

Establishment of the Diversified Cultivation System of Practical Innovation Ability for Marine Science and Technology Talents

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Abstract: Practical innovation ability is the short board for marine science and technology talents. In order to explore and improve the ways and methods of practical innovation ability, taking the ocean college of Hebei Agricultural University as an example, based on the development needs of the marine industry in Hebei Province, the diversified cultivation system of practical innovation ability for marine scientific and technological talents has been established with the core of improving students' innovative practical ability and the "multidimensional practical innovation model and four types of practical innovation resource platforms" as the main body. It provided a path to solve the current problems in the cultivation of marine science and technology talents, such as insufficient cultivation of innovative abilities, insufficient practical resources and space, and inefficient utilization of practical teaching resources.

1. Introduction

The world today is facing a crisis of energy and resource depletion, and the development and utilization of the rich marine resources is undoubtedly an effective way to solve the problem [1]. At present, China has taken the development of the marine industry as a national development strategy. However, the key to marine development is talents [2]. Therefore, cultivating innovative marine sci-technology talents has become an important mission of higher education in the new era. The Ocean College of Hebei Agricultural University is located in Hebei Province, actively learning from and absorbing the successful experience of marine science and technology education in relevant universities at home and abroad [3-6]. In response to the current problems in the cultivation of marine science and technology talents, such as insufficient cultivation of innovative abilities, insufficient practical resources and space, and inefficient utilization of practical teaching resources [7-9], in line with the needs of the marine economic development in Hebei Province [10,11], and in combination with the actual situation of the college, the diversified cultivation system of practical innovation ability for marine science and technology talents has been gradually explored to promote

the cultivation of practical innovation ability of talents. This system takes the practical innovation platform as the benchmark, improvement and cultivation of practical innovation ability as the starting point, and the integration of educational resources and the improvement of resources utilization as the approach.

2. Establishment Concept of the Practical Innovation Ability Cultivation System for Marine Science and Technology Talents

The Ocean College of Hebei Agricultural University is a college characterized by oceans and aquaculture. Over the years, in combination with the demand of marine economic development in Hebei Province for talents, the college has established the talent cultivation goal of "cultivating applied innovative talents with a solid foundation, a wide range of knowledge, diligent practice, courageously innovation, a good sense of social responsibility and strong adaptability". In order to cultivate marine sci-technology innovation talents that meet the needs of society, through multidisciplinary intersection and integration of relevant resources, the diversified cultivation system of practical innovation ability for marine scientific and technological talents has been established with the core of improving students' innovative practical ability and the "multidimensional practical innovation model and four types of practical innovation resource platforms" as the main body.

3. Deeply Integrating Science and Education to Build the Multi-Dimensional Practical Innovation Teaching Model

In order to meet the requirement of the marine industry development for marine sci-technology talents, the multi-dimensional practical innovation teaching model for marine sci-technology talents has been established with the path of deep integration of science and education, and the goal of improving and cultivating students' practical innovation abilities (Figure 1).

