

## *Original Paper*

# Exploration and Research on the Construction of Environmental Design Discipline in the Context of Interdisciplinary Studies

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### ***Abstract***

*In recent years, in order to thoroughly implement the “National Medium and Long-term Educational Reform and Development Plan,” the construction of art colleges has emphasized the characteristics of disciplines and industries. “Integration of Art and Technology” is not only a contemporary design principle but also the direction and essence of modern design talent cultivation. As the demand for talent in the country continues to rise, versatile talents are currently in short supply. This paper explores the research and practice of talent cultivation in the field of environmental design based on the characteristic of “integration of art and engineering,” using the environmental design major at Qingdao Yellow Sea College as an example. With the rapid development of society and continuous technological progress, the traditional single-discipline training model can no longer meet the complex and changing design requirements. Therefore, this study integrates the fields of art and engineering, constructing a new talent cultivation model aimed at nurturing individuals with both artistic creativity and engineering technical capabilities.*

### ***Keywords***

*Integration of Art and Engineering, Environmental Design Major, Talent Cultivation Model*

## **1. Introduction**

With society continually advancing and technology rapidly developing, the demand for talent in the field of design is becoming increasingly diverse and complex. In this context, the traditional single-discipline training model is no longer sufficient to meet the growing challenges of design. In order to cultivate versatile talents that meet the needs of contemporary development, academia and

practitioners are actively exploring innovative talent cultivation models. Among these, the characteristic model based on the “integration of art and engineering” is gaining attention.

This paper takes the environmental design major at Qingdao Yellow Sea College as an example, delving into the research and practice of the talent cultivation model based on the “integration of art and engineering” characteristics. In this model, the disciplines of art and engineering blend together, aiming to cultivate interdisciplinary talents possessing both creative artistic thinking and mastery of engineering technology. Through this comprehensive cultivation, students can not only pursue aesthetics in design but also apply creativity in practical scenarios.

The paper will thoroughly explore the exploration and practice of Qingdao Yellow Sea College’s environmental design major in the cultivation of talents based on the “integration of art and engineering.” Through interdisciplinary studies, practical projects, and the integration of industry, academia, and research, the study will examine the enhancement of students’ comprehensive competencies and the application of this model in actual design. Simultaneously, attention will be given to potential issues and challenges encountered, as well as the future prospects of this model. Through this research, the aim is to provide valuable insights and references for innovation in design education and talent cultivation.

## **2. The Necessity of Talent Cultivation with the “Integration of Art and Engineering” Characteristic**

As society undergoes rapid transformations and technology advances swiftly, the traditional boundaries of disciplines are gradually fading, and increasingly diverse challenges are emerging. In this context, the urgency of cultivating talents with comprehensive competencies and interdisciplinary capabilities becomes more apparent. “Integration of Art and Engineering,” as an innovative talent cultivation model, is increasingly recognized as a crucial approach to meet the demands of contemporary society.

Firstly, “Integration of Art and Engineering” can foster innovation. The fusion of artistic and engineering domains sparks unprecedented creative inspiration through the collision and intersection of diverse perspectives. This interdisciplinary thinking aids in solving complex problems, propelling the development of new fields, and injecting a continuous stream of vitality into societal innovation.

Secondly, “Integration of Art and Engineering” emphasizes comprehensive abilities. Traditional single-discipline training struggles to meet the demands of complex tasks, whereas this model cultivates students with multidimensional literacy. It enables them to apply professional knowledge to problem-solving and coordinate resources in interdisciplinary collaboration, resulting in more comprehensive solutions.

Moreover, real-world problems often require collaborative efforts across multiple disciplines, and talents cultivated through “Integration of Art and Engineering” play a crucial role in meeting this demand. They can bridge gaps between different fields, facilitate the integration and coordination of various disciplines, and thus better address complex and ever-changing challenges.

Most importantly, talents cultivated through “Integration of Art and Engineering” possess enhanced overall competitiveness. Modern society not only demands narrow specialists but also seeks versatile talents capable of navigating effortlessly across various fields. The talents nurtured through the “Integration of Art and Engineering” model fit this profile, making them more competitive in the job market and better suited to meet the needs of the workplace.

In conclusion, the talent cultivation with the “Integration of Art and Engineering” characteristic is of significant necessity. It not only promotes innovation, enhances comprehensive abilities, and meets the requirements of interdisciplinary collaboration but also nurtures talents with enhanced overall competitiveness, providing robust support for sustainable development and innovation in society.

