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Comparison and Collaborative Optimization of Industry-Education Integration Models in Maritime English Vocational Education between China and Singapore in the Era of Smart Shipping

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ABSTRACT

The rapid development of smart shipping has put forward new requirements for maritime English vocational education, and industry-education integration is an important starting point for improving the quality of maritime English talent cultivation. Based on Bronfenbrenner's Ecological Systems Theory, this paper constructs a four-dimensional ecological comparative analysis framework of "institution-curriculum-faculty-evaluation", and adopts policy text analysis, literature comparison and case study methods to compare the industry-education integration models of maritime English vocational education in China and Singapore. The research finds that the two countries show a divergence between "administrative logic dominance" and "market logic dominance" in institutional ecology, a difference between "syllabus-driven" and "demand-driven" in curriculum ecology, a mismatch between "research-oriented" and "industry competence-oriented" in faculty ecology, and a gap between "institution-centered" and "industry-centered" in evaluation ecology. The root causes of these differences lie in institutional logic, cultural cognition and industry participation mechanisms. Accordingly, this paper constructs a "dual-cycle" optimization model of industry-education integration for maritime English with the collaboration of "government-institution-enterprise-ship", and puts forward localized collaborative optimization paths from four dimensions: institution, curriculum, faculty and evaluation, so as to provide references for the reform of maritime English vocational education and the construction of crew talent team in China under the background of smart shipping.

KEYWORDS

Maritime English; Vocational Education; Industry-Education Integration; Singapore; Comparative Study; Smart Shipping.

1. INTRODUCTION

(1) Realistic Background

In the era of smart shipping, technological changes such as autonomous vessels, remote control navigation and digital twins are reshaping the global shipping industry. The International Maritime Organization (IMO) pointed out in the relevant documents on the "Definition of the Scope of Regulation for Maritime Autonomous Surface Ships (MASS)" that the core competence of crew in the new era will shift from traditional vessel manipulation to comprehensive literacy such as digital communication and interaction, intelligent system collaboration and cross-cultural collaboration. In this context, maritime English, as a common working language in the shipping field, is transforming its functional orientation from exam-oriented to professional competence-oriented. It is no longer just an examination tool for crew to obtain competency certificates, but a core professional competence

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to ensure the safe operation of smart vessels, realize human-machine collaborative decision-making and carry out cross-cultural shipping business communication.

At present, there are still prominent structural contradictions in the industry-education integration of maritime English vocational education in China. On the one hand, there is a mismatch between the actual needs of shipping enterprises for crew's English post competence and the talent cultivation objectives of colleges and universities. According to the relevant statistics of the *China Crew Development Report*, the competitiveness of Chinese crew in the international labor market has long been limited by the shortboard of English communication. The scale of expatriate senior crew continues to grow, but there is still a gap in English application abilities such as vessel management and cross-cultural communication compared with shipping powerhouses. On the other hand, the industry-education integration in the field of maritime English presents a phenomenon of "institutions enthusiastic but enterprises cold": colleges and universities actively promote curriculum reform, but shipping enterprises lack external incentives to participate in curriculum development, internship practice and talent evaluation, and the closed loop of school-enterprise collaborative talent cultivation has not been truly formed. The root cause is that the industry-education integration of maritime English is often simply equated with superficial school-enterprise cooperation, lacking systematic examination and institutional design for the interaction of multiple elements within the industry-education integration ecosystem.

Singapore has strong influence in the field of international maritime talent cultivation relying on mature industry-education integration mechanisms such as the Skills Future lifelong learning system, the dual-track vocational education model of Institute of Technical Education (ITE) and polytechnics, and the "Teaching Factory". The Maritime and Port Authority of Singapore (MPA) provides financial support for enterprises to participate in vocational education and training through the Maritime Industry Cluster Fund, forming a collaborative talent cultivation pattern of "government guidance, industry leadership and institution implementation". Its maritime English teaching is embedded in the overall cultivation system of maritime professional competence, realizing the in-depth coupling of language skills and post competence, which has reference value for the reform of maritime English industry-education integration in China.

