

Exploration on the Training of Applied Talents of Nautical Technology Major Under the Mode of School-Enterprise Cooperation - Take Jiangsu Maritime Vocational and Technical College as an Example

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Abstract: To improve the training quality of applied talents for navigation technology majors, based on the full analysis of the problems existing in current navigation education, such as the lack of students' professional awareness and professional identity, the gap in the implementation of the student-oriented concept, and the poor match between the training effect and the industry demand, a new idea on the training of navigation talents based on the deep cooperation between schools and enterprises is proposed. It includes the construction of new talent training system, the implementation of flexible academic system, the deepening of curriculum evaluation reform and the construction of digital curriculum. Through the continuous deepening of school-enterprise cooperation, the deep integration of production and education, the adjustment and implementation of training plans to support the personalized and comprehensive development of students, to improve the matching degree of talent training and industry needs.

Keywords: Personnel Training; School-Enterprise Cooperation; Integration of Production and Education; Navigation Technology Major

1. Introduction

As a unique engineering technology discipline, the navigation technology major aims to cultivate high-end navigation professionals in line with the demands of the times through rigorous professional ethics education, rich professional knowledge imparting, and

comprehensive cultivation of practical skills, career growth, and global perspectives.

School-enterprise cooperation is a common educational model in the navigation technology major. Xue Ningwei et al. [1], with the background of the "Belt and Road Initiative", expounded on the reform and innovation of the talent cultivation model of the navigation technology major in Wuhan Maritime College based on a clear understanding of its educational positioning and characteristics, and an analysis of the navigation technology's competency requirements, combined with an information-based teaching platform. Liu Kezhong et al. [2] conducted a relatively in-depth exploration of the "school-enterprise joint training" model, detailing their unique insights into the training of navigation talents and the "Outstanding Engineer" program from the perspective of the School of Shipbuilding of Wuhan University of Technology. Ye Wenfeng [3] believes that the future development of the navigation technology major should focus on talent cultivation and improving teaching quality. Educators should proactively respond to the development trends of marine technology and the demands of the marine transportation market, accurately determine the talent cultivation goals and strategies for the new era, adhere to application-oriented approaches, especially emphasizing the improvement of students' practical operation abilities and the integration of theory and practice, and ensure that teaching content is closely related to industrial needs. Yang Chengyi et al. [4] analyzed the main reasons for the shortage of seafarers from aspects such as the decreasing number of applicants for the navigation major

year by year, the low "survival rate" of graduates, the high attrition rate of seafarers, and the cautious attitude of some seafarers in the face of the global pandemic. They proposed that the social recognition of the seafarer profession should be enhanced, the cooperation between enterprises and vocational education should be strengthened, and the apprenticeship system should be vigorously promoted to improve training quality. Liu Xiaolin [5] analyzed the innovative model of talent cultivation in the higher vocational navigation technology major from aspects such as talent cultivation goals, cultivation methods, student management, and student assessment and evaluation systems. the aim was to explore solutions to the problems faced in the talent cultivation of the higher vocational navigation technology major, such as poor student foundations, heavy learning tasks, difficult certification, lack of practical skills, lack of a maritime culture atmosphere, insufficient teaching equipment, and low utilization rates of teaching equipment, as well as severe student attrition. He proposed that the school-enterprise cooperation model is one of the paths to solve the current predicament. Ke Guiqiang [6] pointed out that domestic navigation education and training institutions should strive to create more practical operation and experience-based learning environments for navigation major students, advocate the adoption of an enterprise mentor system, and invite outstanding external experts from the industry to serve as mentors to enhance students' practical guidance. Under the framework of the dual-mentor system, the teaching effectiveness of mentors can be enhanced, while assisting students in clarifying their career positioning and formulating personal development plans. Chen Sheng [7] started from the employment situation of the 2018 graduating class of the navigation technology major at Jiangsu Maritime College, analyzed the problems existing in the employment of navigation technology major students, and proposed that the proposal aims to deepen the collaborative cooperation between colleges and enterprises, strengthen the interaction with the maritime industry, and jointly cultivate high-quality maritime talents. Based on this, this paper proposes new ideas for the cultivation of navigation talents based on deep school-enterprise collaboration,

including the construction of a new talent cultivation system, the implementation of a flexible academic system, the deepening of course assessment and evaluation reforms, and the construction of digital courses. Through continuous deepening of school-enterprise cooperation and the integration of industry and education, the cultivation plan is adjusted and implemented to support students' personalized and all-round development, thereby improving the matching degree of talent cultivation with industry demands.