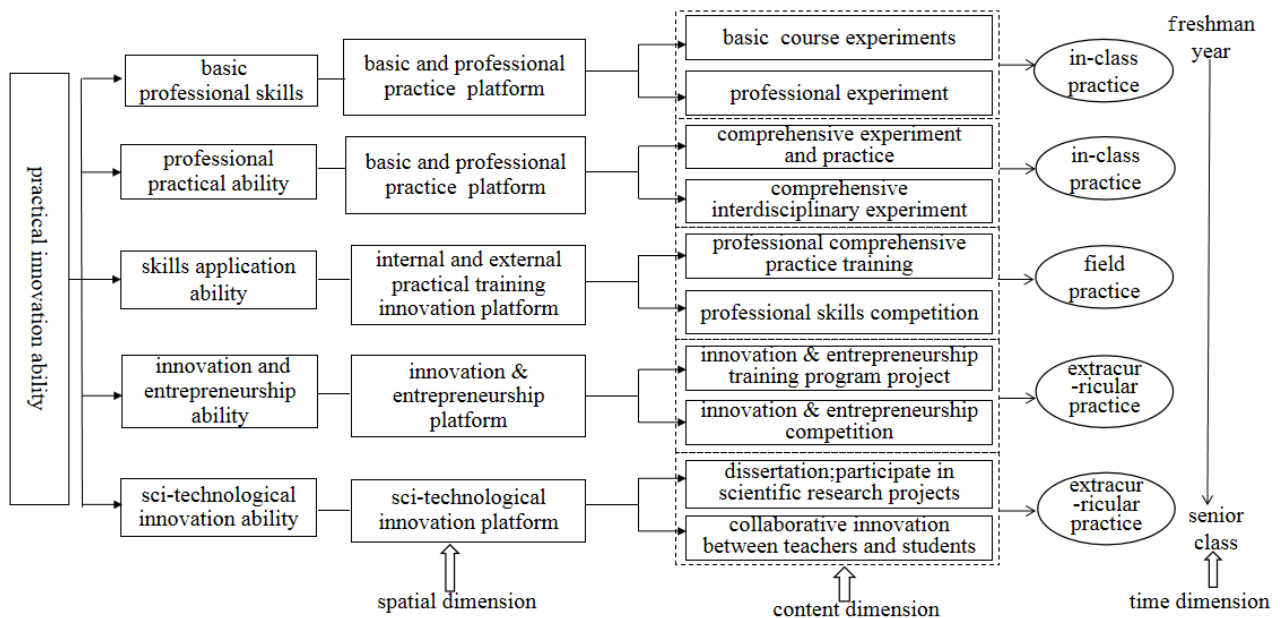


Figure 1: The multi-dimensional practical innovation teaching model of marine science and technology talents

This model focuses on the cultivation of comprehensive practical innovation ability. Through the organic integration of experiments, practical training, innovative practice and scientific research,

new theories, new technologies, and scientific research achievements in the development of disciplines are promptly integrated into practical teaching, and knowledge transfer, ability cultivation and quality improvement are integrated throughout the entire process of student cultivation. This model refines the practical teaching model and content from multiple dimensions of time, space and content. That is, it achieves the four-year continuous line of innovative practical training in the time dimension; it achieves multiple practical training on both internal and external practice platforms in the spatial dimension; in the content dimension, it focuses on the cultivation of basic ability, expansion ability, application ability, innovation ability, and scientific research literacy. The cultivation of practical innovation ability adopts the advanced approach. Namely.

Level 1: The content of practice mainly includes basic and professional experiments, divided into confirmatory experiments and comprehensive experiments. The main purpose is to strengthen students' basic professional skills. It is mainly completed on the basic and professional practical platform.

Level 2: The content of practice is mainly interdisciplinary experimental projects, mainly comprehensive experiments. By setting up professional compulsory and elective experimental projects and implementing personality cultivation, students can have strong professional practical abilities. It is mainly completed on basic and professional practical platform.

Level 3: The content of practice is mainly comprehensive professional practice training and professional skills competitions. The purpose is to enable students to use their mastered professional knowledge and skills to solve practical problems, strengthen the training of knowledge and skills application ability, and cultivate innovative awareness and thinking. It is completed on various internal and external practical training innovation platforms.

Level 4: The practical content mainly focuses on independent innovation experiments and various types of discipline competitions. Students independently apply for innovation and entrepreneurship training programs at all levels, actively participate in various types of discipline competitions, and continuously improve their innovation and entrepreneurship abilities. It is completed on the innovation & entrepreneurship platform.

Level 5: The practical content is mainly in the form of university student research training programs, participation in teacher research projects, collaborative innovation between teachers and students, and completion of dissertation. The purpose is to cultivate students' sci-technological innovation ability and scientific research literacy through innovation & entrepreneurship practice and scientific research practice. It is completed on the sci-technological innovation platform.

4. Integrating Various Teaching and Research Resources to Build Four Multidisciplinary Practical Innovation Resource Platform

According to the establishment idea of "integrated construction of discipline and major, close integration of teaching and research, complementary advantages of internal and external university", integrating teaching and research resources from multiple disciplines, the fully functional, open and shared Marine Science and Technology Practice Center has been established (Figure 2), which can provide a systematic, advanced, and modern resource platform for students' cultivation of practical innovation ability. It provides strong support for the cultivation of high-quality innovative and applied marine science and technology talents.