(2) Literature Review

1) Research on Maritime English Education

Domestic research on maritime English has gradually expanded from language ontology research such as vocabulary, grammar and translation to education and teaching levels such as curriculum design, teaching mode and textbook construction. Yang Yang and Shi Xiaojie, based on the background of new liberal arts construction, pointed out that there are problems such as insufficient matching between teachers' language ability and industry knowledge, and the need to improve the coordination between curriculum practice and theory in ocean-related English for specific purposes (ESP) courses, and proposed a "four-integration" construction path[1]. Wang Aixiang and Li Xiaoxiang focused on higher vocational maritime ESP textbooks, and put forward the basic principles that textbook compilation should adhere to professionalism, practicality and systematicness[2]. In general, existing studies mostly focus on curriculum and teaching reform in a single institution, lack international comparative perspective, and have insufficient systematic sorting of maritime English industry-education integration practices in shipping powerhouses such as Singapore.

At the international level, Fan et al. compared the current situation of maritime English education in multiple countries, refined five research dimensions including evaluation system, textbook development, teaching methods, teacher development and student competence, and believed that China's maritime English education still has shortcomings in post demand analysis and learner-centered teaching practice[3]. This judgment is also consistent with the conclusions of domestic research on maritime English knowledge graphs: domestic research focuses on speculative discussion, lacks empirical investigation, focuses on teaching method discussion, lacks research on learners' real

post needs, and the national collaborative research platform and resource co-construction mechanism still need to be improved.

2) Research on Industry-Education Integration

Industry-education integration is the core issue of modern vocational education reform, and the academic circle has accumulated rich research results. Zuo Caibao et al. pointed out the practical dilemma of insufficient school-enterprise collaboration in maritime talent cultivation, and proposed improvement countermeasures such as optimizing the faculty team and constructing training bases[4]. Liu Wenhui et al. constructed a "four-dimensional drive-three-dimensional empowerment" talent cultivation model for foreign language majors based on the theory of industry-education integration community, providing a reference analytical framework for industry-education integration of foreign language majors[5]. Zhang Ni et al. analyzed practical problems such as niche imbalance and limiting factors in the construction of blended vocational education courses from the perspective of educational ecology, providing a new perspective for understanding the curriculum ecology of industry-education integration[6]. However, in general, there are few comparative studies applying ecological systems theory to the industry-education integration of maritime English.

3) Comparative Research on Vocational Education Between China and Singapore

Domestic studies have sorted out Singapore's vocational education model to a large extent. Zhao Jian, Zhang Jiping et al. introduced Singapore's "Teaching Factory" model and the tripartite collaboration mechanism of government, enterprise and labor at an early stage, and summarized its enlightenment for China's vocational education reform[7]. However, most of the research objects are oriented to the macro vocational education system, and do not sink to the subdivided field of maritime English for specific purposes. In the field of international comparison of maritime education, Wang Xinjian et al. studied the management mode of maritime service qualifications of students in American maritime colleges[8], and Zhi Dashi interpreted the curriculum development concept of IMO model courses[9]. There is still a research gap in the thematic comparative study of Singapore's maritime English industry-education integration.

Based on this, this paper introduces Bronfenbrenner's Ecological Systems Theory, builds a four-dimensional ecological analysis framework of "institution-curriculum-faculty-evaluation", breaks through the limitation of single element comparison, and realizes the transformation from element comparison to systematic comparison. At the practical level, it constructs a "government-institution-enterprise-ship" collaborative dual-cycle model of industry-education integration, providing a systematic solution for maritime English talent cultivation in China in the era of smart shipping.

2. THEORETICAL BASIS AND ANALYTICAL FRAMEWORK

(1) Educational Application of Ecological Systems Theory

American psychologist Bronfenbrenner proposed the Ecological Systems Theory in 1979, which provides a classic analytical tool for analyzing the interaction between individuals and multi-layered environments[10]. The theory places human development in an interconnected and interactive ecological system, dividing it into five levels: micro-system, meso-system, exo-system, macro-system and time system, focusing on the influence of different environmental factors on the subject's development and the two-way interaction between humans and the environment.

Ecological Systems Theory has been widely applied in the fields of teacher development, foreign language teaching, online education, etc. Peng Jian'e pointed out that from the ecological perspective, foreign language teacher development is the result of the interaction between individuals and multi-layered environments, and the nested ecological environment provides important conditions for the professional development of foreign language teachers[11]. Zhang Qinghua analyzed the dilemmas of college foreign language teachers' professional development from the micro-meso-macro

collaborative perspective, and proposed a multi-layered system collaborative empowerment path for the evolution of teachers' professional ecology[12]. Bian Jiasheng, Li Shan et al. constructed a GenAI ternary collaborative interactive second language writing model based on ecological systems theory, confirming the important role of multi-layered ecological factor collaboration in language learning effectiveness[13].