2. Problems in the Cultivation of Navigation Technology Professionals

For a long time, navigation vocational and technical schools have been constrained by the limitations of hardware and software educational resources. the current educational model has failed to fully meet the professional development needs. the teaching of professional knowledge is often disconnected from its practical application. There is insufficient coordination among the talent cultivation plan, teaching objectives, and teaching system, leading to an imbalance in the talent cultivation structure and inconsistent standards for talent quality.

(1) the separation of theory and practice is evident in higher navigation education. In the process of cultivating navigation technology professionals, some schools have experienced a disconnection between teaching content and practical training, resulting in graduates' insufficient in-depth understanding of practical navigation techniques and lack of practical experience. the close connection between theory and practice has not been effectively established. At the same time, due to the constraints of the traditional education model, some navigation professional schools overly emphasize the teaching of theoretical knowledge while neglecting the corresponding practical training facilities. Students have limited opportunities for hands-on practice, which cannot meet the demands of practical operation. Moreover, with the high-tech progress in navigation technology, the talent cultivation goals and teaching content of China's higher navigation education have not been updated in a timely manner. Many advanced navigation technologies have not been included in the curriculum, leaving a significant gap in students' exposure to cutting-

edge technologies and making it difficult to meet their demands for refined learning and practical training.

(2) Students' knowledge structure is relatively limited. School education has not fully covered multiple fields such as culture and art, technological progress and marine exploration, agricultural ecology and sustainable development, ethics and law, economic strategies, big data/information technology, language enhancement, and scientific research and innovative thinking. Particularly in key areas related to the navigation industry, such as management, economic regulations, and public administration skills, there are obvious deficiencies. This results in many graduates, although holding positions in maritime administration or ship leadership, being unable to effectively manage employees and coordinate the relationships between maritime and marine departments and other related institutions due to a lack of practical skills, thus limiting their work efficiency.

(3) the practical training course system for navigation technology has structural deficiencies. the planning and resource allocation for practical training teaching in schools have not fully demonstrated rigor and scientificity, leading to numerous challenges in practical training courses and facility allocation. the goal setting, project diversity, and teaching quality of practical training courses have not reached the ideal standards, and there is a lack of standardization and balance in course arrangement. the navigation technology profession has extremely high requirements for technical proficiency and application ability in actual work. Therefore, educational institutions must strengthen the quality and quantity of practical and training links when setting talent cultivation goals and designing courses. Although the proportion of practical training courses in the teaching syllabus of some domestic navigation colleges is relatively low, even if the basic course volume is met, due to the limitations of equipment resources, students still have difficulty in improving their ability to apply professional theory to practice, and their hands-on ability and practical operation level cannot be fully enhanced.

(4) Navigation colleges encounter significant facility shortages in practical operation training. Practical teaching is the core part of navigation

professional courses. New navigation technologies and equipment are constantly emerging, and the practical training facilities of schools are unable to meet the demands for quantity and quality. the aging and insufficient upgrading of existing facilities result in a significant gap between the equipment used by students in practice and the standards of practical training courses, greatly reducing the integration of theory and practice. At the same time, the conflict between the limited investment of school funds and the continuous increase in enrollment has intensified, making the shortage and obsolescence of equipment more severe for students in the navigation technology major during practical training.

3. Jiangsu Maritime Vocational and Technical College Navigation Technology School-Enterprise Cooperation Talent Training Model

3.1 Navigation Technology School-Enterprise Cooperation Training Model

In recent years, Jiangsu Maritime Vocational and Technical College has deconstructed the traditional seafarer training syllabus based on the ship-school alternation and dual segmented training model, combined with the requirements of seafarers' vocational qualification certificates and enterprise special ship training certificates, and constructed a curriculum system of "course certificate integration and building blocks" professional group. In accordance with the relevant provisions and requirements of the Manila Amendment to the STCW Convention, the 11 rules of the State Maritime Administration, and the training outline of seafarers of the State Maritime Administration (2020 Edition), the school-enterprise cooperation of navigation technology majors aims to cultivate "three strong and four good" nautical talents in line with the requirements of international conventions and domestic laws and regulations, and is guaranteed by the school-enterprise collaborative education mechanism based on the Quadripartite Cooperation and Development Council, and under the guidance of the general framework of the school's "three integrations, three integrations, and three combinations" talent training model, it highlights the quality cultivation of seafarers and strengthens the cultivation of vocational

ability. It has formed a talent training model of "alternating ship schools and integrating course certificates". Following the alternate education model of ship and campus, that is, 1 semester of on-campus study plus 0.5 semesters of on-board internship, and then 1 semester of on-campus further study, plus 0.5 semesters of shipboard sea affairs practice, we have broken through the constraints of traditional education plans. Benchmarked against the professional skills and qualities required by the industry, it focuses on the goal of developing top seafarers, with a special emphasis on the improvement of English proficiency and seafarers' literacy. We have restructured our professional curriculum, worked with the industry to plan talent development strategies, and jointly designed onboard training courses and implementation plans. We have innovatively implemented a new model of phased nautical talent cultivation through school-enterprise cooperation, and are committed to cultivating senior seafarers with global competitiveness.