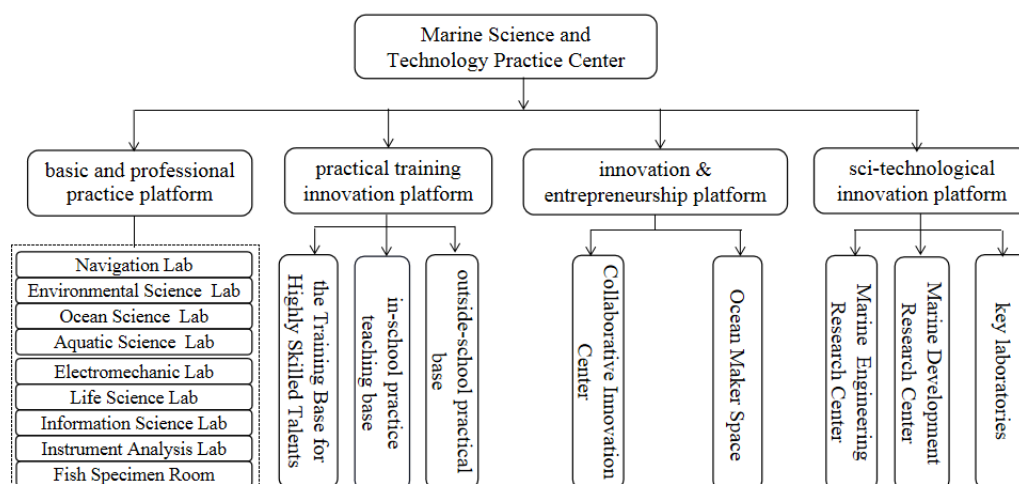


Figure 2: The marine science and technology practice center

4.1. Coordinating Various Disciplines and Professional Resources to Build a Systematic Basic and Professional Practice Resource Platform

Taking the laboratories of various disciplines as carrier, the existing practical resource conditions have been comprehensively sorted and integrated, and the functions of relevant laboratories have been redesigned. The fully functional, open and shared basic and professional practical teaching platform capable of meeting the needs of cultivating the practical ability of marine science and technology talents has been constructed, including 9 professional comprehensive laboratories and 11 basic laboratories. It provides students with a systematic, advanced, and modern practice resource platform. Through the intelligent management system of the Marine Sci-technology Practice Center, online reservation, approval, authorization and monitoring for laboratory use can be achieved. Teachers and laboratory administrators can view the experimental status of students in real time.

4.2. Complementary Advantages of Internal and External University to Build a Training Practical Innovation Resource Platform

In order to strengthen the cultivation of students' practical innovative abilities, the college has deeply expanded both internal and external spaces, fully exploited teaching and research resources, and established a resource-rich, shared and open resources platform for practical training innovation. Firstly, in accordance with the idea of "centralization, openness, and intensification", the construction of sharing practical resource platform has been promoted. The training base for highly skilled talents in Hebei Province has been built and is open to students. Secondly, relying on the advantages of production, education and research, on the basis of extensive alliances with various enterprises, institutions and research institutes, 84 production, teaching, and research bases have been established. Professional teachers serve as technical consultants for the enterprise in part-time, and the main technical personnel of the enterprise serve as practical training instructors for students in part-time. Students directly participate in scientific research and production practice in the practical training base, which can provide conditions for innovation & entrepreneurship training and dissertation (graduation design). Currently, 80% of dissertation (graduation design) or innovation project topics come from actual production, cultivating students' practical innovation abilities.

4.3. Collaborative Innovation between Teachers and Students to Establish the Innovation & Entrepreneurship Practice Resource Platform

Facing the needs of marine science and technology, and focusing on cultivating students' innovative thinking and practical innovation abilities, the marine science and technology innovation & entrepreneurship practice resource platform has been constructed with students as the main body, and with the collaborative innovation between teachers and students as the way. That is, the Ocean Maker Space.

The Ocean Maker Space is a comprehensive service-oriented resource platform built by relying on Qinhuangdao University Science Park and integrating the information science, collaborative innovation center, innovation & entrepreneurship center and other resources of the college. The Ocean Maker Space makes full use of internet+ technology, integrates the college's innovation & entrepreneurship service resources and technological advantages, effectively promotes teachers, students and sci-technological personnel to carry out innovation & entrepreneurship practices, and strives to build an innovation & entrepreneurship incubation base and a cluster of high-tech industries. Currently, there are more than 10 projects that have settled in The Ocean Maker Space, mainly involving the field of marine sci-technology services and the comprehensive utilization of marine resources.

4.4. Relying on Key Disciplines and High-level Teachers to Build a SCI-technological Innovation Practice Platform

Based on the idea of "promoting professional development through disciplinary development, and nurturing professional teaching through scientific research", by fully exploring the advantages of regional, disciplinary and professional characteristics, relying on the existing disciplinary, technical, talent and management advantages of the college, integrating advantageous resources, and seeking the support of governments, enterprises and institutions at all levels, The Qinhuangdao Marine Development Research Center, the Qinhuangdao Marine Engineering Research Center, the Qinhuangdao Key Laboratory for Aquatic Economic Animal Breeding and the Qinhuangdao Key Laboratory for Aquatic Product Storage, Transportation, and Preservation have been established. Based on these platforms, while serving the development of the marine economy, using practice, graduation design, collaborative innovation projects and scientific research projects as carriers, the advantages of scientific research resources and practical conditions have been transformed into talent cultivation advantages, effectively improving students' practical innovation ability and innovation level.