(2) Construction of "Four-Dimensional Ecological" Comparative Analytical Framework

Combining the core connotation of Ecological Systems Theory and the realistic characteristics of industry-education integration in maritime English vocational education, this paper constructs a four-dimensional ecological comparative analysis framework of "institution-curriculum-faculty-evaluation". The industry-education integration of maritime English, as a complex educational ecology, corresponds to direct education scenarios such as classroom teaching, training bases and vessel internships in the micro-system; the meso-system reflects the collaborative connection between colleges and enterprises; the exo-system covers external conditions such as industry policies, shipping markets and technical standards; the macro-system includes deep constraints such as national education systems, social culture and International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW).

On this basis, four core observation dimensions are decomposed: institutional ecology focuses on the governance model and policy tools of industry-education integration; curriculum ecology pays attention to curriculum content supply and iterative update mechanism; faculty ecology points to the training path of "double-qualified" teachers; evaluation ecology covers talent quality assurance and competence certification system. The four dimensions are nested and interactive, jointly constituting a complete ecology of maritime English industry-education integration.

3. COMPARISON OF INDUSTRY-EDUCATION INTEGRATION MODELS OF MARITIME ENGLISH VOCATIONAL EDUCATION BETWEEN CHINA AND SINGAPORE

(1) Comparison of Institutional Ecology: Governance Structure and Policy Tools

1) Differences in Governance Subjects

Maritime English vocational education in China implements a multi-head collaborative management model, forming a "dual-head management" pattern. The Ministry of Education coordinates the macro planning and quality supervision of vocational education, while the Maritime Safety Administration (MSA) of the Ministry of Transport is responsible for the qualification approval of crew training institutions, the formulation of competency examination syllabi and the supervision of training quality. There is a certain tension in the work orientation of the two types of departments: the education competent department emphasizes deepening industry-education integration and school-enterprise cooperation; the maritime management department focuses on the compliance of training institutions and the pass rate of examinations, and the two have not fully aligned in the talent cultivation objectives of maritime English. Existing studies have pointed out that the teaching evaluation and supervision system of maritime colleges and universities in China still needs to be improved to further meet the continuous quality monitoring requirements of the STCW Convention.

Singapore has formed a governance model led by the Maritime and Port Authority (MPA) and SkillsFuture Singapore. MPA undertakes the functions of qualification review of maritime training institutions and pre-approval of courses (Pre-approved Courses), and at the same time provides funding for enterprise training projects relying on the Maritime Industry Cluster Fund; SkillsFuture Singapore coordinates the national lifelong learning system, providing credit subsidies and course certification for vocational courses such as maritime English. The collaboration of "industry

competent authority + lifelong learning governance institution" promotes the talent cultivation of maritime English to closely align with industry post needs.

2) Differences in Policy Tools

China's industry-education integration policies are mainly project-driven. The *National Vocational Education Reform Implementation Plan* in 2019 proposed to build high-level industry-education integration training bases and promote school-enterprise "dual-subject" talent cultivation; the *Opinions on Deepening the Construction and Reform of the Modern Vocational Education System* issued by the General Offices of the Central Committee and the State Council in 2022 clarified the dominant position of enterprises in vocational education. However, when the policies are implemented in the field of maritime English, they mainly rely on project-based means such as modern apprenticeship pilots and the identification of industry-education integration enterprises, lacking a regular and continuous funding guarantee mechanism. Industry-education integration is an inevitable path for the high-quality development of maritime vocational education, but in reality, the problems of "institutions enthusiastic but enterprises cold" and "disconnection between schools and enterprises" still objectively exist.

Singapore adopts incentive tools of credit subsidies and fund sharing. Skills Future Credits provide training credits for citizens aged 25 and above, which can be used for officially certified courses such as maritime English; MPA's Maritime Industry Cluster Fund provides up to 50% matching subsidies for enterprise training investment, forming a strong economic incentive. At the same time, it has built the Skills Framework for Sea Transport, solidifying maritime English competence indicators into industry standards, promoting the transformation of industry-education integration from policy calls to market internal needs.

