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Engineering-Oriented Talent Cultivation in Environmental Design from the Perspective of New Engineering

Hui Zhang[1,*]

[1] Faculty of Art and Design, Anhui Institute of Information Technology, Wuhu 241199, Anhui Province, China

[*] Corresponding Author

Abstract

With the rapid advancement of technology and the increasing complexity of urban environments, environmental design education must evolve to meet contemporary demands. The concept of New Engineering emphasizes interdisciplinary learning, technological integration, and industry collaboration, providing a valuable framework for cultivating engineering-oriented talent in environmental design. However, traditional environmental design education often lacks adequate engineering integration, resulting in gaps in technical proficiency and limited practical application. This paper explores the challenges in conventional environmental design education and proposes a reformed talent cultivation model that incorporates engineering principles, project-based learning, and digital technology. A case study of curriculum reform at Anhui Institute of Information Technology demonstrates the feasibility and effectiveness of this approach. The findings suggest that engineering-oriented environmental design education enhances students' problem-solving abilities, innovation skills, and industry adaptability, better preparing them for the challenges of future urban development.

Keywords

New Engineering, Environmental Design, Engineering-Oriented, Talent Cultivation.

1. Introduction

1.1. Background of New Engineering and Environmental Design

New Engineering is an engineering practice-oriented mindset that differs from traditional engineering concepts and requirements. It is closely linked to modern industrial development, economic transformation, and social progress. This concept emphasizes that universities should focus on industry and enterprise demands when advancing professional education and talent cultivation, striving for the comprehensive growth of students rather than merely enhancing isolated skills or knowledge [1,2]. Under the framework of New Engineering, the reform and upgrading of the environmental design education system in higher education institutions have become a fundamental trend.

Environmental design encompasses areas such as landscape design and interior design. Historically, many programs in this field have focused on aesthetic expression, functionality, and human-centered approaches. As cities face increasing environmental pressures related to climate change, resource scarcity, and rapid urbanization, design education must integrate engineering knowledge to ensure that proposed solutions are both creative and technically viable. Against this backdrop, the New Engineering Education Reform in China was introduced to cultivate interdisciplinary professionals capable of merging engineering concepts, digital technology, and design thinking in various application scenarios. This educational shift

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underscores the importance of producing graduates who not only envision innovative design solutions but also possess the technical acumen to implement them effectively.

1.2. The Need for Engineering-Oriented Talent Cultivation

Higher education, as the key platform for national talent cultivation, continuously adopts new educational concepts to meet the needs of national development [3]. Traditional environmental design education often does not sufficiently integrate engineering principles, leading graduates to struggle with technical implementation, data-driven analysis, and systematic problem-solving. Many existing programs emphasize artistic expression and design theory while overlooking crucial components such as structural feasibility, material technology, and environmental performance evaluation. Consequently, there is a growing demand for engineers with a design mindset and designers with engineering knowledge. Engineering-oriented talent cultivation in environmental design addresses this gap by promoting interdisciplinary learning, project-based pedagogy, and digital tool proficiency. These approaches enable students to tackle sustainability challenges, adapt to emerging technologies, and collaborate more effectively with engineers, urban planners, and other professionals.

2. Challenges in Traditional Environmental Design Education

2.1. Research Scope and Methodology

This study focuses on integrating engineering principles into environmental design curricula through pedagogical strategies and curriculum reforms. The research methodology comprises a literature review on the theoretical underpinnings of New Engineering, an examination of the challenges facing traditional environmental design programs, a case study of reforms in an environmental design program at Anhui Institute of Information Technology, and an analysis of preliminary outcomes. These findings offer insights into how engineering-oriented education can enhance both the competence and employability of environmental design graduates.

2.2. Lack of Engineering Integration in the Curriculum

Research shows that traditional environmental design education often exhibits a significant disconnect among teaching practices, undergraduate student development, and market demands [4]. In many environmental design programs, courses concentrate on visual aesthetics, concept development, and user-centered design—essential elements, but with limited attention to engineering fundamentals such as structural analysis, systems design, and material science. The absence of these components hampers graduates' ability to create design solutions that are both conceptually innovative and technically sound. Consequently, graduates may be ill-equipped to work effectively with engineers or evaluate the feasibility of their designs under real-world conditions, leading to higher project costs, technical conflicts, and communication barriers [5].

2.3. Weak Interdisciplinary Approach

Environmental and urban challenges require a synthesis of knowledge from diverse fields, including civil engineering, data science, ecology, and social sciences. However, many universities maintain rigid departmental boundaries, limiting students to specialized coursework that may only superficially relate to other disciplines. As a result, environmental design students often lack exposure to collaborative projects that replicate real-world scenarios. This isolation constrains innovation and can lead to solutions that are neither technically robust nor socially inclusive. A more holistic, interdisciplinary approach is therefore necessary to bridge the gap between design-oriented thinking and engineering-based methodologies.

