Research and Practice on the Reform of Talent Cultivation Mode of Digital Intelligence Empowerment and Four Creation Integration for Environmental Design Majors in Applied Universities

Yang Wang[1] Pingqing Zhang[2]

[1,2] *College of Art and Design, Yantai Nanshan University, Yantai, Shandong 265713, China*
[2]*Corresponding author.*

ABSTRACT

The rapid development of digital intelligence technology has continuously added new kinetic energy to social and economic development, and put forward new requirements for the digital transformation and upgrading development of China's design industry. However, there is still a lack of digital art and design talents who are capable of digital transformation and upgrading. This has become a bottleneck that restricts the digital transformation and upgrading of China's design industry. The researcher takes the reform of talent cultivation mode of "Digital Intelligence Empowerment, Four Creation Integration" as the entry point to carry out various research work. This requires universities to promote the reform of environmental design professional talent training needs for the digital economy era, and keep up with the trend of big data, intelligent environmental evolution and design industry development trends. The researcher implements the teaching reform and practice of "Digital Intelligence Empowerment, Four Creation Integration" in various aspects such as teaching mode, curriculum system, practice teaching and teaching evaluation. Through research and practice, this will enable the university to actively meet the social changes of the intelligent era, vigorously promote the deep integration of digital intelligence technology into the environmental design professional innovation and entrepreneurship education and teaching, in order to cultivate the society's urgent need for high-quality applied design talents with a sense of innovation and entrepreneurial spirit.

Keywords: *Environment design, Digital Intelligence Empowerment, Four Creation Integration, Cultivation mode.*

1. INTRODUCTION

1.1 National Policies Need to Be Reformed

During his visit to Tsinghua University, Chinese President Xi Jinping emphasized the need to use the "catalyst" of cross-fertilization of disciplines to promote the construction of new engineering disciplines, new medical disciplines, new agricultural disciplines, and new liberal arts disciplines. In November 2020, China's Ministry of Education issued the Declaration on the Construction of New Liberal Arts, which points out that it is necessary to actively promote the in-depth integration of modern information technologies, such as artificial intelligence, big data, and the majors in the liberal arts. majors, and to cultivate students' ability to integrate cross-field knowledge and practical skills. The report of the 20th National Congress of the Communist Party of China (CPC) also proposes to comprehensively implement the new development concept and insist on the central position of innovation in the overall situation of modernization. China has elevated the importance of innovation to an unprecedented level. Innovation-driven is a defining feature of high-quality development. High-quality development is to take innovation as the first driving force, which

will surely release the kinetic energy of innovation and entrepreneurship in the whole society, stimulate the vitality of innovation and entrepreneurship, and carry out the concept of innovation and digital intelligence technology throughout the high-quality development [1]. In the context of national strategies such as Made in China 2025 and Innovation Drive, the society needs a large number of high-quality applied talents who can lead the progress of ideas and technological innovation, and have the spirit of innovation and entrepreneurial awareness.

1.2 Development of Environmental Design Industry Needs to Be Reformed

The environmental design industry needs digital talents adapted to the requirements of the development of digital economy, which undoubtedly puts forward new requirements for the cultivation of talents in environmental design majors of applied universities. The environmental design major belongs to the typical category of applied liberal arts, which is more prominently and deeply affected by the digital economy characterized by digitization, informatization and intelligence. Big data, artificial intelligence and other information technologies have become new research methods, paradigms and important means to study various new issues emerging in the field of art and design.

1.3 Social Supply and Demand Need to Be Reformed

With the implementation of the major strategy of old and new kinetic energy conversion, cultural and creative industries in Shandong Province have entered a new stage of transformation and integration development, thus requiring more innovative design talents. There is a high degree of coupling between innovation and entrepreneurship education as a means to cultivate college students' innovative spirit and entrepreneurial awareness, and the high-quality development of digital intelligence in environmental design majors. However, the current innovation and entrepreneurship education in universities is seriously disconnected from professional education and digital intelligence technology, and fails to help the high-quality development of higher education well.