3) Differences in Institutional Constraints

The legal norms of maritime English education in China mainly rely on the principled provisions of the *Vocational Education Law* and departmental regulations such as the *Rules for the Examination, Assessment and Certification of Competency of Seafarers on Seagoing Ships*, focusing on standardizing the minimum competency standards for crew competency, and there are no special institutional arrangements for the industry-education integration of maritime English. China's implementation of the STCW Convention has gone through stages of regulation introduction, institutional construction to full implementation, and the system of crew training, examination and certification has been established, but there are still gaps in the supporting systems related to industry-education integration.

Singapore has established a constraint mechanism linking course approval and funding. For institutions to obtain funding from the Maritime Industry Cluster Fund, their courses must pass MPA's pre-approval, and the running institutions need to submit complete course syllabi, faculty qualifications and teaching facility materials. Only after passing the review can they carry out training and apply for subsidies, ensuring that maritime English courses meet the real needs of the industry through institutional constraints.

(2) Comparison of Curriculum Ecology: Content Supply and Iteration Mechanism

1) Development Model of Curriculum Standards

China's maritime English curriculum standards operate on a dual-track system. The MSA formulates a unified national competency examination standard based on the STCW Convention, which serves as the bottom-line requirement that all training institutions must abide by; on this basis, various colleges and universities independently develop school-based courses and textbooks, and there are large differences in curriculum depth and content selection among different colleges. The compilation of higher vocational maritime ESP textbooks should adhere to professionalism, practicality and systematicness, but existing textbooks generally have shortcomings such as slow content update and insufficient real post scenarios.

Singapore adopts a multi-party joint development mechanism. MPA jointly with industry organizations such as the Singapore Shipping Association and the Maritime Foundation regularly updates the language competence indicators in the maritime industry skills framework. When ITE and polytechnics develop maritime English courses, shipping enterprises must participate in the discussion of course syllabi to ensure that the teaching content fits the real work scenarios of posts, realizing multi-party collaboration among competent departments, industry associations, colleges and enterprises, and reducing the risk of disconnection between courses and posts.

2) Efficiency of Curriculum Update and Response

The revision cycle of domestic maritime training syllabi is generally 5-8 years, and there is a lag in curriculum update in the face of smart shipping technology iteration and STCW Convention amendments. The 2024 amendments to the STCW Convention added competence requirements such as anti-harassment and mental health communication, and how to transform the new requirements into teaching content in domestic maritime English courses is still in the exploration stage. Wang Ju et al. pointed out that the revision of domestic regulations should align with the update rhythm of international conventions to force the timely iteration of curriculum teaching[14].

Singapore's curriculum has established a regular evaluation mechanism. Maritime majors in Singapore Polytechnic conduct annual industry demand surveys and complete a comprehensive curriculum review every two years; once IMO releases model courses or STCW amendments, MPA quickly organizes industry experts and college teachers to interpret them, and completes corresponding curriculum adjustments within 6 months to ensure that maritime English teaching keeps pace with the reform of international maritime rules.

3) Integration of Smart Shipping Content

Domestic colleges and universities have begun to try to introduce materials such as autonomous vessel communication and intelligent human-machine interaction into maritime English classrooms, but most of them are scattered teaching supplements, lacking systematic curriculum design, and enterprises have insufficient depth of participation in the construction of English courses related to smart shipping. Wei Lidui et al. proposed that maritime education in the era of smart vessels needs to systematically reconstruct the curriculum system, teaching mode and training platform, and there is still a lack of forward-looking and systematic reform in relevant aspects[15].

Singapore regards digital communication competence as the core literacy of maritime English. Skills Future has released digital development routes and maritime digital construction plans, incorporating digital language communication into the core competence of maritime practitioners. The maritime English courses of Singapore Polytechnic systematically include contents such as communication protocols of smart vessels, English operation of electronic chart systems, and remote control vessel command interaction, balancing traditional maritime language competence and new competence in the era of smart shipping.

(3) Comparison of Faculty Ecology: Construction Path of Double-Qualified Faculty

1) Realistic Dilemma of Maritime English Teachers in China

Domestic maritime English teachers generally have structural contradictions: teachers with foreign language backgrounds have solid language skills, but lack practical experience in the maritime industry, making it difficult to deeply combine language training with real post scenarios; part-time teachers from shipping enterprises are familiar with the business, but have shortcomings in foreign language teaching methods and curriculum design capabilities. Yang Yang and Shi Xiaojie also proposed that the insufficient matching of industry knowledge and language ability of ocean-related ESP teachers restricts the improvement of curriculum quality.