Stage 1(1): the on-campus stage, which focuses on the development of support-level crews. At this stage, the qualification requirements for the support crew will be met, and the corresponding qualifications will be obtained, as well as the necessary special training certificates.

The second stage (0.5): the practical session is carried out on the actual operating vessel of the partner company. During this period, they will complete the top internship of the support class crew, and after passing the assessment of the Maritime Safety Administration, they can obtain the certificate of competency of the support class crew.

Section 3(1): On-campus operational-level training stage. This phase will result in a comprehensive study and comprehensive training of the professional knowledge and skills required for the operation of the crew to pass the certificate of competency examination for the operation class crew.

The fourth stage (0.5): the practical training stage, which is also carried out on the ships of the cooperative enterprises. At this stage, the shipboard internship of the operation-level crew will be completed in accordance with the regulations of the MSA, and upon successful completion, the third officer of the operation-level crew will be issued by the MSA and the

graduation certificate of the school.

3.2 Deficiencies in the School-Enterprise Cooperation Training Model of Navigation Technology

(1) Single form of cooperation. At present, the form of school-enterprise cooperation of Jiangsu Maritime Vocational and Technical College is relatively single, mainly based on internship training and employment recommendation. This single cooperation model may not give full play to the respective advantages of schools and enterprises, nor can it meet the needs of students majoring in navigation technology for all-round development and improvement of comprehensive quality. In addition, the single form of cooperation also limits the in-depth cooperation between schools and enterprises in scientific research and technological innovation.

(2) Lack of substantive cooperation. Although schools and enterprises have signed school-enterprise cooperation agreements, there is often a lack of substantive cooperation content in the actual implementation process. Some companies simply accept students for internships without in-depth teaching engagement and mentoring. At the same time, schools may also lack in-depth understanding and effective communication with enterprises, resulting in the inability to effectively integrate the actual needs and technical resources of enterprises into teaching.

(3) Insufficient participation of enterprises. Firms are often under-engaged in school-enterprise collaborations. Some enterprises may think that school-enterprise cooperation is only a unilateral demand of the school, and lack sufficient motivation and enthusiasm to participate in it. In addition, some companies may also be cautious about the impact of school-enterprise cooperation on the normal operation of the enterprise.

4. Countermeasures and Suggestions for the Cultivation of Application-Oriented Talents in Navigation Technology under the School-Enterprise Cooperation Model

As a discipline that closely combines practice and application, school-enterprise cooperation plays an irreplaceable role in improving students' skill level and enhancing professional competitiveness. In order to better realize the

docking of school-enterprise cooperation in navigation technology, the author has the following suggestions.

4.1 Clarify the Goal and Positioning of Cooperation Schools and Enterprises Need to Establish Close Cooperative Relations and Communication Mechanisms.

Through the establishment of special cooperative institutions or committees, regular meetings and exchange activities, jointly formulate cooperation plans and implementation plans, and jointly build practical teaching bases and laboratories, we will provide strong support for talent training and technological innovation. First of all, it is necessary to realize the seamless connection between talent training and industry needs. the school should adjust and optimize the curriculum and teaching content of the navigation major according to the actual needs of the navigation enterprise to ensure that students master solid navigation knowledge and skills. At the same time, companies can provide students with practical opportunities and on-the-job internships to help them better understand and adapt to the actual work of the nautical industry. Second, we should focus on technological innovation and industrial upgrading. the nautical industry faces an ever-changing marine environment and technological challenges that require constant innovation and upgrading. Schools and companies can work together to carry out nautical technology research and innovation projects, explore new navigation methods, ship design and navigation management systems, etc., to improve the safety and efficiency of navigation. Attention should also be paid to the promotion of nautical culture and the image of the industry. As an important strategic industry, the nautical industry needs to attract more young people to join. Schools and enterprises can jointly hold nautical knowledge competitions, nautical culture exhibitions and other activities to publicize the charm and development prospects of the nautical industry, and improve the society's awareness and recognition of the nautical industry.

4.2 Jointly Build a Practical Teaching Base

In the process of cultivating navigation technology professionals, the practical teaching base plays a pivotal role. the school-

enterprise cooperation to build a teaching base can not only make up for the lack of teaching resources in the school, but also provide students with a close to the real professional environment, so that they can closely combine the theoretical knowledge they have learned with practical operation, so as to improve their professional quality and practical ability. Therefore, in the school-enterprise cooperation, the two sides should attach great importance to the necessity and urgency of jointly building a teaching base.