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2.4. Insufficient Practical and Industry-Oriented Cultivation

Another significant challenge in environmental design education is an overreliance on theoretical instruction and studio-based coursework. While design studios encourage creativity and conceptual exploration, they sometimes overlook hands-on practice, industry collaborations, and internships. Students may graduate without adequate experience in managing construction constraints, regulatory standards, or budgetary limitations. This shortfall is especially critical in modern urban development projects, where an integrated understanding of policy, economics, and engineering implementation is essential. Strengthening the link between academic learning and professional practice is therefore vital for producing graduates who can meet current industry demands.

3. Reforming Talent Cultivation Models in Environmental Design

3.1. Incorporating Engineering Knowledge into Environmental Design Curricula

Integrating engineering-oriented content into the curriculum is essential for cultivating well-rounded professionals. Such reforms may involve introducing core courses on structural design, environmental systems, and material technologies. Additionally, offering specialized electives in digital intelligence, sustainable and ecological design, and digital cultural innovation can further enhance students' ability to tackle complex environmental challenges. Through design-driven approaches and digital intelligence empowerment, the program aims to foster industry collaboration and local service development [6]. These curricular enhancements aim to balance design creativity with engineering rigor. Students can learn to evaluate their ideas quantitatively, ensuring that their projects are not only visually compelling but also feasible and sustainable.

3.2. Strengthening Interdisciplinary and Project-Based Learning

Interdisciplinary and project-based learning (PBL) can significantly advance the application of engineering principles in environmental design programs. Instead of relying solely on lecture-based courses, students can engage in team projects that require collaboration with peers from civil engineering, computer science, and urban planning. These cross-departmental endeavors encourage participants to consider multifaceted challenges, from initial conceptualization to technical execution. Such an approach mirrors real-world professional environments, where multiple stakeholders must align their expertise to achieve project goals. Moreover, PBL fosters deeper learning as students integrate knowledge from various areas, refine their communication skills, and practice flexible problem-solving—critical for tackling today’s urban and ecological challenges.

3.3. Enhancing Digital and Technological Competencies

Advances in digital tools and smart technologies are reshaping the ways in which environmental design is conceptualized and realized. Students benefit from exposure to Geographic Information Systems (GIS) for spatial analytics, Building Information Modeling (BIM) for collaborative design processes, and data-driven methods for evaluating environmental impacts. Virtual reality (VR) and augmented reality (AR) platforms also provide immersive simulations that facilitate stakeholder engagement and user feedback. By integrating these digital skills into the core curriculum, programs can prepare graduates to leverage technology effectively for optimizing construction workflows, predicting environmental outcomes, or clearly communicating design concepts to a wide range of audiences.

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4. Case Study and Practical Implementation

4.1. Example of University Curriculum Reform: Anhui Institute of Information Technology

Anhui Institute of Information Technology recently conducted a major curriculum reform within its Environmental Design program course, focusing on the “Landscape Design III” course. Recognizing the importance of engineering-oriented competencies, faculty members introduced new modules covering landscape engineering, hydrological system simulation tools, and digital modeling techniques [7]. Additionally, the course format was adjusted to incorporate team-based collaboration with students from computer science, management, and mechanical engineering programs, enabling interdisciplinary groups to jointly tackle design challenges.

The revised "Landscape Design III" course further integrates digital modeling software and engineering design, allowing students to apply fundamental engineering knowledge in landscape planning and construction. By balancing aesthetic objectives with engineering constraints, students can develop regionally adaptive and feasible solutions. Feedback from both students and faculty instructors highlighted that this integrated approach fostered greater creativity, improved students’ engineering problem-solving abilities, and enhanced readiness for professional collaboration.

4.2. Outcomes and Feedback

Preliminary results from the curriculum reform at Anhui Institute of Information Technology revealed several positive trends. First, students reported a deeper understanding of the technical dimensions of landscape design, noting that simultaneously considering form, function, and engineering constraints enriched their spatial thinking. Second, industry partners expressed increased confidence in the employability of graduates who participated in the updated “Landscape Design III” course, emphasizing these students’ collaborative skills and technical analysis capabilities. Third, faculty members observed an increase in innovative design proposals, as students adopted iterative feedback processes that combined engineering evaluations with creative exploration. These results suggest that infusing engineering knowledge into design-focused curricula can better align environmental design education with market demands and the broader societal imperative for sustainable development.

5. Conclusion

Engineering-oriented talent cultivation in environmental design is essential in an era marked by rapid technological advancements and complex urban challenges. By integrating engineering principles, interdisciplinary collaboration, and digital tools, environmental design students can develop comprehensive competencies that enable them to simultaneously address sustainability, construction feasibility, and aesthetic considerations. The case study at Anhui Institute of Information Technology highlights the practical benefits of this approach, with evidence indicating enhanced teamwork, deeper technical understanding, and greater creative output among students who have undergone an engineering-integrated curriculum.

Future research could explore the long-term career trajectories of graduates from such programs and investigate how universities can sustain productive industry partnerships. Additionally, examining emerging digital platforms, such as artificial intelligence and advanced data analytics, could provide insights into new opportunities for engineering–design integration. By adopting the perspective of New Engineering, talent cultivation in environmental design can better equip graduates with both visionary insight and technical

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expertise, preparing them to tackle the pressing environmental and infrastructural challenges of contemporary society.

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