At the same time, the professional title evaluation system in colleges and universities generally focuses on scientific research achievements, with papers, projects and teaching awards as the core

evaluation indicators; the weight of teachers' enterprise practice, industry training development and crew training effectiveness is low. Under the guidance of the system, teachers lack endogenous motivation to devote themselves to enterprise practice and develop industry-education integration courses.

2) Access and Development of Maritime English Teachers in Singapore

In Singapore, practical experience in the maritime industry is a hard threshold for maritime vocational teachers. Full-time maritime teachers in ITE and polytechnics generally need to have more than five years of experience in the maritime industry and hold competency certificates for corresponding posts. Under the "Teaching Factory" model, a large number of enterprise technical experts are employed as part-time teachers to enter campuses and carry out project-based teaching, bringing front-line practical cases into classrooms. Singapore's "Teaching Factory" implements a dual-track rotation of schools and enterprises, where students rotate between on-campus learning and on-the-job project internships in enterprises, balancing systematic theoretical learning and post practical training.

Teachers' performance appraisal highlights industry contributions, with the weight of project development, enterprise training effectiveness and graduate industry satisfaction higher than scientific research achievements, guiding teachers to actively connect with the shipping industry and deepen industry-education integration practices.

3) School-Enterprise Faculty Collaboration Model

Some domestic colleges and universities have implemented a "dual-mentor system", but there is no regular communication platform between on-campus English teachers and enterprise mentors. Enterprise mentors mostly give lectures or short-term training guidance, and rarely participate in curriculum syllabus revision and textbook development, which easily leads to the separation of on-campus teaching and enterprise guidance.

Singapore has established a joint school-enterprise teaching team, where on-campus full-time teachers and enterprise part-time teachers jointly formulate teaching plans, design project tasks and carry out academic evaluation; enterprise teachers deeply participate in curriculum revision and textbook compilation, breaking the barriers between campus teaching and industry posts, and realizing real embedded collaboration rather than superficial part-time work.

(4) Comparison of Evaluation Ecology: Quality Assurance and Competence Certification

1) Student Competence Evaluation Methods

Maritime English evaluation in China is mainly based on final written examinations and unified competency certificate examinations, which focus on the assessment of language knowledge, and lack sufficient investigation of post application abilities such as oral communication in real vessel scenarios, emergency situational communication and cross-cultural collaboration. Relevant review studies on maritime English show that domestic testing research mostly serves teaching mode discussion, and there are few empirical studies on learners' real post performance.

Singapore adopts modular micro-credentials combined with enterprise project assessment. After completing course modules, students need to pass multiple assessments such as oral interviews, situational tasks and project reports to obtain corresponding micro-credentials. During the enterprise internship in the "Teaching Factory" stage, enterprise mentors conduct comprehensive evaluation combined with students' performance in real post English communication, team collaboration and problem handling, realizing the combination of process evaluation and post authenticity evaluation.

2) Curriculum Quality Evaluation Mechanism

Domestic curriculum quality monitoring mainly relies on on-campus supervisors' lectures and student evaluation of teaching, with low participation of industry enterprises in curriculum evaluation.

The MSA's review of training institutions focuses on school-running qualifications and examination pass rates, and rarely evaluates the industry adaptability of maritime English course content.

Singapore implements a dual mechanism of MPA official review and third-party industry satisfaction research. MPA regularly reviews funded courses, verifying the implementation of course syllabi, faculty conditions and teaching facilities; Skills Future entrusts third-party institutions to investigate graduate employer satisfaction, and the employer evaluation results serve as an important basis for course renewal and continued funding, forcing continuous curriculum optimization.

3) Differences in Evaluation Orientation

China's evaluation system is institution-centered, with evaluation standards mainly from education departments and examination institutions, and enterprises have limited discourse power, which easily leads to the disconnection of "teaching-examination-application": teaching is carried out around the examination syllabus, and the cultivation of post practical English application ability is weakened.

Singapore's evaluation system adheres to industry orientation, with evaluation standards jointly formulated by government agencies, industry associations and enterprises, and college teaching serves the real needs of posts, avoiding the exam-oriented tendency from the institutional level. Research on educational ecology proposes that the construction of blended courses in vocational education needs to break the "flowerpot effect" and establish an evaluation mechanism connecting real production environments, which is referenced by Singapore's practice.