### **3. Current Research Status and Shortcomings of Talent Cultivation with the “Integration of Art and Engineering” Characteristic**

In recent years, to deeply implement the “National Medium and Long-term Educational Reform and Development Plan,” the national and provincial governments have raised higher requirements for the development of disciplines and majors in universities. Directives emphasize building industry-oriented schools, including art schools, highlighting the characteristics of disciplines and industries, and concentrating efforts on constructing advantageous and distinctive discipline clusters to enhance overall strengths. Series of documents, such as “Opinions on Accelerating the Construction of High-Level Undergraduate Education and Comprehensive Enhancement of Talent Training Capacity” and “Opinions on Deepening Undergraduate Education and Teaching Reform to Improve Talent Training Quality,” have been successively issued, treating teaching reform as a breakthrough point for improving talent training quality.

Simultaneously, within the context of the national goal to build an innovative country, environmental design, as a crucial component of the national talent landscape alongside architectural design and urban planning, prompts many universities to analyze their existing resources and conditions critically. They actively explore innovations tailored to their characteristics and academic strengths, aiming to follow a path that highlights distinctive features in order to better serve society.

In 2005, Canadian scholar George Siemens proposed in the article “Connectivism: A Learning Theory for the Digital Age” that knowledge pathways are more important than knowledge content. Based on theoretical research, we need to explore teaching implementation paths that focus on collaborative education, interdisciplinary integration, and comprehensive cross-campus training. Through collaboration between the university and local communities, businesses, and government, multiple specialized nodes and information sources can be created to form knowledge pathways, ultimately constructing a comprehensive, multidimensional, and collaborative local university environmental design learning system.

As the demand for talent in the country continues to rise, cultivating versatile talents has become an urgent goal. Therefore, many scholars have conducted in-depth research and practical exploration of

the “Integration of Art and Engineering” education model, aiming to nurture arts students who not only possess foundational knowledge in art and aesthetics but can also address deficiencies in science and engineering knowledge.

Although there has been research and practice in the field of art and engineering integration in China, most scholars have focused primarily on analyzing the advantages of this model and conducting macro-level studies. However, there is a relative lack of research on the technical micro-level aspects, such as the mechanisms and specific implementations of integration.

### *3.1 Difficulty in Course Integration*

The cultivation of talents with the integration of art and engineering requires the integration of courses from different disciplines, but the significant differences in the knowledge structures and teaching methods of various disciplines make course integration challenging. It is difficult to ensure a balanced integrated curriculum that retains the characteristics of each discipline while forming an organic learning system.

### *3.2 Imbalanced Faculty Structure*

The structural differences between faculties in the fields of art and engineering create communication and collaboration barriers among teachers. Teachers in art and engineering have differences in teaching methods, philosophies, and professional backgrounds, making it challenging to coordinate their collaboration and ensure consistency in teaching objectives.

### *3.3 Imperfect Evaluation System*

Talent cultivation with the integration of art and engineering involves comprehensive abilities across multiple disciplines, making traditional assessment systems inadequate for evaluating students’ interdisciplinary literacy comprehensively. There is a need for the design of evaluation methods that align with the characteristics of art and engineering integration, accurately measuring students’ performance in creativity, technology, collaboration, and other aspects.

### *3.4 Blurred Discipline Boundaries*

The talent cultivation model with the integration of art and engineering may lead to blurred discipline boundaries. While interdisciplinary integration is necessary for cultivating versatile talents, excessively blurring discipline boundaries may result in insufficient deep learning in specific areas, affecting professional development.

### *3.5 Relatively Low Social Recognition*

Traditional talent cultivation models have existed for a long time, leading to relatively low social acceptance of emerging models like art and engineering integration. This may result in lower professional recognition during recruitment processes, affecting the employment opportunities for talents cultivated through art and engineering integration.

### *3.6 Uneven Distribution of Teaching Resources*

Talent cultivation with the integration of art and engineering requires more investment in teaching resources, including faculty, experimental equipment, and course resources. However, there may be an

uneven distribution of resources in different disciplinary areas, affecting the implementation effectiveness of the talent cultivation model with art and engineering integration.

In conclusion, while talent cultivation with the integration of art and engineering has many advantages, it also faces challenges and shortcomings. Addressing these issues requires collaborative efforts from schools, teachers, employers, and others to continually improve the cultivation model and adapt to the evolving needs of the times.

