital transformation driven by new-quality productive forces, Generative Artificial Intelligence (GenAI/GAI) is profoundly influencing the design logic and educational paradigm of the landscape architecture discipline. Postgraduate education in landscape architecture has long been confronted with issues such as the disconnection between design thinking cultivation and the application of cutting-edge technologies. Based on an analysis of the competency training objectives for professional master students in landscape architecture and the core characteristics of generative artificial intelligence, this paper conducts teaching practice from three dimensions—teaching objectives, curriculum system, and teaching methods—systematically constructing a "3+3+2" new teaching model, and elaborates on how Generative Artificial Intelligence promotes the transformation of design teaching from skill training to creativity-oriented education. The research results show that this new teaching model effectively improves students' design and creation efficiency, interdisciplinary knowledge integration ability and original innovative thinking, and provides a feasible path and practical reference for the digital and intelligent transformation of landscape architecture postgraduate education in the new era.

**Keywords:** Generative Artificial Intelligence (GenAI/GAI); Skill-based Tools; Design Thinking; Teaching Models.

## 1. Introduction

The Development Plan for New-Generation Artificial Intelligence issued by the State Council has for the first time incorporated AI talent cultivation into the national strategy,

clearly proposing the core goal of fostering high-level interdisciplinary AI professionals [1]. The Opinions on Accelerating the Advancement of Educational Digitalization jointly released by the Ministry of Education and eight other ministries have further specified concrete measures to comprehensively promote intelligentization [2] and facilitate AI's role in driving educational transformation. Additionally, the Implementation Opinions on the "AI + Manufacturing" Special Action issued by eight departments focuses on cultivating highly skilled talents [3], emphasizing the in-depth integration of AI with industry practices. As a carrier for cultivating professional and interdisciplinary talents oriented to meet the high-end needs of the industry, building on undergraduate general education, the professional master's education in Landscape Architecture is fully aligned with the orientation of national policies. However, with the rapid development of Generative Artificial Intelligence (GenAI/GAI), the traditional teaching model in design education—relying on hand-drawing expression, computer modeling and deduction, and the transmission of knowledge within a single discipline—has been disrupted. Relying solely on these conventional training approaches, it is not only difficult to meet the interdisciplinary and innovative competence requirements for "high-level interdisciplinary talents" [4] as stipulated in national policies, but also impossible to adapt to the industry's high-end demands in intelligent design, cross-regional ecological coordination, digital project management, and other fields. Therefore, exploring the innovation of teaching models integrating GenAI/GAI in the professional master's education of Landscape Architecture not only accurately responds to the national policy orientation of "AI+" for disciplinary integration and matches the practical needs of the industry's intelligent

transformation, but also provides an effective path for resolving the dilemma in the professional master's education of Landscape Architecture—where traditional educational and teaching models are disconnected from the demands for high-end talents.

## **2. Competency Cultivation Goals for Professional Master's in Landscape Architecture**

Guided by the professional qualification requirements for landscape architecture practitioners, the professional master's education in Landscape Architecture aims to cultivate high-level interdisciplinary and application-oriented professionals with strong professional capabilities, occupational literacy, and creative thinking, who can serve the national strategies of "Beautiful China" and "Rural Revitalization." Graduates of this program primarily work in competent authorities, enterprises, and public institutions related to landscape architecture, such as urban-rural construction, ecological protection, forestry and grassland, and tourism management, engaging in relevant technical and management work.

### **2.1 Ability for Disciplinary Deepening and Cutting-Edge Exploration**

Professional masters in Landscape Architecture must possess the ability for disciplinary deepening and cutting-edge exploration. They should master systematic and in-depth specialized knowledge of the landscape architecture discipline, focus on specialized fields, break through the knowledge breadth limitations of the undergraduate stage, and form specialized research capabilities. Additionally, they should understand the demands of national strategies on the landscape architecture industry, timely track disciplinary frontiers and industry policies and regulations, and demonstrate academic literacy to transform theoretical innovations into practical solutions.

### **2.2 Interdisciplinary Thinking and Ability to Solve Complex Problems**

Professional masters in Landscape Architecture are required to develop interdisciplinary thinking, integrate relevant academic theories from multiple disciplines, and apply cross-disciplinary knowledge to solve complex professional problems. Through scientific

research projects and engineering practices, they should master the full-process management capabilities—from problem formulation and scheme design to project implementation—along with critical thinking and innovative practical abilities, so as to meet the industry's demands for application-oriented professionals.