5. The Implementation Guarantee Mechanism of the Diversified Practical Innovation Ability Cultivation System for Marine Science and Technology Talents

In order to ensure the effectiveness of practical innovation ability cultivation, the win-win cooperation mechanism for both college and enterprises, the incentive and constraint mechanism for teachers and students, and the evaluation and monitoring mechanism for the cultivation process have been established, providing a good mechanism for achieving talent cultivation goals.

5.1. Establishing the Long-term Win-win Cooperation Mechanism to Achieve Deep Integration between College and Enterprises

The college has established a long-term stable win-win cooperation mechanism with relevant enterprises, institutions and research institutes in Beijing, Tianjin, Hebei, Zhejiang, Guangdong and

Hainan. Currently, there are 49 cooperative units, involving in aquaculture, marine, chemistry, biological pharmacy, environment and information. Extensive cooperation is carried out in talent cultivation, technology research and project practice. Relying on respective expertise in talent, technology, facilities and other aspects, the college, enterprises and institutions cooperate extensively to achieve mutual benefit and win-win results. On the one hand, the college gives full play to its advantages in talent resources and scientific research, actively participating in scientific research, talent training, cultural services and other work of enterprises. On the other hand, through the introduction of talents to college, the dual tutor system, joint training of talents, and the joint construction of laboratories and internship bases, the enterprise has fully utilized its resource and technical advantages and can provide high-quality platform resources for the cultivation of students' practical innovation ability and practical training.

5.2. Establishing the Scientific Incentive and Restraint Mechanism to Mobilize the Enthusiasm of Teachers and Students

In order to further deepen the cultivation of practical innovation ability, the college has formulated and revised a series of relevant policies and documents to encourage teachers and students to voluntarily participate in practical innovation activities, including professional title evaluation, annual assessment, teacher incentive mechanism, student awards, credit recognition and other aspects. For example, the "Teacher Teaching Quality Evaluation System" and the "Construction Management Measures of Teaching Cases for the Integration of Professional Education and Innovation & Entrepreneurship Education" developed by the college provide teaching rewards and workload to teachers who carry out teaching reform or guiding students in sci-technological innovation. At the same time, awards has been set for master teachers, excellent teachers or excellent guidance teachers to fully mobilize the teachers' enthusiasm for practical innovation education. In terms of student evaluation, the "Student Comprehensive Quality Evaluation System" covering multiple indicators such as academic record, technological innovation and social practice is implemented to guide students to achieve comprehensive growth and personality development. According to the requirements for cultivating innovative talents, the "Management Measures for Innovation & Entrepreneurship Competition for College Students" and the "Measures for Evaluating and Rewarding the Effectiveness of Deepening the Reform of Innovation & Entrepreneurship Education" have been formulated. Meanwhile, a series of scholarships and special funds have been established to encourage students to learn and participate in technological innovation, so as to ensure that excellent talents receive high-quality education.

5.3. Establishing the Comprehensive Internal and External Evaluation and Monitoring Mechanism to Continuously Optimize the Cultivation Process

Through conducting professional satisfaction surveys, social evaluation of talent cultivation quality and graduate tracking surveys, the college regularly conducts investigation to major enterprises, research institutes and other employers to obtain timely graduate quality information and continuously improve the innovative talent cultivation process. Guided by the ideology of "combination of special inspection and classified supervision, equal emphasis on overall monitoring and effectiveness evaluation", the full-process internal evaluation and monitoring mechanism has been established. The special inspections have been carried out to evaluate the cultivation effectiveness of practical innovation ability, and the internal guarantee system has been formed to continuously improve the cultivation quality of innovative talent.

6. Conclusions

The practical innovation ability is one of the most important links in cultivating high-quality innovative and applied talents. The diversified practical innovation ability cultivation system for marine science and technology talents can not only effectively and systematically cultivate students' practical abilities, but also enable the timely transformation of scientific research achievements into teaching. So it can make the knowledge learned by students seamlessly connect with social needs and effectively cultivate students' innovative awareness and ability. It plays an important role in promoting the cultivation of innovative and applied talents.

The diversified practical innovation ability cultivation system for marine science and technology talents has established the multi-dimensional practical innovation teaching model and four types of practical innovation resource platforms, and proposed its implementation guarantee mechanism. It has provided a path to solve the current problems in the cultivation of marine science and technology talents, such as insufficient cultivation of innovative abilities, insufficient practical resources and space, and inefficient utilization of practical teaching resources. However, the cultivation for practical innovation ability of marine science and technology talents needs to continuously follow the needs of the marine economic development, constantly tap the latest scientific research achievements and industrial needs, and timely update the content and methods of practical innovation ability cultivation, so as to continuously promote and improve the effectiveness of innovative and applied talent cultivation.

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