4. ANALYSIS OF THE CAUSES OF DIFFERENCES IN INDUSTRY-EDUCATION INTEGRATION BETWEEN CHINA AND SINGAPORE

(1) Institutional Logic: Divergence Between Administrative Driving and Market Incentives

The industry-education integration of maritime English in China is mainly driven by administration. The government promotes reform through policy documents and project pilots, and enterprise participation is more endowed with social responsibility attributes. Without a stable market-oriented interest distribution mechanism, once the project cycle ends, enterprises' participation motivation is easy to decline, and industry-education integration is difficult to sustain itself.

Singapore designs industry-education integration as a market-oriented investment behavior. The government reduces the training costs of enterprises and individuals through subsidies and credit grants. Enterprises can obtain financial matching subsidies by participating in talent cultivation, and the improvement of employees' competence feeds back to enterprise production benefits, forming a positive cycle of "input-return", and industry-education integration transforms from external policy requirements to internal market demand.

(2) Cultural Cognition: Differences Between Academic Preference and Skill Orientation

There has been a long-standing cultural tendency in China to value academic qualifications over skills. Maritime English is often regarded as an examination tool, and the value of professional language competence has not been fully valued; the social attractiveness of maritime majors is limited, making it difficult to attract high-quality students; the lack of positive incentives at the social cultural level for maritime English teachers' investment in industry practice further restricts the promotion of industry-education integration.

Singapore has formed a social value concept that skills and academic qualifications are equally important. ITE graduates enjoy social recognition, and a through train admission channel from ITE to polytechnics and universities has been built, with more than 40% of ITE graduates continuing to study in polytechnics. Skilled talents have a complete upward channel, cultivating a good social soil for the industry-education integration of maritime vocational education.

(3) Industry Participation Mechanism: Incentive Absence and Interest Community

Although domestic policies have clarified the dominant position of enterprises in vocational education, there is a lack of supporting economic returns and institutional guarantees. Enterprises need to invest costs in receiving students and participating in curriculum development, but the benefits of talent cultivation are lagging and uncertain, which inhibits enterprises' willingness to participate.

Singapore has built a government-institution-enterprise interest community relying on the Maritime Industry Cluster Fund. Enterprises can obtain financial matching funds by investing in training, and the results of participating in curriculum development serve their own talent recruitment; receiving interns can get subsidies, balancing the interests of multiple subjects and building a sustainable collaborative pattern.

5. COLLABORATIVE OPTIMIZATION PATH OF MARITIME ENGLISH INDUSTRY-EDUCATION INTEGRATION IN CHINA

Based on the comparison between the two countries, Singapore's system can be used for reference, but cannot be simply copied. Combined with China's institutional environment and shipping industry status, this paper constructs a "dual-cycle" model of maritime English industry-education integration with the collaboration of "government-institution-enterprise-ship": the "domestic large cycle" connects colleges, shipping enterprises and vessel sites to realize the connection between talent cultivation and domestic shipping posts; the "international outer cycle" aligns with IMO rules and shipowner needs, benchmarks international crew competence standards, and the two cycles promote each other. Four optimization paths are proposed as follows.

(1) Institutional Level: Constructing a Multi-Party Collaborative Governance Community

First, establish a joint meeting system for maritime English industry-education integration. Led by the MSA of the Ministry of Transport, joint with the Department of Vocational and Adult Education of the Ministry of Education, maritime service agencies, shipowners' associations and maritime colleges to hold regular consultations, review the revision of curriculum standards, evaluate the implementation effect of industry-education integration policies, and solve the problem of poor institutional connection between education and maritime management departments.

Second, explore the establishment of a special fund for maritime English industry-education integration. The source of funds can consider crew examination fees, supporting taxes of shipping enterprises, etc., used to subsidize enterprises to participate in curriculum development, internship reception and teachers' enterprise practice, transforming enterprises' participation from social responsibility to economic incentive. Relevant measures need to be gradually promoted in combination with financial reality.

Third, establish a classified access mechanism for maritime English courses. Distinguish between basic courses for all crew and expansion courses for specific posts; basic courses implement the unified bottom-line standards of MSA; expansion courses are entrusted to industry associations for pre-evaluation, encouraging enterprises to deeply participate in curriculum construction.

