Article

Research on the Training Mode of Compound Talents of Maritime Management in Vocational Colleges

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Abstract: Against the backdrop of China's strategic initiatives to build a maritime power, transportation powerhouse, and shipping leader, the nation's shipping industry, maritime supervision, port operations, vessel management, and maritime emergency response are undergoing rapid transformation toward intelligentization, green development, internationalization, and legal compliance. This evolution has created an urgent demand for highly skilled professionals with interdisciplinary expertise. As the core platform for cultivating high-level applied talents in shipping and maritime fields, the vocational undergraduate maritime management program bears the critical mission of nurturing professionals who are "technically proficient, management-savvy, business-savvy, skill-driven, and visionary." However, current vocational undergraduate maritime management education still faces significant challenges, including unclear objectives, monotonous curricula, weak practical training, insufficient industry-education integration, and inadequate internationalization, ultimately failing to meet the industry's complex needs for interdisciplinary talent. Grounded in vocational undergraduate education and aligned with emerging maritime industry trends and competency requirements, this study constructs a tailored talent development model for maritime management professionals through six core dimensions: educational objectives, curriculum design, practical platforms, faculty development, industry-education collaboration, and comprehensive evaluation systems. Furthermore, it proposes actionable implementation pathways and robust safeguard mechanisms to enhance the overall quality of maritime management education. By addressing these systemic gaps, this research provides essential theoretical support and practical references for advancing the high-quality development of the global shipping industry and ensuring sustainable maritime operations.

Keywords: vocational education; maritime management; interdisciplinary talents; talent cultivation; industry integration

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1. Introduction

Building a maritime powerhouse is a critical national strategic priority, reflecting the importance of advancing the marine economy. As the cornerstone of this sector, the shipping industry is experiencing profound transformations in areas such as smart ship technologies, environmentally sustainable shipping practices, digital maritime operations, and modernized governance frameworks [1]. These advancements necessitate the cultivation of highly skilled technical professionals who possess dual expertise in maritime regulations, ship management, port operations, and shipping services. Furthermore, these professionals must demonstrate practical proficiency in applying advanced technologies, managing emergency situations, engaging in international communication, and fostering innovative practices. The demand for such multifaceted expertise underscores the urgency of developing a workforce capable of addressing the complex challenges and opportunities within the maritime management sector.

Vocational undergraduate education plays a pivotal role in nurturing high-level applied professionals tailored to meet the evolving needs of the maritime industry. This

educational model emphasizes the seamless integration of theoretical knowledge, practical skills, and core competencies, fostering interdisciplinary, hands-on, and developmental attributes in students. Such an approach aligns closely with the industry's demand for versatile talents capable of adapting to dynamic technological and operational landscapes. However, current maritime management education often falls short by prioritizing theoretical instruction over practical application, focusing on singular skill sets rather than multidisciplinary capabilities, and relying on traditional content instead of incorporating cutting-edge technologies. These limitations have led to a significant disparity between the skills provided by educational institutions and the actual needs of the maritime sector. Addressing this gap requires the establishment of a scientific, systematic, and actionable vocational undergraduate model designed to cultivate maritime management professionals with interdisciplinary expertise. This model must integrate advanced technological training, practical problem-solving abilities, and innovative thinking to ensure graduates are well-equipped to contribute effectively to the industry's growth and modernization [1].

2. The Connotation and Competency Requirements of Compound Talents in Maritime Management at the Vocational Undergraduate Level

2.1. Core Connotation

The vocational undergraduate program in Maritime Management is designed to cultivate interdisciplinary professionals who possess a robust theoretical foundation and advanced technical application skills. These graduates are equipped with strong managerial competencies, comprehensive legal literacy, and a global perspective, enabling them to address multifaceted challenges in maritime supervision, port operations, vessel management, shipping services, and maritime emergency response. The program emphasizes the integration of diverse knowledge areas, fostering the synthesis of capabilities that are essential for effective problem-solving in complex maritime contexts. Additionally, it prioritizes the development of comprehensive competencies that align with the dynamic demands of the industry, ensuring graduates are adaptable to position-specific requirements. By focusing on these core attributes, the program aims to produce professionals who can navigate the intricacies of maritime management with precision and innovation, contributing to the sustainable development of the sector. This holistic approach ensures that graduates are not only technically proficient but also capable of strategic thinking and decision-making in a globalized maritime environment [2].

