

Research on Pathways for Enhancing the Competencies of Maritime Education Faculty in the Era of Intelligent Shipping

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Abstract: *With the advent of the intelligent shipping era, maritime education faces unprecedented transformation. As the key force in cultivating maritime professionals, the competency upgrade of maritime educators is crucial. Based on an analysis of the characteristics of the intelligent shipping era, this paper outlines the competencies maritime educators should possess in the new era, thoroughly examines the challenges they face in upgrading their capabilities, and proposes practical upgrade pathways from multiple dimensions. It aims to provide valuable references for maritime education to adapt to the development of the intelligent shipping era.*

Keywords: *intelligent shipping; maritime educators; competency enhancement; development pathways*

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1. Introduction

Intelligent shipping, as the core direction for the future development of the shipping industry, is driving profound transformations in the maritime field. With the widespread application of new-generation information technologies such as the Internet of Things, big data, artificial intelligence, and blockchain in shipping, the level of vessel intelligence continues to rise, and shipping business models undergo continuous innovation. This places new demands on the knowledge structure and skill levels of maritime professionals. As the primary implementers of maritime talent cultivation, the ability of maritime educators to adapt to the demands of the intelligent shipping era directly impacts the quality of maritime education and the effectiveness of professional training. Therefore, researching pathways for upgrading maritime educators' competencies in this era holds significant practical importance.

2. New Requirements for Maritime Educators' Competencies in the Era of Intelligent Shipping

2.1 Interdisciplinary Knowledge Integration Capabilities

Intelligent shipping encompasses multiple disciplines including maritime technology, naval architecture, information technology, automation control, and data analysis. Maritime educators must not only master traditional maritime expertise — such as navigation science, ship handling, and marine meteorology — but also acquire knowledge in emerging fields like computer science, artificial intelligence, and big data analytics. For instance, when teaching intelligent ship courses, instructors must integrate maritime knowledge with sensor technology, communication systems, and intelligent algorithms to help students grasp the operational principles and methods of smart vessels. Educators with interdisciplinary knowledge integration capabilities can assist students in building comprehensive knowledge frameworks, better equipping them to meet the demand for multidisciplinary talent in the intelligent shipping era.

2.2 Digital Teaching Competency

In the era of intelligent shipping, digital teaching resources and methods are increasingly abundant. Maritime educators should proficiently utilize online teaching platforms, virtual simulation software, and intelligent teaching tools to deliver blended learning experiences. Through virtual simulation technology, instructors can create realistic maritime scenarios — such as vessel navigation simulations and port operation simulations — enabling students to practice operations in virtual environments and enhance their problem-solving skills. Additionally, instructors should possess the ability to utilize digital tools for instructional evaluation and data analysis. By mining and analyzing student learning data, they can promptly understand student learning progress, adjust teaching strategies, and achieve personalized instruction.

2.3 Practical Innovation Capabilities

The intelligent shipping industry is evolving rapidly, with new technologies, equipment, and business models continuously emerging. Maritime educators must cultivate strong practical innovation capabilities, closely monitor industry developments, actively engage in corporate practices and research projects, and integrate the latest industry technologies and practical experiences into their teaching. For instance, instructors can engage in the R&D and testing of smart vessels, transforming practical experience into teaching case studies that expose students to cutting-edge technological applications. Additionally, educators should encourage students to undertake innovative practical activities, fostering their creative thinking and hands-on skills while guiding them to explore emerging challenges and solutions within the intelligent shipping domain.

2.4 Lifelong Learning Capabilities

In the era of intelligent shipping, knowledge updates accelerate rapidly. Maritime educators must embrace lifelong learning to continuously enhance their professional competence and comprehensive capabilities. Teachers should actively participate in various training programs and academic exchanges, stay informed about the latest industry research and technological trends, and consistently update their knowledge base. Simultaneously, educators should master self-directed learning and effective study methods to swiftly adapt to challenges posed by new knowledge and technologies, thereby setting an example of lifelong learning for their students.

