

Construction and Practice of "Three Industry Integration and Three-dimensional Interaction" Talent Training System for Ship and Marine Engineering Specialty

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Abstract:

In response to the new round of scientific and technological revolution and industrial transformation, China has implemented a series of national strategies such as "Made in China 2025". Under the background of Marine power and the transformation of new and old energy, in order to better adapt to regional economic development, application-oriented undergraduate universities shall further integrate the development of specialty, industry and innovation and entrepreneurship, and implement the cooperative education mechanism of deep integration between school and enterprise and professional innovation and finance guided by market and social demand. Taking the naval architecture and marine engineering of Qingdao Huanghai University as the research object, taking the integration of specialty, industry and innovation and entrepreneurship as the path, the practice teaching system shall be gradually implemented to form the three-dimensional interactive teaching mode of students, teachers and enterprise experts, teaching, scientific research and social service, specialty, industry and innovation and entrepreneurship, thus constructing the innovative and applied talents training system of "three industries integration and three-dimensional interaction". To cultivate innovative and applied talents in naval architecture and marine engineering equipment.

Keywords: *Integration of three industries, Three-dimensional interaction, Integration of industry and education, Professional innovation, Talent training system*

I. INRODUCTION

The Ministry of Education has made important arrangements for the training of innovative and entrepreneurial talents in colleges and universities, an important deployment was made for the cultivation of innovative and entrepreneurial talents in colleges and universities, and the "Strategy of Constructing a Marine Powerful Country" was put forward, and the *Implementation Opinions on Deepening the Reform of Innovation and Entrepreneurship Education in Colleges and Universities* were successively issued to the

General Office of the State Council [1]. In 2018, Shandong province issued the *Action Plan of Shandong Ocean Province Construction*, which brought the construction of the Marine Powerful Province into the major project of conversion of new and old kinetic energy. In 2016, Qingdao was approved as one of the first demonstration cities for Marine economy innovation and development during the 13th Five-Year Plan period. At the same time, under the new situation of international competition and the new demand of national development strategy, "Emerging Engineering Education" arises at the historic moment. The "Emerging Engineering Education" is an important strategic choice of educational reform under the new form and new background. Its main objective and task orientation is to train engineering innovative talents in the new period and build a powerful country in engineering education. Therefore, its core is always around the cultivation of people for what, what kind of people and how to cultivate people. In accordance with the spirit of the national *Opinions on the Implementation of Innovation and Entrepreneurship Education Reform in Colleges and Universities and the Implementation Plan for the Construction of Applied Colleges and Universities in Shandong Province* and other documents, in order to better adapt to regional economic development, professional, industry and innovation and entrepreneurship will be further integrated and developed, the university-enterprise cooperative innovation talent training mechanism, and the university and enterprise participating in the market and social demand-oriented innovative and entrepreneurial talent training system [2] shall further improve the talent training evaluation system. Therefore, the innovative applied talent training system shall be constructed to adapt to the "smart ship" under the background of marine power. The demand of "Marine +" for professional talents of naval architecture and marine engineering. Taking the major of naval architecture and marine engineering of Qingdao Huanghai University as the research object, this paper explores the talent training system of "integration of three industries and three-dimensional interaction" to train innovative and applied talents of naval architecture and marine engineering equipment.

II. IMPLEMENTATION MEASURES OF "INTEGRATION OF THREE INDUSTRIES AND THREE-DIMENSIONAL INTERACTION" TALENTS TRAINING SYSTEM

2.1. Construct the Practice Teaching System of Hierarchy Step by Step

In the context of marine power and the transformation of old and new kinetic energy, the development of marine equipment such as "smart ship", "green shipbuilding", "Marine+" and so on has diversified demands for talents. Therefore, the requirements for knowledge advancement, timeliness and practicability of knowledge are further strengthened. It is imperative to integrate industry and education, specialize in innovation and finance, and form the integration of profession, industry and innovation and entrepreneurship. In view of the problem that talent cultivation in colleges and universities is difficult to adapt to the demand of society and market for innovation and entrepreneurship [3], based on the talent training scheme setting and teaching reform status of naval architecture and marine engineering of Qingdao Huanghai University, a hierarchical and progressive practical teaching system [4] is constructed, as shown in Figure 1.