(2) Curriculum Level: Establishing a Post Demand-Driven Dynamic Iteration Mechanism

Establish a maritime English curriculum advisory committee composed of HR of shipping enterprises, PSC inspectors and representatives of expatriate crew agencies, conduct annual post competence surveys, and timely transform new requirements such as smart shipping and STCW Convention amendments into teaching content. In response to the new requirements of the 2024 STCW Convention amendments such as mental health and anti-harassment communication, complete the pilot development of micro-modular courses by 2026.

Promote the project-based reform of maritime English courses, with on-campus teachers and enterprise mentors jointly designing real project tasks such as English business for vessel handover, English response to PSC inspections, English operation of smart vessel systems, and cross-cultural team communication. Yuan Nan proposed in the analysis of higher vocational maritime English teaching reform from the perspective of industry-education integration that curriculum content and teaching method optimization can be realized through enterprise research, reform practice, effect feedback and summary rectification, providing practical reference for project-based reform[16].

Build a digital teaching resource library for maritime English, integrate VR/AR communication scenario libraries, PSC typical case libraries, English terminology libraries for smart vessels, and IMO model course micro-lesson resources relying on cloud-edge-end architecture[17], enriching the teaching carrier of industry-education integration.

(3) Faculty Level: Building a “Dual-Amphibious” Maritime English Teacher Team

Implement the system of enterprise on-site training for maritime English teachers, taking offshore enterprise practice experience as a necessary condition for associate professor promotion, with a cumulative practice experience of not less than 12 months. Practice forms include on-board probation, post exercise in shipping enterprise document work, business evaluation in crew training institutions, etc.; colleges and universities guarantee teachers’ treatment during the training period, and enterprises provide practical post support to make up for teachers’ shortcomings in industry practice.

Improve the appointment system of “industrial professors” for maritime English, appointing industrial professors from senior crew and maritime management personnel of shipping enterprises, requiring them to have practical backgrounds in ESP or cross-cultural communication; clarify that industrial professors undertake practical teaching, curriculum revision and graduation design guidance tasks, with practical teaching hours not less than 30% of total practical hours; give equal treatment in on-campus resources and honor evaluation, and establish a two-way flow channel for school-enterprise teachers.

Reconstruct the teacher evaluation indicators, construct a three-dimensional evaluation system of teaching ability-industry contribution-scientific research level, with the weight of industry contribution not less than 30%, and incorporate enterprise curriculum development, crew training services and participation in industry standards into the assessment, guiding teachers to actively connect with industry needs.

(4) Evaluation Level: Promoting the Transformation of Evaluation Paradigm from Institution-Led to Industry-Participated

Promote shipping enterprise experts to participate in the proposition and oral examination review of maritime English course assessment, design situational oral examinations around post tasks such as vessel emergency communication and foreign-related business communication, optimize the proportion of English application ability assessment in competency examinations, and break the exam-oriented orientation.

Build a tracking database of crew international competitiveness, track and record shipowners’ English evaluation of expatriate crew, statistics of language-related deficiencies in PSC inspections, and employment data of crew on cruise and ocean-going vessels, and regularly release evaluation results as a reference for the training quality of maritime colleges and the qualification review of training institutions.

Explore the modular micro-credential system for maritime English. Decompose maritime English into modules such as basic maritime English, vessel business communication, PSC situational communication, smart shipping English and cross-cultural communication, which are uniformly certified by MSA and nationally recognized; gradually study the feasibility of mutual recognition with certificates of shipping countries and crew exporting countries to serve the export of China’s crew labor services.

6. CONCLUSION AND OUTLOOK

Based on Bronfenbrenner's Ecological Systems Theory, this paper constructs a four-dimensional analysis framework of "institution-curriculum-faculty-evaluation" to compare the industry-education integration models of maritime English vocational education between China and Singapore. The research shows that the differences in industry-education integration between the two countries are rooted in institutional logic, social cultural cognition and industry participation incentive mechanisms. China still has shortcomings in cross-departmental institutional coordination, enterprise participation incentives, teacher industry practice training and industry-oriented evaluation construction; Singapore has realized the close connection of maritime English with posts relying on market-oriented subsidies, multi-party co-construction of courses, strict industry teacher access and industry-led evaluation, but this model cannot be directly copied, and reform should be based on China's local reality.