2. KEY QUESTIONS TO BE ADDRESSED IN THIS STUDY

2.1 Changing the Limitations of Innovation and Entrepreneurship Education in Environmental Design Programs

At present, the innovation and entrepreneurship education of environmental design majors in applied universities has not yet formed a representative education and management model. Innovation and entrepreneurship education in the practice of integration with professional education and digital and intellectual technology is even more problems and dilemmas of integration in a single way, and there is still a certain distance from the integration of parallel tracks. The existing environmental design professional innovation and entrepreneurship education is generally limited to the integration of a certain course, a specific activity or competition. It has not been able to carry out comprehensive, systematic and in-depth changes in the talent training mode, curriculum system design, teaching management mode, faculty construction, digital technology and informaionization.

2.2 Improving the Problem of Disconnection Between Innovation and Entrepreneurship Education and Environmental Design Professional Education

Based on the background of "mass entrepreneurship and innovation", innovation and entrepreneurship education activities have been carried out in full swing. However, due to the influence of people, environment, conditions, concepts and other factors, it is inevitable that there are various problems in the cultivation of innovative and entrepreneurial talents. The main problems are summarized as follows: first, the innovation and entrepreneurship talent cultivation model has not been established; second, the innovation and entrepreneurship digital curriculum and education system is not complete; third, the innovation and entrepreneurship faculty are relatively lacking; fourth, the role of digital and intellectual technology in innovation and entrepreneurship education is not yet obvious. The

drawbacks of the traditional education model that has been unfavourable to the cultivation of innovative and entrepreneurial talents are also becoming more and more prominent. The innovation and entrepreneurship education of the university and professional education are uniform, and there is a large disconnection problem. Aiming at the real teaching problems, the researcher constructs the "Digital Intelligence Empowerment, Four Creation Integration" talent cultivation system for environmental design majors in applied undergraduate universities and carries out the application practice. At the same time, it also provides reference suggestions for the integration of innovation and entrepreneurship education in other majors [2].

2.3 Solving the "Bottleneck" Problem Of The Cultivation of Practical Teaching and Application Ability of Environmental Design

Through the implementation of the talent cultivation mode reform of "Digital Intelligence Empowerment and Four Creations Integration", the researchers build a whole-process practical teaching and application ability cultivation system of "Creative Thinking (Freshman year) - Creative Ability (Sophomore) - Innovative Awareness (Junior) - Entrepreneurship (Senior)" in the major of environmental design. The researchers standardize the practice teaching system of the environmental design major through the introduction of digital intelligence technology, and establish a standard system for training skills of environmental design majors in order to improve the quality of talent training.

2.4 Constructing a Practical Teaching System and Mode That Integrates Digital Intelligence and Education

The practical teaching links related to innovation and entrepreneurship education lack overall planning at the strategic level. The connection between different practical teaching links is not yet close. The synergy and logic of the teaching content of mathematical and intellectualization are not yet strong. This requires systematic planning and design of talent training programs and curriculum system. There is a big difference between the digitalized practical training cases and training materials of environmental design majors and the real digital scenarios of design industry enterprises. This is not conducive to the cultivation of students' comprehensive application ability and digitalization ability, nor is it conducive to students' scientific analysis and evaluation of the content of digitalization practical training with a more open mind and a broader vision.

2.5 Enhancing Teachers' Digital Literacy and Updating Practical Teaching Content

The practice teaching faculty of innovation and entrepreneurship education for environmental design majors is weak. The number of practicing teachers with high academic qualifications, cross-disciplinary learning experiences and rich design practice experiences is seriously insufficient. Teachers' informatization literacy and digital education and teaching ability need to be improved. The enthusiasm of professional teachers to participate in innovation and entrepreneurship practice teaching reform is not high. Experimental teachers lack the enthusiasm to keep pace with the development of the digitalization era and the motivation to reform innovation and entrepreneurship practice teaching. This inevitably leads to the guiding role of innovation and entrepreneurship practice teaching is difficult to give full play to. At the same time, the content of environmental design professional practice teaching has not kept pace with the development of the digital age, and the whole lags behind the latest design practice development of industry enterprises. Practice teaching lacks a scientific quality assurance system, the evaluation standard is sloppy, and the role in innovation and entrepreneurship education and practice activities is not obvious.