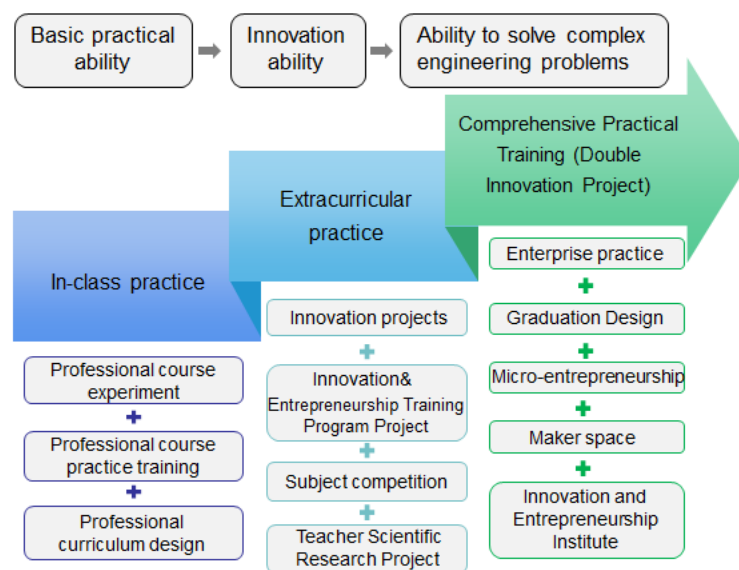


Figure 1 Gradual Practice Teaching System

In accordance with the basic practice ability-innovation and entrepreneurship ability-the ability to solve complex engineering problems, a hierarchical practice teaching system is constructed, and a curriculum practice reform mode with project-based teaching as the main line is designed to form a comprehensive innovation practice system of "in-class practice - extracurricular practice - comprehensive ability improvement". In the in-class practice module, schools and enterprises are deeply integrated, and the real engineering projects of enterprises are introduced into the curriculum training to form a professional core curriculum group. The professional core courses such as hull structure and drawing, ship construction technology and ship design implement project-based teaching, multi module practice, and adopt the close combination of experiment, training and curriculum design to cultivate students' innovative consciousness, innovative thinking and master professional knowledge. The extracurricular practice module makes full use of the second classroom to design the college students' innovation and entrepreneurship training program, the "Internet +" competition, discipline competition and teachers' scientific research projects in modules, promote each other through specialized innovation and combine competition with innovation, and train students' team awareness, communication and innovation ability. Comprehensive practice module, earnestly implements graduation practice, do a good job in graduation design, and improve students' ability to solve complex problems.

2.2 Construct the Teaching Mode of "Three-Dimensional Interaction"

The reform of teaching mode is the fundamental way for the effective connection of education chain, talent chain, industrial chain and innovation chain [5]. Based on deepening the integration of industry and education, innovative and entrepreneurial talents training need to be reformed from the teaching links. Based on the cultivation of innovative and entrepreneurial talents to deepen the integration of industry and education, we need to reform the teaching mode from the teaching link, draw lessons from the cultivation

results of agricultural innovative and entrepreneurial talents of Ma Ruiyan and other experts [6], based on the teaching situation of naval architecture and marine engineering of Qingdao Huanghai University, and take the innovative and applied talents of ship and marine engineering major as the goal to build an "three-dimensional interactive" innovative teaching mode. The first dimension of "three-dimensional interaction" teaching mode is students, teachers and enterprise experts, the second dimension is teaching, scientific research and social service, and the third dimension is specialty, industry and innovation [2]. The three dimensions are interrelated and promote each other, as shown in Figure 2.