In the process of jointly building a teaching base, the school and the enterprise should jointly formulate a detailed plan and implementation plan. First of all, the two sides should clarify the construction objectives, functional positioning and construction standards of the teaching base to ensure that the base can meet the needs of practical teaching. Secondly, the two sides should invest corresponding funds, equipment and technical support to jointly build and improve practical teaching facilities to provide a good learning environment for students. In addition, the two sides should establish a long-term cooperation mechanism to ensure the sustainable operation and development of the teaching base. In addition, the co-construction of teaching bases should also pay attention to the arrangement and implementation of practical teaching activities. According to the characteristics of the navigation technology major and the needs of the industry, the school should formulate a scientific and reasonable practical teaching plan, and clarify the objectives, contents and methods of practical teaching. At the same time, schools should also strengthen the process management and quality monitoring of practical teaching to ensure the quality and effectiveness of practical teaching. Finally, school-enterprise cooperation to build a teaching base also needs to focus on results-oriented evaluation and feedback. the two sides should regularly evaluate the construction results of the teaching base, including the perfection of facilities and equipment, the quality of practical teaching, and the satisfaction of students.

4.3 Build a Platform for Industry-University-Research Cooperation

The major of navigation technology focuses on building a platform for industry-university-

research cooperation, which is of far-reaching significance in modern education. the industry-university-research cooperation platform can not only promote students to combine theoretical knowledge with practical application, improve practical ability and innovation ability, but also promote industrial development and technological progress.

In the process of building a platform for industry-university-research cooperation, universities, enterprises and research institutions need to work closely together to develop training programs, develop courses and teaching materials, and carry out scientific research projects and technological innovation. In addition, they can also strengthen their ties and cooperation by sharing resources and building laboratories and practice bases. Through cooperation with enterprises and research institutions, universities can keep abreast of the latest technological trends and market demand in the industry, to adjust the teaching content and research direction. At the same time, the platform can also promote the cross-integration between different fields and generate new scientific research results and technology applications.

However, in the process of building an industry-university-research cooperation platform, there are also some challenges and problems that need to be solved. For example, how to balance the interests of all parties, how to ensure the quality of teaching and practical results, how to protect the rights and safety of students, etc. Therefore, universities, enterprises and research institutions need to strengthen communication and coordination, and formulate clear cooperation agreements and rules and regulations to ensure the stable operation and sustainable development of the platform.

4.4 Implement "Order-Based" Training

To more closely integrate the needs of enterprises, schools can cooperate with enterprises to carry out "order-based" training. That is, according to the actual needs of the enterprise, formulate a special talent training plan, and tailor the navigation talents with specific skills and qualities for the enterprise.

The first is to adjust the teaching content and curriculum accordingly according to the order-based training plan. Add courses that are closely related to the actual needs of shipping

enterprises, such as ship driving, maritime safety management, etc.; At the same time, the original course content is optimized, focusing on the practical application of theoretical knowledge and the cultivation of operational skills. In addition, it strengthens the connection with the international shipping market and introduces international advanced maritime education concepts and teaching methods. the second is to select outstanding students with sailing potential to enter the order-based training class through comprehensive quality tests and interviews. At the same time, a student training tracking mechanism is established to regularly evaluate students' learning and practical ability, and provide personalized guidance and assistance to students. In addition, strengthen communication and cooperation with parents to jointly pay attention to the learning and growth of students. Third, the school and shipping companies have established a close employment docking mechanism to provide priority employment opportunities for students in order-based training classes. At the same time, a feedback mechanism is established to collect feedback from enterprises and students, and to evaluate and improve the effect of cooperation. By continuously adjusting and optimizing the cultivation program, the pertinence and effectiveness of order-based training can be improved.

5. Conclusion

Under the development pattern of the new era, the continuous updating and application of navigation technology has an increasing demand for professional talents, and school-enterprise cooperation is an effective way to cultivate high-quality navigation technical talents with practical ability and innovative spirit. School-enterprise cooperation not only gives students the opportunity to get in touch with cutting-edge navigation technology and equipment, but also enables them to learn and grow in practice, combining theoretical knowledge with practical operation, to improve their comprehensive quality and competitiveness. At the same time, for enterprises, participating in school-enterprise cooperation can provide them with more excellent talent reserves and promote technological innovation and industrial upgrading of enterprises.

Looking forward to the future, school-enterprise cooperation will play a more important role in cultivating applied talents in navigation technology. We will continue to be committed to building a close industry-university-research cooperation system, promoting the innovation and development of maritime education, and contributing more to the prosperity and development of the maritime industry. Here, we look forward to more nautical colleges and enterprises to join the ranks of school-enterprise cooperation, jointly explore and practice a more effective training path for the application of nautical technology professionals, and inject new vitality and impetus into the vigorous development of China's maritime industry.

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