### **2.3 Occupational Literacy and Industry Leadership Capabilities**

Professional masters in Landscape Architecture must be proficient in professional norms such as project management standards and technical criteria, and possess teamwork and cross-field communication skills. They should also have an international perspective [5] and local awareness: in project design and implementation, they should absorb advanced international experience while inheriting excellent traditional Chinese culture, deeply integrating ecological wisdom, the aesthetic pursuit of poetic gardens with modern intelligent design technologies. By empowering ecological protection with technology, highlighting landscape value through culture, and leading industry upgrading through innovation, they will promote the transformation of the landscape architecture industry towards a higher-level development model.

## **3. Core Characteristics of Generative Artificial Intelligence**

### **3.1 Low Cost of Interdisciplinary Learning**

Different from traditional programming-based and algorithm-based AI tools, design-oriented Generative AI tools (such as Midjourney and Stable Diffusion) do not require mastery of complex coding and algorithmic principles. Instead, they can quickly generate design drawings through simple prompt descriptions. This type of low-code and highly visual design tool provides professional master's students in Landscape Architecture with a convenient path for scheme processing and optimization, reducing the time cost of learning underlying technologies and enhancing the interdisciplinary integration of AI technology with the landscape architecture discipline.

### **3.2 Rapid Transformation and Implementation of Skills**

Generative AI features real-time feedback,

which shortens the cycle between learning and output. Professional master's students in Landscape Architecture can proficiently apply AI tools to curriculum design and project practice after short-term training. In the site analysis phase, AI tools can quickly generate visual drawings (e.g., topographic elevation analysis maps) to replace the complex drawing process of CAD. In the scheme design phase, AI tools can iteratively produce different design schemes through prompts. In the result presentation phase, AI tools can complete tasks such as drawing rendering and text optimization. Its high efficiency accelerates the implementation of designs, making it more suitable for professional master's students in Landscape Architecture to verify design concepts and optimize adjustments through result comparison in research projects.

#### 4. Generative AI-Empowered Teaching Model

##### 4.1 Constructing a Three-Dimensional Collaborative Competency Teaching Goal

In the full-process design of landscape architecture, professional master's students are required to possess professional design capabilities and multi-disciplinary collaboration skills. They should be able to use information technology to construct three-dimensional spatial models and complete comprehensive capabilities for visual, parametric, and collaborative design schemes of complex sites through teamwork. Therefore, the teaching goal for cultivating professional master's talents in Landscape Architecture should focus on "adapting to new demands [6], applying new technologies, and establishing new mechanisms," constructing a "Knowledge-Ability-Literacy" three-dimensional collaborative competency goal system (e.g., Figure 1).

##### (1) Knowledge dimension

Closely aligned with national strategic policies, students should master the core theoretical knowledge system of landscape architecture planning and design, including the coordination of site environment, current status, vertical planning, landscape, and space. They should be familiar with relevant professional knowledge such as municipal engineering, water conservancy, architecture, ecology, and aesthetics, and understand the technical

applications of BIM, GIS, parametric design, as well as the operation and use of AI-assisted tools.

##### (2) Ability dimension

Students should learn to apply professional knowledge for site analysis, modeling, and spatial design; possess the abilities to accurately diagnose site problems, develop creative multi-scheme concepts, and make scientific and rational decisions; be able to use multiple tools collaboratively for design expression; proficiently apply AI tools for thinking integration and scenario optimization; and have team collaborative design capabilities and communication skills.

##### (3) Literacy dimension

Students should have the awareness of autonomous learning and technological innovation to continuously improve themselves; cultivate rigorous thinking abilities and attach importance to the integration of design and construction as well as feasibility; establish the values of digitization, refinement, and collaboration, and continuously enhance professional capabilities with the help of auxiliary drawing tools.