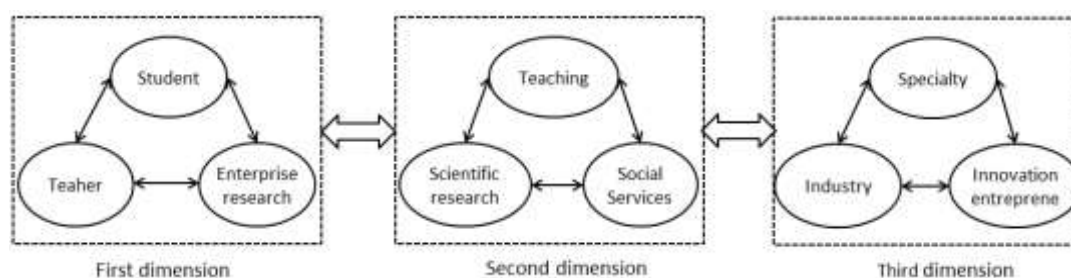


Fig. 2 Teaching Mode of "Three-dimensional Interaction"

2.2.1 The first dimension is based on "people": students, teachers and enterprise experts.

In the teaching activities, taking the students as the center, the full-time teachers and enterprise experts form a teaching team, and the school and enterprise experts participate together. From the theoretical teaching and practical teaching in the first classroom to the innovation and entrepreneurship training and guidance and enterprise practice training in the second classroom, teachers play the functions of preaching, learning and dispelling doubts in the whole teaching process. Teaching reflection after class can further deepen the understanding and application of knowledge, which is conducive to the improvement of teaching methods and the improvement of teaching effect. Introduce enterprise experts into the classroom, which combines their own professional skills and professional knowledge to guide students to practice and practice, and improve their professional practice ability. Students, as the main body of learning, can not only acquire professional knowledge, but also interact with teachers and enterprise experts in the course of teaching. They can also understand the methods and thinking behind knowledge, deeply realize the charm of personality and life experience of teachers and enterprise experts beyond their professional knowledge, give full play to the main role of students in teaching process, and improve students' engineering accomplishment and spirit of unity and cooperation.

2.2.2 The second dimension is based on "things": teaching, scientific research and social services.

Talent training, scientific research, social service and cultural inheritance are the basic functions of colleges and universities. Teaching, scientific research and social service are the important work of teachers and professional technicians in colleges and universities. Colleges and universities should first improve the effect of talent training, and teaching and scientific research complement and promote each other. Carry out cultural inheritance and serve the society on the basis of talent training and scientific research. Provide

intellectual support for professional construction, industrial development needs and the effectiveness of innovation and entrepreneurship.

2.2.3 The third dimension is based on "results": specialty, industry, innovation and entrepreneurship.

Innovation refers to the behavior of improving or creating new things, methods, elements, paths and environments in a specific environment in line with idealized needs or to meet social needs, guided by the existing thinking mode and opinions different from conventional or ordinary people's ideas, using existing knowledge and materials ^[7]. Under the background of mass entrepreneurship and innovation, we should deepen the integration of industry and education and professional creation, and promote the organic integration of specialty, industry, innovation and entrepreneurship. Under the guidance of academic lectures from famous teachers and tutors, relying on enterprise engineering practice projects, taking each innovation studio as the platform and Qingdao Huanghai University students' scientific and technological innovation project as the carrier, the students are trained to cultivate their innovation consciousness, stimulate their creative potential and strengthen the practical ability of combining theory and practice [8]. Therefore, the naval architecture and marine engineering revise the traditional talent training scheme, add courses such as "entrepreneurship foundation" and "college students career planning" in the talent training program, and set up innovation and entrepreneurship practice module to provide a variety of innovative entrepreneurship courses for students to choose. Students participate in the "Internet+" competition, and the innovation and entrepreneurship training program is fully covered. Through project-based teaching, special training, subject competition and entrepreneurial practice, students' innovative and entrepreneurial ability can be improved.