3.Challenges Facing Maritime Educators in Upgrading Their Capabilities in the Era of Intelligent Shipping

3.1 Difficulties in Updating Knowledge Structures

Traditional maritime educators' knowledge structures primarily focus on specialized maritime domains, with relatively limited exposure to interdisciplinary fields like emerging information technology and artificial intelligence. With the advent of the intelligent shipping era, educators must rapidly acquire substantial new knowledge, presenting significant challenges in updating their knowledge frameworks. On one hand, teachers bear heavy daily teaching responsibilities, leaving insufficient time and energy for systematic learning and training. On the other hand, some teachers exhibit relatively weaker receptivity to new knowledge, potentially encountering difficulties during the learning process. This results in slow knowledge structure updates, making it difficult to meet the teaching demands of the intelligent shipping era.

3.2 Barriers to Digital Teaching Applications

Although digital teaching resources and methods are gradually being applied in maritime education, some teachers still face obstacles in utilizing digital teaching applications. Some educators lack proficiency in operating digital teaching tools, preventing them from fully leveraging their advantages. For instance, when using virtual simulation software, they may struggle to effectively design teaching scenarios or guide students through practical operations. Furthermore, certain instructors hold insufficient understanding of digital teaching, viewing traditional methods as more reliable and exhibiting resistance toward digital approaches. This mindset limits the broader adoption of digital teaching in maritime education.

3.3 Lack of Practical Opportunities

Maritime studies are inherently practice-oriented, and the era of intelligent shipping demands even higher practical competencies from instructors. However, maritime educators currently face a widespread shortage of practical opportunities. On one hand, insufficient collaboration between schools and enterprises makes it difficult for instructors to secure stable corporate internship positions. On the other hand, factors such as high vessel operating costs and significant safety risks reduce enterprises' willingness to accommodate instructors for onboard training. Consequently, instructors lack opportunities to hone their skills in real-world work environments, resulting in insufficient practical experience and an inability to integrate the latest industry practices into their teaching.

3.4 Incomplete Training System

To support maritime educators in upgrading their competencies, a comprehensive training system is essential. However, the current training framework for maritime educators in the era of intelligent shipping remains inadequate. Training content often lacks systematic structure and relevance, failing to adequately address instructors' practical needs and varying knowledge levels. Training methods remain largely monotonous, predominantly relying on theoretical lectures while neglecting hands-on practice and case studies. Insufficient training faculty further compounds the issue, as some instructors themselves possess limited depth of understanding and mastery of intelligent shipping technologies, hindering their ability to deliver high-quality training services. These challenges collectively constrain the effectiveness of competency enhancement for maritime instructors.

4. Pathways for Upgrading the Competencies of Maritime Instructors in the Era of Intelligent Shipping

4.1 Implement Interdisciplinary Training to Optimize Knowledge Structures

Schools and education authorities should organize interdisciplinary training programs tailored to the demands of the intelligent shipping era. Experts from fields such as computer science, artificial intelligence, and data analysis should be invited to instruct maritime educators, systematically covering foundational knowledge and its applications in shipping. Training content may include programming languages (e.g., Python), big data processing technologies (e.g., Hadoop, Spark), and AI algorithms (e.g., machine learning, deep learning). Simultaneously, encourage teachers to participate in interdisciplinary academic seminars and workshops to enhance collaboration with educators from other disciplines and broaden their knowledge base. For instance, organize joint research projects on intelligent shipping between maritime instructors and information technology teachers to foster knowledge integration and practical application. Additionally, teachers should proactively utilize online learning platforms and academic journals for self-directed learning to continuously update their knowledge structures.