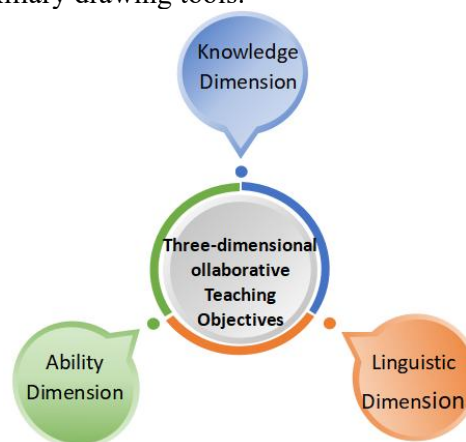


Figure 1. Teaching Objective System for the "3D Collaborative" Capability

##### 4.2 Implementing a Three-Stage Integrated Curriculum System

Planning and design courses are core professional courses in the talent training program for professional master's in Landscape Architecture. They aim to systematically teach the basic theories, cutting-edge technologies, and practical applications in the field of landscape architecture planning and design. Combined with real engineering cases, these courses enhance students' abilities to analyze and solve problems, help them understand the

practical application of theoretical knowledge, guide them to pay attention to disciplinary frontiers, and cultivate their innovative thinking and scientific research capabilities. Based on the curriculum teaching objectives and content, a "Foundation-Advancement-High-Level" three-stage integrated curriculum system has been formulated (e.g., Figure 2).

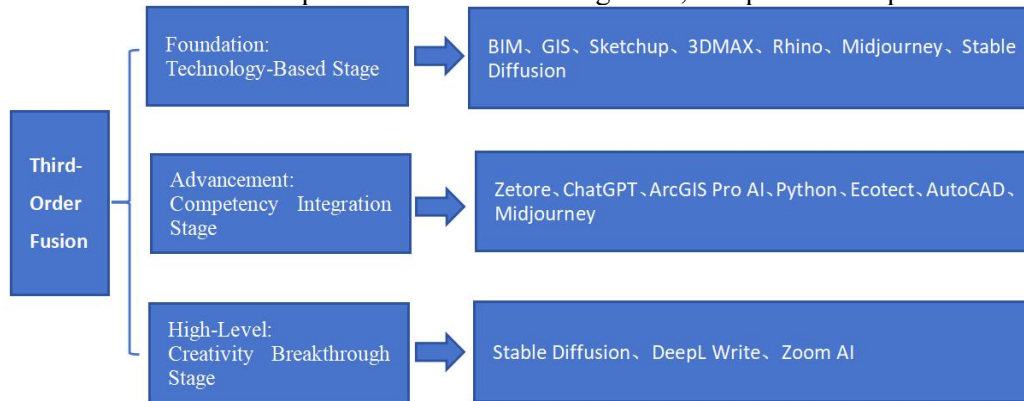
(1) Foundation: Technology-based stage

Building on the theoretical knowledge system established during the undergraduate stage, the postgraduate stage further strengthens the theoretical foundation. Courses focus on the application of design norms and the expression of design thinking, aiming to cultivate students' awareness of professional standards and aesthetic capabilities. In the design process, the application and practice of Generative AI tools are emphasized, and a multi-level digital tool system is introduced. In the preliminary analysis phase, technical platforms such as BIM and GIS are integrated to help students master site analysis capabilities and form design thinking oriented to 3D modeling and engineering collaboration. In the design phase, 3D drawing software such as SketchUp, 3ds Max, and Rhino are proficiently used to build site white models and construct spatial scenarios, facilitating the analysis of spatial scales and scheme refinement. In the design expression phase, AI image generation technologies such as Midjourney and Stable Diffusion are introduced to optimize scheme

expression and cultivate critical thinking.

(2) Advancement: Competency integration Stage

At the theoretical level, AI tools (e.g., Zotero, ChatGPT) are used to quickly retrieve cutting-edge policy documents and academic achievements, assisting students in organizing data contexts accurately and efficiently, and cultivating systematic thinking and a macro perspective. A multi-disciplinary collaborative teaching platform is built, integrating professional knowledge in sociology, ecology, and other fields to establish a database. Data integration tools such as ArcGIS and Python [7] re introduced, enabling students to improve their comprehensive capabilities in solving complex site problems through training in AI modeling, problem decomposition, and collaborative cooperation. In professional experimental courses, projects serve as the carrier to strengthen specific content such as project processes, construction implementation, and cost control, while continuing to enhance the full-process use of advanced AI tools. The Ecotect tool is used to simulate environmental performance such as sunlight and ventilation [8], allowing timely scheme adjustments. AutoCAD, Midjourney, and other tools are utilized to refine construction drawings, improving drawing standardization and efficiency. This stage focuses on cultivating students' abilities in theoretical deepening, cross-domain integration, and practical implementation.