3. IDEAS AND METHODS FOR DESIGNING REFORM PROGRAMS

3.1 Re-examining the Intersection of Disciplines and Multi-dimensional Innovation

Environmental design is a highly comprehensive cross-specialty, and its talent cultivation focuses on innovative thinking, professional quality, practical ability and the realization of the final design effect. Applied university environmental design students' mathematics and science foundation and computer technology ability are relatively weak, and cannot copy the teaching mode of arts or science majors that emphasize both mathematics and science. This requires administrators or teachers to actively explore innovative entrepreneurship education and teaching programs that meet the quality of art students and the quality of the student population. Only by integrating the ability of "creative thinking - creative ability - innovative consciousness - entrepreneurial spirit" into the whole process of cultivating environmental design professionals, can universities better adapt to the current social requirements for art and design talents [3]. Universities must adhere to the concept of integration and innovation, with the "Four Creation Integration" as the core of the cultivation of numerical and intellectual environmental design talents. Universities should be problem-oriented, focusing on cultivating students' ability to comprehensively apply "digital intelligence" technology and skilfully apply various intelligent design tools to efficiently complete design work and provide technical support for design management decision-making. At the same time, through the teaching reform, teachers should re-examine the core competitiveness of future environmental design professionals, and deepen the teaching reform of digital intelligence in a targeted manner. Teachers should integrate the "Four Creations" into a closed loop, promote the common growth of teachers and students, and ultimately realize the goal of training applied and innovative art and design talents.

3.2 Revising the Talent Training Program Based on the Concept of "Digital Intelligence Empowerment and Four Creation Integration"

Relying on the "Environmental Design" Shandong Provincial Characteristic Specialty and Shandong Province first-class undergraduate professional construction platform, the college vigorously promotes the integration of "Digital Intelligence Empowerment, Four Creation Integration" education new model reform. In the environmental design professional training objectives and programs, the university will integrate creative thinking (freshman), creative ability (sophomore), innovation consciousness (junior), entrepreneurship (senior) of the "Four Creation" concept. This requires the professional training program to follow the idea of "creativity first, school-enterprise integration, practice assistance, service to the community", highlighting the cultivation of students' design thinking ability, creative expression skills, design and creative skills, and entrepreneurial vocational skills [4]. Teachers follow the idea of "one main line, two classrooms, three docking, and four creation integration", and determine the cultivation objectives and specifications of each specialty according to the analysis of the demand for vocational positions in social enterprises. At the same time, the university organizes teachers to revise the talent training program for environmental design majors in a timely manner, highlighting the innovative environmental design talent training features of "Digital Intelligence Empowerment and Four Creation Integration".

3.3 Creating a Curriculum System Based on "Creativity, Creation, Innovation and Entrepreneurship"

The researchers divided the four-year curriculum of environmental design into four stages: design foundation, design introduction, design improvement and design synthesis [5]. At the same time, the researchers build the practice teaching system of "basic practice + professional practice + innovation practice + comprehensive practice" to strengthen the cultivation of students' four abilities of environmental design: creative thinking, creative skills, innovation ability and entrepreneurial

literacy, so as to build the "Four Creations" ability. Curriculum system. Specifically: the curriculum of the first year is based on the professional theory training mode, accumulating students' design thinking and creativity; in the second year, teachers start to implement the curriculum project teaching package, allowing students to create professional works independently; in the third year, the curriculum introduces the digital intelligence technology, aiming to stimulate the students' innovation ability and seek for the development of the students' personality; in the fourth year, the curriculum adopts the customized cultivation, and the cooperation between schools and enterprises to cultivate the students, so as to enhance the students' comprehensive practical ability and the digital intelligence ability. The fourth-year course adopts customized training, and the school-enterprise cooperation cultivates students, enhances students' comprehensive practical ability and the application ability of digital intelligence technology, and cultivates students' entrepreneurial consciousness.

3.4 Promoting the Digitalization of the Knowledge System of Innovation and Entrepreneurship Courses

Under the background of digital economy, the rapid development of organizational reconfiguration, data and digital intelligence is driving the accelerated updating of the knowledge system of traditional environmental design professional education. At present, there are problems such as insufficient cross-fusion of interdisciplinary knowledge and insufficient systematic and innovative degree of innovation and entrepreneurship curriculum system in environmental design majors in terms of big data, cloud computing and artificial intelligence technology [6]. Therefore, in the optimization of innovation and entrepreneurship curriculum system of environmental design majors, universities should break the single-dimension situation of traditional professional education in the curriculum knowledge system, which is strictly divided by majors and levels. Universities should actively advocate and adhere to the principle of "design as the core, digital intelligence as a supplement, integration as the foundation, ability as the key", and promote the cross fertilization of environmental design professional knowledge and digital technology across specialties and disciplines. This requires the reconstruction of the knowledge framework, professional structure and curriculum system for professional talent training.