2.2. Requirements for Competency Structure

Core competencies encompass a comprehensive understanding of maritime regulations, ship and crew management, port and shipping administration, maritime traffic engineering, and maritime geography. These foundational skills are essential for ensuring the smooth operation and governance of maritime activities [3, 4]. Technical proficiency involves mastery of advanced operational tools and systems, such as regulatory platforms, ship simulation devices, port dispatching systems, and smart maritime platforms, which are integral to modern maritime operations. Management expertise requires the ability to effectively coordinate on-site activities, respond to emergencies, mitigate risks, prepare documentation, and handle administrative responsibilities with precision and efficiency. International communication skills are vital, including fluency in maritime English for reading, writing, and engaging in cross-border exchanges, alongside a thorough understanding of international maritime conventions and shipping regulations to facilitate global collaboration. Holistic development is equally important, emphasizing legal awareness, safety consciousness, accountability, teamwork, and a commitment to lifelong learning. These attributes collectively ensure that professionals are well-equipped to adapt to evolving challenges and maintain high standards in the maritime sector.

3. The Real Problems in the Training of Maritime Management Talents in Vocational Undergraduate Education

3.1. Insufficiently clear positioning of training objectives

Many institutions face challenges in aligning their vocational undergraduate programs with the intended objectives of fostering "high-level, interdisciplinary, and application-oriented" education. A significant issue lies in the imbalance between academic rigor and technical focus, which often leads to a lack of clarity in the positioning of training objectives. This misalignment results in curricula that fail to adequately integrate interdisciplinary competencies, leaving students underprepared for the evolving demands of the maritime management field. The curriculum often remains overly traditional, heavily emphasizing conventional maritime management courses while neglecting emerging areas such as intelligent systems, green technologies, international practices, and digital innovations. Furthermore, the lack of interdisciplinary integration creates a fragmented learning experience, as courses are not sufficiently interconnected to provide a cohesive educational framework. Cross-disciplinary and cross-role modules, which are essential for fostering a comprehensive understanding of maritime management, are notably scarce. Practical training, which is critical for application-oriented education, is underrepresented, with limited opportunities for students to engage in project-based or case-based learning. This deficiency hampers the development of practical problem-solving skills and the ability to apply theoretical knowledge in real-world scenarios. Addressing these issues requires a systematic overhaul of curricula to ensure they are both forward-looking and aligned with the dynamic needs of the maritime industry [5, 6].

3.2. Insufficient practical teaching conditions and weak combat readiness

On-campus training programs heavily depend on simulation systems, which fail to adequately replicate the complexities and dynamic nature of real-world scenarios in maritime law enforcement, port operations, and ship management. This reliance on simulated environments limits students' ability to develop practical skills that are essential for addressing real-life challenges in these fields. Furthermore, off-campus internship bases are insufficient in both quantity and stability, restricting opportunities for students to gain hands-on experience in core operational tasks. The practical teaching approach often emphasizes verification-based learning, which lacks the depth and innovation required to cultivate comprehensive problem-solving abilities and adaptability. The faculty composition also presents significant challenges, as it is predominantly composed of full-time teachers who are recruited directly from academic institutions without substantial frontline experience in maritime, port, or shipping enterprises. This lack of industry exposure results in a narrow knowledge base and limited interdisciplinary teaching capabilities, hindering the ability to provide students with a well-rounded education. Additionally, part-time instructors from industry and enterprises contribute minimally to the depth and standardization of teaching, further exacerbating the issue. Addressing these shortcomings requires a strategic overhaul of practical teaching methodologies, faculty development, and collaboration with industry partners to ensure students are adequately prepared for professional roles in the maritime sector.