Accordingly, this paper constructs a "dual-cycle" optimization model of industry-education integration with the collaboration of "government-institution-enterprise-ship", and proposes improvement plans from the aspects of collaborative governance, curriculum iteration, dual-amphibious faculty and multi-evaluation system. Some measures are subject to financial and industry realistic conditions and need to be gradually implemented in stages. Limited by data conditions, this paper mainly carries out comparative analysis based on public policy texts and existing literature, lacking first-hand research and interview data from colleges and universities and shipping enterprises, and the acquisition of first-hand data from overseas subdivided courses is limited. Subsequent research can be further deepened and combined with case studies.

Facing smart shipping, the demand for crew's digital communication and cross-cultural communication language competence continues to upgrade. Artificial intelligence technology brings new opportunities for maritime English teaching, and teaching applications such as intelligent teaching assistants and situational dialogue simulation can be further explored; at the same time, we will continue to improve China's maritime English vocational education standards, steadily promote the exploration of certificate mutual recognition, and serve the high-quality development of the shipping industry and the construction of the crew talent team.

REFERENCES

[1] Yang, Y., & Shi, X. J. (2026). Optimization path of ocean-related ESP courses in colleges and universities under the background of new liberal arts. *Maritime Education Research*, 43(2), 59–65.

[2] Wang, A. X., & Li, X. X. (2018). Analysis on the compilation principles of higher vocational maritime ESP textbooks. *China Vocational and Technical Education*, (20), 84–87, 91.

[3] Fan, L., et al. (2020). Maritime English education and training in China and major seafarer-supplying countries. *Maritime Policy & Management*, 47(5), 623–641.

[4] Zuo, C. B., Quan, D., & Zhang, L. (2024). Research on countermeasures for maritime excellent talent cultivation under the background of industry-education integration. *Ship Vocational Education*, 12(1), 1–4.

[5] Liu, W. H., Xie, Y., & Zhou, S. J. (2025). Construction of "Foreign Language +" talent cultivation model in undergraduate colleges from the perspective of industry-education integration community. *Maritime Education Research*, 42(4), 48–53.

[6] Zhang, N., Wang, Y., & Huang, L. P. (2024). Research on the construction of blended "golden courses" in vocational education under the background of industry-education integration-From the perspective of educational ecology. *Vocational and Technical Education*, 45(2), 51–55.

[7] Zhao, J., Zhang, J. P., & He, Q. H. (2009). Investigation and reference of Singapore's maritime education and crew training system. *Maritime Education Research*, 26(2), 41–44.

[8] Wang, X. J., Wang, H. X., Liu, Z. J., et al. (2018). Research on the management mode of maritime service qualifications of students in American maritime colleges. *Maritime Education Research*, 35(4), 41–47.

[9] Zhi, D. S. (2018). Curriculum development ideas of IMO model courses. *Maritime Education Research*, 35(4), 48–50.

[10] Bronfenbrenner, U. (1979). *The ecology of human development: Experiments by nature and design*. Harvard University Press.

[11] Peng, J. E. (2015). Ecological perspective on foreign language teacher development research. *Language Education*, 3(4), 37–42.

[12] Zhang, Q. H. (2020). Dilemmas and breakthrough paths of college foreign language teachers' professional development from the perspective of ecological systems theory. *Technology Enhanced Foreign Language Education*, (4), 111–116.

[13] Bian, J. S., Li, S., & Jiang, Q. (2025). Construction and empirical research on GenAI ternary collaborative interactive second language writing model based on ecological systems theory. *Technology Enhanced Foreign Language Education*, (3), 76–84, 115.

[14] Wang, J., & Liu, S. Y. (2021). Requirements of STCW Convention on special training for crew of passenger ships and China's performance suggestions. *Maritime Education Research*, 38(1), 46–50.

[15] Wei, L. D., Wei, H. J., & Cao, H. F. (2018). Reform path of higher maritime education for smart vessels. *Maritime Education Research*, 35(4), 7–11.

[16] Yuan, N. (2022). Analysis on higher vocational maritime English teaching reform from the perspective of industry-education integration. *Maritime Education Research*, 39(2), 78–82.

[17] Yan, T. M. (2018). Construction and teaching practice of marine English blended learning resources based on cloud classroom. *Maritime Education Research*, 35(4), 99–103.