3.5 Enhancing the Digital Technology Literacy and Capability of the Professional Teaching Staff

The key to innovation and entrepreneurship teaching reform lies in teachers, and the difficulty of reform lies in the change of teaching thinking and teaching technology. In order to carry out innovation and entrepreneurship teaching reform, the first step is to improve the teachers' professional practice ability and professional teaching ability, which are integrated with "digital intelligence" technology [7]. Universities should make great efforts to cultivate a composite professional teaching team with high teaching quality, strong practical ability, outstanding sense of reform and innovation, and proficiency in "digital intelligence" technology. This will fundamentally solve the problem of mismatch between teachers' innovative and entrepreneurial qualities and the requirements of the digital age [8].

4. ACHIEVEMENTS OF TEACHING REFORM — TAKING THE COLLEGE OF ART AND DESIGN OF YANTAI NANSHAN UNIVERSITY AS AN EXAMPLE

4.1 Integrating the Concept of "Digital Intelligence Empowerment, Four Creation Integration" in the Formulation of Talent Cultivation Objectives and Programs

The College of Art and Design of Yantai Nanshan University has formulated the "14th Five-Year" Development Plan of the College of Art and Design, which clearly defines the development idea and target orientation. The college has comprehensively promoted the reform of undergraduate teaching mode based on "Digital Intelligence Empowerment, Four Creations Integration", and continuously improved the quality of talent cultivation [9]. The environmental design major combines the concept of "Four Creations", highlights the cultivation of students' creative ability, emphasizes the cultivation of students'

professional practice skills, and guarantees the cultivation of students' design practice and innovation ability.

4.2 Promoting the Integration of Information Technology and Innovation and Entrepreneurship Education, Relying on the Advantages of the Disciplines and the Innovation of Digitalized Teaching Mode

Relying on the advantages of scientific research platform of Intelligent Internet + Design Engineering Research Centre of Shandong Province Higher Education Institutes, the college vigorously develops the advantageous characteristic professional group of digital art and actively promotes the cross-disciplinary and coordinated development of multiple disciplines [10]. The college makes full use of modern information technology means of collaborative innovation and entrepreneurship education to realize the integration of common education and individual training of environmental design professionals.

4.3 Stimulating Students' Learning Initiative and Innovation Consciousness by Combining Flexible Classroom Teaching with Social Practice

The college organizes students to complete the teaching and practice of innovation and entrepreneurship with professional tutors. Students join different project research teams according to their own interests, realizing zero distance communication between teachers and students. By strengthening the cooperation between industry, academia and research, the college inspires students to think "Four Creations" and gradually cultivates students' awareness of independent learning [11]. This in-depth cooperation between schools and enterprises has changed the traditional single, closed classroom teaching method. It combines teaching practice with innovation and entrepreneurship, integrates design resources, optimizes the cultivation of innovative talents, and greatly improves students' independent working ability, practical ability and innovation ability. This will inevitably stimulate students' learning initiative and enhance their innovative consciousness and entrepreneurial spirit.

4.4 Achieving Construction Results in Educational and Teaching Reforms

In the past three years, the college has more than 1,000 participants in various design competition programs, and has won more than 300 design competition awards at all levels and in all categories. The college has won a total of 29 innovation and entrepreneurship training programs for college students, including 7 at the national level. The participation rate, award rate and award quality of students in all kinds of national science and technology competitions have improved year by year. The innovative practice and design application ability of students have been steadily improved. Through the teaching mode reform of "Digital Intelligence Empowerment, Four Creations Integration", students have not only made a better breakthrough in their majors, but also significantly improved their digital literacy and practical ability. Students have not only learned professional knowledge, but also have the ability to solve practical design problems, and their comprehensive ability has been better manifested.

5. CONCLUSION

The development of the digital economy in the new era has become a national strategy, and accelerating the construction of a digital China has become a key force in the implementation of China's major development strategies for the "14th Five-Year Plan" period. Driven by multiple factors, the digital economy in China has entered a critical period of continuous segmentation, in-depth development and iterative upgrading. With the arrival of the knowledge economy era, the social demand for innovative and entrepreneurial talents has become increasingly urgent. The state, society and universities attach great importance to the cultivation of innovative and entrepreneurial talents.