**Figure 2. AI Tools at Each Stage of the "Third-Order Fusion" Curriculum System**

(3) High-Level: Creativity breakthrough Stage

This stage focuses on AI-empowered innovation, cutting-edge exploration, and value leadership, breaking through the dilemmas of traditional design thinking and focusing on frontier topics and innovative development in the landscape architecture discipline. By setting professional topics such as carbon neutrality,

smart gardens, urban renewal, and heritage activation, AI tools (e.g., Stable Diffusion) are used to generate diverse design concept sketches. AI tools integrate different design styles, regional cultures, and other expression forms to stimulate creative thinking. Relying on scientific research platforms and university-enterprise cooperation platforms, students are

encouraged to participate in research projects, using AI-assisted tools for literature sorting and data modeling. Meanwhile, academic writing assistants such as DeepL Write [9] and real-time translation tools like Zoom AI are used to accurately capture international cutting-edge academic trends and broaden international perspectives. At the same time, students are guided to use AI tools standardizedly to avoid problems such as design homogenization and value deviation, cultivating their sense of responsibility. Students' awareness of academic achievement transformation and copyright application is strengthened through measures such as establishing achievement accounting management, standardizing the process of achievement publication and authorization, conducting intellectual property training, and improving achievement protection mechanisms, so as to effectively safeguard the legitimate rights and academic value of academic achievements.

### 4.3 Innovating the Teaching Method of Human-AI Collaboration + Project-Driven Learning

The cultivation of professional master's students in Landscape Architecture focuses on enhancing their thinking and practical abilities. Therefore, in practical teaching, a parallel teaching method combining human-AI collaboration and project-driven learning has been formulated based on methods such as questionnaires and student source evaluation (e.g., Figure 3). In teaching, teachers establish a teaching resource library on the Xuexitong platform, with content focusing on professional frontiers, real projects (e.g., pocket parks, rural landscape renewal, urban sustainable

development), and scientific research topics. A dual-tutor system (on-campus and off-campus) is implemented, introducing real enterprise projects and industry demands. Before class, teachers distribute learning resources through the online platform—including the use of AI tools and real cases—requiring students to complete resource learning in their spare time, organize and analyze the provided cases, and form their own viewpoints and understandings. During class, the focus is on scheme discussions, AI-assisted scheme adjustments, and other sessions to stimulate intellectual exchange and classroom vitality. After class, students need to sort out and form a feasible design scheme based on in-class discussions and submit it to the online platform for AI-based evaluation. Industry experts are regularly invited to provide intensive practical guidance according to the curriculum content, standardizing students' professional capabilities. Throughout the process of project analysis, discussion, and implementation, students are fully empowered by AI, cultivating their innovative thinking and problem-solving abilities.

By empowering teaching reform through human-AI collaboration and driving practical education with real projects, a closed-loop teaching system for talent cultivation and capability training has been systematically constructed—covering scientific research project leadership, students' active participation, and enterprise practice implementation<sup>[10]</sup>. This system breaks down the barriers between teaching, scientific research, practice, and industry development, achieving a win-win situation for students' skill development and enterprises' talent needs.

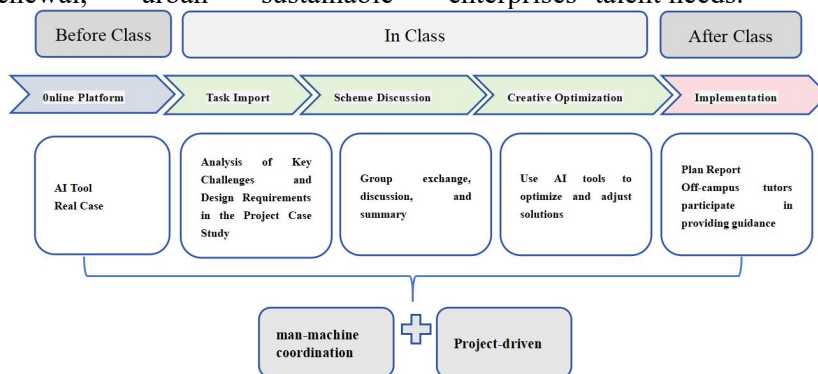


Figure 3. "Human-Machine Collaboration + Project-Driven" Teaching Method

### 5. Conclusion and Discussion

Through the application and exploration of

Generative Artificial Intelligence (GenAI/GAI) in the planning and design courses for professional master's students in Landscape