#### **4. Research on Talent Cultivation Pathways with the “Integration of Art and Engineering” Characteristic in Environmental Design Major**

##### *4.1 Research Framework*

Environmental design, as a comprehensive discipline involving architecture, art, and engineering, demands a higher level of talent cultivation. Historically, the environmental design major has primarily focused on artistic qualities, neglecting the supplementation of science and engineering knowledge, resulting in students facing challenges in practical applications. Additionally, the traditional teacher-centered teaching model lacks practical and interdisciplinary teaching, making it difficult for students to adapt to the complex and ever-changing professional environment. Therefore, how to truly integrate artistic and engineering knowledge, provide comprehensive interdisciplinary education, remains a subject requiring in-depth exploration. Simultaneously, there is an urgent need for reforms in teaching models and faculty development to meet the demand for cultivating versatile talents. Building on the historical and current development of the “Integration of Art and Engineering” specialty and the training models and issues in the environmental design major, we should focus on the following aspects to advance the reform and development of talent cultivation in the “Integration of Art and Engineering” specialty in environmental design:

- 1) **Establishing a Multidisciplinary Curriculum:** The curriculum of the environmental design major should encompass various disciplines such as art, design, architecture, materials, humanities, and social sciences, ensuring students receive comprehensive knowledge and skill development. Simultaneously, strengthening collaboration with other disciplines promotes interdisciplinary learning, enhancing students’ overall capabilities.
- 2) **Promoting Innovative Teaching Models:** In the teaching process, adopting a student-centered teaching model is essential, encouraging active student participation to foster creativity and teamwork. Through project practices, internships, and social research, students can engage with real-world issues, enhancing their problem-solving abilities.
- 3) **Faculty Development and Integration of Teaching Resources:** Schools should prioritize faculty development, hiring teachers with rich practical experience and academic expertise. Additionally, fostering discipline exchange and collaboration, and bringing in renowned domestic and international scholars and industry experts, can enrich teaching resources.

4) Addressing Industry Needs and Social Feedback: The cultivation of environmental design professionals should closely align with industry needs, paying attention to social feedback. Continuously adjusting teaching content and cultivation objectives ensures students are better equipped to meet industry development and societal demands. Through these efforts, talent cultivation in the environmental design major will better align with societal needs, address industry challenges, nurture outstanding and comprehensive design professionals, contributing more to social development and progress. This represents a crucial direction and development trend for talent cultivation in the environmental design major with the “Integration of Art and Engineering” characteristic.

#### *4.2 Research Strategies*

By implementing a quality strategy — accelerating the transformation of professional education from quantity to quality — and adopting a distinctive strategy — establishing a diversified and hierarchical environmental design professional education system — we aim to strengthen the cultivation framework of practical and creative abilities. This framework is designed to meet the demand for environmentally friendly and resource-efficient talents in society. The goal is to deliver well-rounded, applied, and high-quality design professionals with a higher level of knowledge and strong innovative capabilities:

##### *4.2.1 Focus on Professional Intersections, Emphasizing the Characteristics of Art and Engineering Integration*

Leveraging the provincial first-class major, Qingdao Yellow Sea University has developed a training model based on the integration of art and engineering. This model emphasizes “professional intersection, disciplinary cross-fertilization, and open collaboration.” The university prioritizes foundational knowledge, places emphasis on practical skills, and strengthens the development of capabilities. The curriculum system is comprehensive, with clear levels. The teaching process is overall coordinated, step-by-step, and progressively implemented. The practice system is diverse, flexible, and goal-oriented.

##### *4.2.2 Establish External Interfaces for a Diverse and Open Teaching Model*

Enhancing the service capabilities of first-class majors for strategic needs such as rural revitalization, living environments, and cultural heritage conservation. This involves further advancing the in-depth cooperation within the “university-administration-industry” quadrilateral framework. The university aims to explore talent cultivation models, curriculum development, and establish an excellent mentor resource pool. The objective is to create a diverse and collaborative education system.

#### *4.3 Research Content*

##### *4.3.1 Building an Environmental Design Talent Cultivation Model Based on the “Integration of Art and Engineering” Characteristic*

Redefining the curriculum system to embody the innovation and strong practical aspects of the integration of “design, culture, art, architecture, ecology, and engineering.” This reconstruction aims to create a talent cultivation model for environmental design that is characterized by the integration of art and engineering.