III. KEY ISSUES TO BE SOLVED

1) Solve the problems of insufficient of industry education integration, single school enterprise cooperation and insufficient integration of theoretical teaching and practical teaching. Carry out the integration of industry and education and carry out eight docking, i. e. specialty setting and regional economic development demand, teaching content and vocational standard, teaching process and production process, curriculum system and post requirement, professional teacher and enterprise technician, practical training project and enterprise project, students and enterprise staff, professional culture and enterprise culture. Through the construction of production-teaching integration platform, outside-campus practice training base and other forms, professional teachers and enterprise experts organize teaching team, introduce enterprise real engineering practice project into teaching content, revise teaching syllabus and practice training according to enterprise standards, effectively improve students' professional practice ability.

2) Solve the problem that professional education is not closely combined with innovation and entrepreneurship education. Based on the idea of cultivating talents through innovation-driven development strategy implemented by the state, the innovation and entrepreneurship education will be integrated into the talent training system, and the whole process of talent training will be carried out. The professional

education and innovative and entrepreneurial education will be organically combined, and the ideological and political education will be deeply integrated, so as to construct the innovative and entrepreneurial education system for professional creation integration^[9-10] to cultivate students' innovation consciousness and innovation ability.

IV. INNOVATION OF TALENT TRAINING SYSTEM

1). Construct the practice teaching system of "speciality + industry + innovation and entrepreneurship". Integrate enterprise engineering practice projects into practical teaching in modules, implement project-driven multi-modular practice teaching, gradually integrate mass entrepreneurship and Innovation Training Program projects, so as to promote the coordinated development of professional chain and industrial chain, talent chain and innovation chain, and promote the diversified development of students.

2). Establish three-dimensional interactive teaching mode. The implementation of school-enterprise double tutors, professional teachers, enterprise tutors jointly guide practice training and graduation project, "theory-experiment-practice-innovation-competition" organic combination, so as to realize the organic connection between professional chain and industrial chain, talent chain and innovation chain, and teaching content and production practice content.

V. EFFECTIVENESS OF IMPLEMENTATION

Through the practice of talent training system of "integration of three industries and three-dimensional interaction", the major of naval architecture and marine engineering of Qingdao Huanghai University has achieved fruitful achievements in the construction of majors and courses. This major was approved as an advantageous specialty of private undergraduate colleges and universities in Shandong Province in 2015 and a first-class specialty construction site in Shandong Province in 2020. The school and enterprise cooperate to build 3 online open courses and launch the online teaching alliance of Shandong Province, with a total of 5 specialized core courses taught, among which Shipbuilding Technology won the first-class course in Shandong Province.

It has built an innovation and entrepreneurship platform, approved a national maker space and an innovation and entrepreneurship incubation base in Shandong Province, and established 8 innovation studios, all of which implement "double tutors". Over the past five years, students have won more than 800 provincial and national-level disciplines competitions, including 115 national awards, including the National Marine Vehicle Design and Production Competition, the First Prize of China University Intelligent Robot Creativity Competition, the First Prize of National College Students Advanced Graphic Technology and Product Information Modeling Innovation Competition, more than 700 provincial awards. 1 provincial gold award, 16 silver awards and 15 bronze prizes in the 2021 "Internet+" University Student Entrepreneurship Competition; It has obtained more than 200 programs of innovation and entrepreneurship training programs for college students above provincial level, 106 patent authorizations and 68 papers published; It has won the competition excellent organization award for many times. 2 studios and 4 club

cadres have been awarded the titles of “Shandong Excellent University Student Science and Technology Association” and “Shandong Excellent University Student Association Cadre” by Shandong Association of Science and Technology for many times, and 12 students have won national honors such as “Star of Self-improvement of Chinese University Students” and “China Flying Young Scholarship”.

It has cultivated Miao Liqi, chief technician of Qilu reported by CCTV.com, Sun Jingdong, model worker of Qingdao and other "great country craftsmen". A number of entrepreneurial models have emerged: Gao Jian of HangZhou Warensen Electric Co., Ltd., with an annual sales of more than 80 million yuan, and Zhang Chenggong of Qingdao Yongming Intelligent Technology Co., Ltd., with an annual sales of more than 20 million yuan. More than 50 employers have highly appraised the graduates: they have excellent professional skills, strong innovation consciousness and ability, and can quickly adapt to the demands of the post.

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