Architecture, students can proficiently use various AI tools for auxiliary and optimized design. This has significantly improved the efficiency of pre-site analysis, scheme optimization and deduction, spatial scale control, rendering presentation, and literature analysis, achieving a qualitative breakthrough in reducing the scheme cycle from months to weeks. From the course outcomes submitted by students, the research focuses on four core areas: ecological restoration, urban renewal, rural revitalization, and campus safety.

### **5.1 Ecological Restoration**

Students focused on urban ecological protection and restoration, as well as climate adaptability and resilience issues. Utilizing AI tools for site environment analysis, they adopted measures such as removing artificial weirs, transforming rigid revetments into ecological gentle slopes, restoring natural hydrological processes, and constructing multi-level habitats in the design, thereby establishing a complete ecological network.

### **5.2 Urban Renewal**

Students also paid attention to the sustainable development of old residential districts. Through research and analysis of location, population, building structure, road systems, parking systems, convenient facilities, and plant structures, they proposed the concept of triple core empowerment—ecology, leisure, and culture. Using AI tools to create diverse site spaces, they designed an all-age shared garden community where "every step is a scene, and returning home is healing" through age-friendly space design, child-friendly areas, rain gardens, ecological pavement, cultural sketches, and signage.

### **5.3 Rural Revitalization**

By retrieving literature and cases with AI tools, analyzing the spirit of central documents, and exploring the functions and values of rural spaces, students raised a series of questions such as "how to sustain the development vitality of villages" and "how to make villages more compatible with local elderly and children." Drawing on the successful practical case of the Songjiagou Village Renovation Project, they proposed design strategies including highlighting the characteristics of village history and context, showcasing local customs,

preserving the green mountains and clear waters of the countryside, constructing a harmonious and symbiotic civilization, building distinctive rural landscapes that emphasize original cultural forms, and improving supporting functional facilities to effectively enhance the quality of life. Specific measures such as re-planning site functional zones, updating and adding public service facilities, expanding children's activity areas and public gathering spaces, and enriching landscape sketches have created people-oriented, vibrant, green, convenient, diverse, and sustainable characteristic rural activity spaces.

### **5.4 Campus Safety**

Focusing on the main body of schools, students proposed the design vision of "a place for children to spread their dreams—the ideal school space." Using AI tools and big data, they investigated and analyzed the needs of teachers and students, as well as the types of spaces suitable for children's activities. Considering the behavioral habits of the entire school community, they created a pleasant and livable campus landscape tailored to local conditions, expanding activity venues and enriching space functions. Diverse space forms were designed, including spaces for intimate interaction with nature, interest development, and knowledge acquisition. Measures such as green buildings, sunken green spaces, and bioretention facilities were integrated to achieve sponge city goals. AI tools were used for sunlight analysis, building facade analysis, and plant space analysis, constructing an open, transparent, safe, ecological, and interesting courtyard-style campus space system.

Practice has shown that Generative AI plays a significant role in the design courses for professional master's students in Landscape Architecture. From site analysis and concept generation to scheme refinement, it is constantly reshaping the paradigm of traditional design—not only expanding the speed and scope of scheme generation, but also promoting the transformation of design thinking from traditional experience to data-driven and logically collaborative approaches. It breaks the thinking limitations of traditional design, broadens the creative perspective, and strengthens the capabilities of digital design and innovative expression. Therefore, embedding Generative AI into the entire process of talent

cultivation for professional master's in Landscape Architecture, strengthening the professional core, and constructing a student-centered, real-project-targeted intelligent teaching path will help cultivate high-level interdisciplinary landscape architecture professionals with professional literacy, innovative awareness, and practical capabilities, providing a practical model for the digital education and teaching reform of professional master's in Landscape Architecture.

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