3.3. The integration of industry and education remains superficial, with insufficient collaborative talent cultivation

School-enterprise partnerships often lack substantive depth, remaining confined to surface-level collaborations such as ceremonial nameplate exchanges, guest lectures, and brief internship programs. These initiatives, while symbolically significant, fail to foster meaningful integration in critical areas like the joint development of academic programs, collaborative curriculum design, co-authorship of textbooks, shared faculty training initiatives, and the establishment of integrated training bases. The absence of such

comprehensive mechanisms hinders the creation of a truly collaborative education framework capable of addressing the evolving demands of industry and academia. Furthermore, the evaluation systems employed in talent cultivation remain outdated and overly reliant on traditional written examinations. These assessments prioritize rote memorization and theoretical knowledge while neglecting essential competencies such as practical skills, interdisciplinary expertise, innovative thinking, professional ethics, and the ability to respond effectively to emergencies. This narrow focus undermines efforts to cultivate versatile and adaptable talents who can thrive in dynamic professional environments. To address these shortcomings, it is imperative to adopt modernized evaluation methods that emphasize holistic development, ensuring that graduates are equipped with the diverse skill sets required to meet the complex challenges of contemporary industries and society.

4. Construction of a Compound Talent Training Model for Maritime Management at the Vocational Undergraduate Level

By aligning vocational undergraduate programs with the evolving demands of the maritime industry, a comprehensive six-pronged integrated model has been developed to cultivate versatile professionals equipped for the challenges of this dynamic sector. This model emphasizes goal-oriented guidance to ensure students have clear objectives and pathways for their career development [7]. Curriculum-based support is designed to provide a robust academic foundation tailored to industry-specific requirements, while practice-driven empowerment focuses on hands-on training and real-world application of skills to bridge the gap between theory and practice. Faculty support plays a critical role in mentoring and fostering student growth, ensuring that educators are well-equipped to deliver high-quality instruction. Industry-education collaboration strengthens the connection between academic institutions and maritime enterprises, facilitating internships, cooperative projects, and knowledge exchange. Finally, evaluation-driven assessment ensures continuous improvement by systematically measuring student progress and program effectiveness, fostering holistic development in knowledge, competencies, and professional literacy.

4.1. Clarifying the Objectives of Compound Talent Cultivation

Guided by the strategic goals of enhancing maritime and shipping capabilities, this program is designed to develop high-level, multidisciplinary maritime management professionals who embody both ethical values and advanced professional competencies. These individuals will be equipped with a comprehensive understanding of maritime operations, technical proficiency, and practical management skills. They will also demonstrate strong international communication abilities and innovative problem-solving capacities. The program emphasizes the integration of theoretical knowledge with practical application, ensuring that graduates are well-prepared for roles in maritime supervision, port operations, vessel management, shipping services, and maritime emergency response. By fostering expertise in these areas, the initiative aims to address the growing demand for skilled professionals capable of navigating the complexities of the modern maritime industry. Furthermore, the program seeks to cultivate a workforce that can contribute to the sustainable development of maritime activities, aligning with broader economic and environmental objectives. This holistic approach ensures that graduates are adaptable, forward-thinking, and capable of meeting the evolving challenges of the sector.

4.2. Building a "Composite Modular" Curriculum System

The curriculum framework is designed to establish a comprehensive and adaptable course system that integrates foundational knowledge with specialized and interdisciplinary competencies. It employs a "basic platform + specialized modules + composite modules + extension modules" structure to ensure a well-rounded educational

experience. The basic platform module focuses on strengthening essential courses, including ideological and political education, legal education, maritime English, computer technology, marine culture, and safety literacy, which are fundamental for fostering a solid academic and professional foundation [8, 9]. The specialized core module provides targeted courses such as maritime administration and regulations, ship management, port operation management, maritime traffic management, and shipping operations and documentation, ensuring students acquire expertise in key areas of the maritime industry. The composite competency module introduces interdisciplinary subjects that address emerging trends and challenges, such as smart maritime operations, green shipping practices, maritime emergency response strategies, international maritime conventions, ship pollution prevention measures, and the application of big data in maritime supervision. Additionally, the extension and innovation module incorporates practical and forward-thinking elements, including vocational skills competitions, entrepreneurship initiatives, drone patrols for maritime surveillance, maritime command simulations, and case studies on international shipping operations. This curriculum framework emphasizes the integration of job roles, courses, competitions, and certifications, aligning educational content with professional standards and industry requirements. By embedding maritime job specifications, skill competition themes, and qualification criteria into the curriculum, the system aims to enhance the relevance and applicability of the education provided, preparing students to excel in diverse maritime roles and contribute effectively to the industry.