4.2 Strengthen Digital Teaching Training to Enhance Digital Instructional Capabilities

Schools should increase investment in training maritime educators' digital teaching competencies by regularly organizing training activities. Training content should cover: - Utilizing online teaching platforms (e.g., Chaoxing Learning Pass, Yuke Classroom) - Operating virtual simulation teaching software (e.g., ship maneuvering simulators, navigation radar simulators) - Producing instructional videos - Applying intelligent teaching tools (e.g., smart teaching evaluation systems, instructional data analysis software) Through training, instructors should become proficient in utilizing digital teaching tools and capable of designing appropriate digital teaching plans based on instructional objectives and student characteristics. Concurrently, institutions can establish model digital teaching courses, select outstanding instructors for demonstration lessons, organize peer observations, and disseminate best practices in digital pedagogy. Additionally, implementing a digital teaching incentive program to recognize and reward instructors demonstrating exceptional performance in digital instruction will motivate educators to actively adopt digital teaching methods.

4.3 Deepen Industry-Academic Collaboration to Expand Teacher Practice Opportunities

Schools should actively establish close industry-academia partnerships with shipping enterprises and intelligent vessel R&D institutions to provide teachers with more practical opportunities. Through cooperative agreements, teachers can be assigned to enterprises for on-the-job training, participating in real-world projects such as intelligent vessel operations management and digital transformation of shipping services. During these placements, faculty can gain in-depth insights into the latest technologies and operational workflows within the intelligent shipping industry, accumulate practical experience, and transform these insights into teaching case studies. Concurrently, enterprises can provide schools with internship facilities and training venues, jointly establishing practical teaching bases to support hands-on instruction for both students and faculty. Additionally, schools may invite enterprise technicians to serve as adjunct instructors, collaborating with in-house faculty to deliver practical teaching. This fosters shared

faculty resources between schools and enterprises, enhancing the quality of practical instruction.

4.4 Improving Training Systems and Enhancing Training Quality

Schools should establish a robust training system for maritime instructors in the era of intelligent shipping. In designing training content, thorough research into instructors' actual needs is essential. Courses should be tiered and categorized based on instructors' knowledge levels and teaching experience to ensure relevance and practicality. Training methods should be diversified, combining theoretical lectures, practical operations, case studies, group discussions, and field visits to maximize effectiveness. For instance, in intelligent shipping technology training, teachers should be arranged to visit intelligent vessel operators for firsthand experience of vessel operations. In teaching methodology training, teachers should engage in case analysis and group discussions to explore how new pedagogical concepts and methods can be applied to maritime education. Strengthen the development of the training faculty by selecting industry experts and university professors with extensive practical and teaching experience to serve as instructors, ensuring training quality. Simultaneously, establish a training effectiveness evaluation mechanism to track and assess teachers' learning outcomes and the application of teaching practices after training. Provide timely feedback on evaluation results to inform the optimization of the training system.

4.5 Establish Incentive Mechanisms to Motivate Faculty Self-Improvement

Schools should establish comprehensive incentive mechanisms to encourage maritime educators to actively enhance their capabilities. Prioritize faculty members demonstrating outstanding performance in intelligent shipping teaching and research during title evaluations, position promotions, and performance assessments. For instance, incorporate participation in intelligent shipping research projects, publication of high-level academic papers, and development of digital teaching resources as key indicators for title evaluations. Offer promotion opportunities and performance bonuses to educators achieving significant results in intelligent shipping teaching reforms. Establish dedicated research funds to support faculty research in intelligent shipping, providing financial and equipment resources. Simultaneously, encourage participation in teaching competitions and skill contests, offering awards and honors to winning faculty to stimulate competitive spirit and self-improvement motivation.

5. Conclusion

The advent of the intelligent shipping era presents new opportunities and challenges for maritime education. As the core force in maritime education, maritime instructors must continuously enhance their capabilities to meet evolving demands. Through interdisciplinary training, digital teaching development, strengthened industry-academia collaboration, refined training systems, and incentive mechanisms, we can effectively elevate instructors' competencies. This will cultivate more high-caliber maritime professionals suited for the intelligent shipping era, providing robust talent support for China's shipping industry's intelligent development.

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