#### 4.3.2 Restructuring the “Three Verticals and Four Horizontals” Curriculum System to Build an Integrated Course Cluster

Establishing a new approach, model, and distinctive curriculum system for cultivating high-quality applied art and design professionals in the environmental design major. This restructuring involves the integration of vertical and horizontal courses to foster a comprehensive understanding of the field.

#### 4.3.3 Implementing Project-Led Education for Industry-Education Integration

Introducing elements such as collaboration with enterprises, integration of scientific research, practical projects, competitions, village preservation, heritage conservation, and transformation. Implementing project-led teaching to enhance students’ professional innovation and practical application capabilities through a blend of academic and real-world experiences.

#### 4.4 Research Pathways

An exploration into multidisciplinary and cross-professional integration in professional development aims to break through existing limitations of disciplines and professions. Cross-disciplinary professional development is not only a proactive response to the requirements of the new era, adapting to the new technological revolution and industrial changes, but also an intrinsic driving force for deepening professional reforms, creating “first-class majors,” and innovative development such as “gold courses.”

##### 4.4.1 Establishment of an Art and Engineering Integrated Teaching and Research Team

Qingdao Yellow Sea University, with a comprehensive range of disciplines, strengthens communication and dialogue among talents from different disciplines. This fosters an interdisciplinary teaching and research team combining art with science, technology, and engineering. The aim is to extend a unique and creative talent cultivation model in line with contemporary needs and societal demands.

##### 4.4.2 Construction of an Art and Engineering Integrated Curriculum System

The “Integration of Art and Engineering” aligns with the Ministry of Education’s “Four New” professional development initiative. It combines artistic disciplines with computer science, big data analysis, and artificial intelligence. The curriculum system is structured along “three verticals and four horizontals,” featuring the integration of art, architecture, and electronic information under the “three verticals.” Horizontally, it establishes four levels of courses and practical course systems: design practice, cognitive foundations, technical assurance, and entrepreneurial foundations.

##### 4.4.3 Collaborative Integration with Emerging Industries

Adhering to systematic and targeted approaches, the emphasis is on collaborative cultivation with enterprises. There is a focus on enhancing reforms and innovations in teaching models, teaching forms, and teaching content. The “university-administration-industry” collaboration forms an effective mechanism for multi-party collaborative education. This includes the integration of industry and education, and the establishment of a sound ecosystem for university-enterprise cooperation. Utilizing external internship bases, the involvement of enterprise mentors in practical teaching, and the creation of a collaborative education mechanism that is “open, co-constructed, and shared.”

## 5. Conclusion and Outlook

The cultivation of talents in the integrated field of Art and Engineering for Environmental Design represents an innovative training model. By seamlessly merging artistic and engineering disciplines, it produces well-rounded professionals with diverse skills. In practice, the cultivation of talents in this integrated field has yielded significant achievements. Looking ahead, the development of talent in the integrated field of Art and Engineering for Environmental Design will continue to grow, facing both challenges and promising directions:

**Continuous improvement of the educational system:** To enhance the integration of Art and Engineering, ongoing improvements in the educational system, optimization of course structures, and the strengthening of faculty development are essential. Emphasis on interdisciplinary collaboration in practice and comprehensive training requires increased attention to the synergy between disciplines, fostering the integration and transmission of knowledge.

**Reinforcement of practical education:** The cultivation of talents in the integrated field of Art and Engineering for Environmental Design should place greater emphasis on the importance of practical education. Collaborative efforts with industries should be intensified to provide more practical projects and opportunities, enabling students to continuously enhance their skills and address real-world challenges.

**Focus on technological and digital advancements:** As technology advances and digitalization progresses, talent cultivation in the integrated field of Art and Engineering for Environmental Design must keep pace. Institutions should incorporate new technologies and tools into their teaching methods, enabling students to grasp cutting-edge technologies, thus improving design efficiency and quality.

**Promotion of international collaboration:** Talent cultivation in the integrated field of Art and Engineering for Environmental Design needs to align with international standards, incorporating advanced international experiences and philosophies. Institutions can actively engage in international exchanges, cooperate with foreign educational resources, and provide students with broader development platforms.

Through continuous improvement of the educational system, reinforcement of practical education, focus on technological and digital advancements, promotion of international collaboration, and emphasis on social responsibility and sustainable development, talent cultivation in the integrated field of Art and Engineering for Environmental Design is poised for a broader and more prosperous future, making positive contributions to the prosperity and sustainable development of the design industry.

## Conflicts of Interest

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



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