4.3. Building a "Virtual-Physical Integration, Practical" Practice Platform

On-campus development of advanced training centers involves the establishment of facilities designed to simulate real-world maritime operations. These include maritime traffic management simulation laboratories, port simulation sand tables, ship navigation simulation rooms, smart maritime big data platforms, and emergency command training facilities. Such infrastructure enables the integration of simulation-based training with comprehensive practical drills, fostering a hands-on learning environment. Off-campus development focuses on forming deep collaborative partnerships with key industry stakeholders, such as the Maritime Safety Administration, port groups, shipping companies, pilotage stations, and maritime search and rescue centers. These partnerships facilitate the creation of stable internship bases, offering students opportunities for on-the-job training, capstone internships, and project-based learning experiences. Comprehensive practical training is conducted regularly, encompassing activities such as vessel traffic management, maritime search and rescue operations, ship pollution mitigation, port emergency response drills, and maritime law enforcement simulations. These activities are designed to enhance interdisciplinary application capabilities, ensuring that participants acquire a robust understanding of the complexities involved in maritime operations. By combining theoretical knowledge with practical experience, this approach aims to cultivate highly skilled professionals equipped to address the dynamic challenges of the maritime industry.

4.4. Building a "Dual-qualified" Composite Faculty Team

To strengthen the interdisciplinary capabilities of full-time faculty, efforts will be made to provide opportunities for teachers to gain hands-on experience in maritime, port, and shipping enterprises. This will include rotational assignments that allow educators to engage directly with industry practices, participate in real-world projects, and acquire professional certifications. Such initiatives aim to enhance their ability to deliver cross-disciplinary instruction effectively. Additionally, the recruitment of industry professionals with diverse expertise, such as maritime law enforcement officers, captains, port directors, and emergency management specialists, will be prioritized [9]. These experts will serve as adjunct faculty, contributing to practical courses and case-based teaching methodologies. To further advance teaching quality, an innovative team will be

established, comprising professional educators, industry practitioners, and technical specialists. This team will collaborate to design and refine curricula, ensuring that it aligns with the evolving demands of the maritime and shipping sectors. By integrating theoretical knowledge with practical insights, the team will also implement pedagogical reforms that foster a more dynamic and application-oriented learning environment. These measures collectively aim to build a "dual-qualified" composite faculty team capable of addressing the complex and interdisciplinary challenges of modern maritime education.

4.5. Enhancing the Industry-Education Integration and Collaborative Talent Development Mechanism

Schools and enterprises collaborate closely to design and implement comprehensive talent cultivation programs, ensuring alignment with industry needs and fostering a workforce equipped with practical and interdisciplinary skills. Industry professionals actively participate in every stage of the process, including defining training objectives, designing curricula, delivering practical instruction, and establishing evaluation standards. This collaborative approach ensures that educational content remains relevant and reflective of real-world workflows and typical industry tasks. Modular and project-based textbooks are developed to simulate authentic scenarios, enhancing the applicability of theoretical knowledge in practical settings. Furthermore, the integration of order-based training and modern apprenticeship systems bridges the gap between education and employment by synchronizing enrollment with recruitment, teaching with production, and internships with job placements. This targeted approach not only addresses the specific needs of industries but also enhances the employability of graduates. In addition to talent development, schools and enterprises jointly provide technical services and social training programs tailored to industry requirements. These include specialized maritime business training, emergency response drills, and safety management programs, which contribute to the overall professional development of the workforce. By strengthening their capacity to deliver professional social services, these initiatives support the sustainable growth and competitiveness of the industry.