Based on the new requirements for design talents in the era of digital economy, this study aims at the current situation of environmental design education and innovation and entrepreneurship education in applied undergraduate universities, and builds an innovative environmental design talent cultivation

system of "Digital Intelligence Empowerment, Four Creation Integration" for environmental design majors in applied undergraduate universities, so as to implement innovation and entrepreneurship education throughout the whole process of cultivating talents in the environmental design majors and adapt to the development environment of digital economy[12]. By building an innovative environmental design talent cultivation system of "Digital Intelligence Empowerment and Four Creation Integration", we can integrate innovation and entrepreneurship education into the whole process of environmental design talent cultivation, and implement digital remodelling and upgrading, so as to adapt to the environment of the digital economy. This study can also accelerate the cultivation of applied high-quality environmental design professional talents with digital intelligence, effectively enhance and expand the breadth and depth of professional education and innovation and entrepreneurship education, and improve the quality of art and design education in higher education institutions.

AUTHORS' CONTRIBUTIONS

Yang Wang was responsible for experimental design and wrote the manuscript, and Pingqing Zhang analysed data and contributed to revising and editing.

ACKNOWLEDGMENTS

Project: General Project of Undergraduate Teaching Reform Research in Shandong Province in 2022: "Research on the Reform of Talent Cultivation Mode of "Specialized and Creative Integration, Four Creations and Connectivity" in Environmental Design Major of Applied Universities" (M2022350); Key Project of Undergraduate Teaching Reform Research in Shandong Province in 2023: "Research on the Reform of Practice Teaching of Environmental Design Major Empowered by "Digital Intelligence" in Applied Universities" (Z2023312).

REFERENCES

[1] Zhao Y. Application Reflection on Innovation and Entrepreneurship Education in Art and Design Majors of Applied Universities from the Perspective of Rural Revitalization. International Education, vol.2, pp.89-92, August 2023.

[2] Wang R, Liu Y. "Integration of Four Innovations": Research on the Practice of Innovation and Entrepreneurship Education for Art and Design Talents. Art Education, vol.3, pp.176-177, July 2019.

[3] Chen G, Li X. Research and Practice on the Training Model of Innovative Talents in Art and Design in Comprehensive Colleges and Universities under the Concept of "Integration of Four Innovations" - Taking the School of Art and Design at Guilin University of Electronic Science and Technology as an Example. Education Observation, vol.35, pp.59-62, August 2019.

[4] Bai D, Cen H, Li R, et al. Exploring the Implementation Path of the Integration of Specialization and Creativity in Innovative Design Practice Courses in Applied Undergraduate Universities. Education Informatization Forum, vol.7, pp.93-95, February 2024.

[5] Li H. Integration and Innovation: Research on the Construction of Innovation and Entrepreneurship Curriculum System in Universities. Chinese University Teaching, vol.2, pp.42-51, May 2023.

[6] He M, Xiao J, Ni J. Exploring the Innovative Path of Art Teaching through Digitalization Empowering the Integration of Industry and Education. Art Education Research, vol.4, pp.150-152, March 2023.

[7] Gong Y. The Construction of a Talent Training Model for Art and Design Innovation and Entrepreneurship under the Background of "Integration of Specialization and Innovation", vol.1, pp.47-49, July 2022.

[8] Mei W, Zhou S, Xia J. International Trends and Local Inspirations of Innovation and Entrepreneurship Education in Higher Education Institutions in the Digital Intelligence Era. Education Development Research, vol.44, pp. 46-54, March 2024.

[9] You J. Research on the development of dual innovation education for environmental art

design majors in colleges and universities. Proceedings of the Symposium on Theory and Practice of Educational Innovation of China Wisdom Engineering Research Society 2023, vol.3, pp.49-51, 2023.

[10] Chen C, Li H. Digital Empowerment of Innovation and Entrepreneurship Education Ecosystem Construction: Value, Logic, and Path. Higher Engineering Education Research, vol.1, pp.187-193, March 2024.

[11] Zhang Z, Li G, Ren L, et al. Research on the Reform Path of Environmental Design Teaching Model under the Guidance of Innovation and Entrepreneurship [J]. Journal of Jilin University of Education, vol.40, pp.80-84, January 2024.

[12] Dong G, Jing Q. Exploration of Innovation and Entrepreneurship Education System in Environmental Design under the Background of New Liberal Arts. Education Informatization Forum, vol.1, pp.84-86, October 2022.