4.6. Establishing a Multi-dimensional Composite Evaluation System

The evaluation framework is designed to provide a comprehensive and multidimensional assessment of talent development quality. It integrates various aspects such as professional knowledge, practical skills, interdisciplinary competencies, innovative capabilities, professional ethics, teamwork, and English proficiency. To ensure the effectiveness of this framework, diverse assessment methods are employed, including formative evaluations that track progress over time, project-based assessments that emphasize real-world application, hands-on tests that measure practical abilities, competition results that highlight performance under pressure, and corporate evaluations that reflect industry standards. Furthermore, a multi-stakeholder evaluation mechanism is established, incorporating input from schools, enterprises, industries, and students. This collaborative approach ensures that the evaluation process remains objective, balanced, and aligned with the evolving demands of the professional landscape. By fostering a holistic perspective, the system aims to cultivate well-rounded individuals who are equipped to excel in dynamic and interdisciplinary environments.

5. Safeguard Measures for the Implementation of Training Models

A professional development committee, composed of university administrators, maritime authorities, and industry experts, will be established to oversee and coordinate reforms in talent cultivation models [4, 9]. This committee will play a pivotal role in addressing critical challenges related to institutional development and will focus on refining systems that promote industry-education integration, school-enterprise collaboration, practical training, faculty development, curriculum innovation, and student management. By providing robust institutional support, the committee aims to

cultivate interdisciplinary professionals equipped to meet the evolving demands of the maritime industry. To ensure the successful implementation of these reforms, increased funding will be allocated to key areas such as the construction of advanced training bases, upgrading of equipment, comprehensive faculty training programs, development of specialized textbooks, and strengthening school-enterprise partnerships. Additionally, efforts will be directed toward fostering an academic and professional environment that emphasizes maritime culture, shipping culture, safety culture, and legal culture. This holistic approach is designed to enhance students' professional identity, instill a strong sense of mission, and elevate their overall competencies. By integrating these cultural elements into the educational framework, the initiative seeks to produce graduates who are not only technically proficient but also deeply committed to the values and responsibilities inherent in the maritime profession.

6. Conclusion and Prospects

Against the backdrop of the evolving maritime power strategy and the shipping industry's push for high-quality development, the maritime management undergraduate program must undergo a significant transformation to align with the dynamic demands of the industry. This requires the establishment of a comprehensive talent cultivation model that integrates diverse competencies and addresses existing gaps. By clearly defining multifaceted educational objectives, redesigning curricula to incorporate interdisciplinary knowledge, and enhancing practical training opportunities, the program can better prepare students for real-world challenges. Additionally, fostering a highly skilled and diverse faculty, deepening collaboration between academia and industry, and implementing rigorous evaluation mechanisms are essential steps to bridge the disconnect between academic training and industry requirements. These measures aim to resolve critical issues such as the prevalence of narrow skill sets, insufficient practical expertise, and the misalignment of educational outcomes with professional expectations. Ultimately, these efforts will contribute to a holistic improvement in the quality of talent cultivation, ensuring that graduates are well-equipped to meet the complex demands of the maritime sector.

Looking ahead, the rapid advancements in smart shipping technologies, green and low-carbon initiatives, and digital maritime innovations will significantly reshape the skill requirements for maritime management professionals. Future professionals will need to possess advanced digital competencies, a deep understanding of sustainable practices, proficiency in international governance, and the ability to drive innovation within the sector. To remain relevant and effective, vocational undergraduate programs in maritime management must proactively adapt to these industry transformations by continuously refining their training models and integrating emerging trends into their curricula. This forward-looking approach will not only enhance the professional development of students but also ensure a consistent supply of highly skilled, versatile technical talents capable of supporting the maritime industry's evolution. By prioritizing adaptability, innovation, and sustainability, these programs can play a pivotal role in advancing the maritime sector's global competitiveness and contributing to the broader goals of sustainable economic growth and technological leadership in the shipping industry.

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