

From “Knowledge Container” to “Shipping Brain”: Redesigning the International Shipping Management Curriculum Driven by Digital Transformation

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Abstract: The digital transformation of the shipping industry is reshaping the industrial ecosystem and talent demand paradigm, posing a severe challenge to talent cultivation in universities. As a core course within the Transportation Management (International Trade) major, International Shipping Management plays a crucial role of cultivating students' international strategic thinking and practical abilities. However, the traditional teaching system following the “knowledge container” paradigm is no longer sufficient to meet the needs of cultivating modern high-end shipping service talents. This study aims to address this challenge by proposing a curriculum redesign scheme aimed at cultivating builders and operators of the “shipping brain.” Core measures include constructing a four-layer modular curriculum system of “foundation-empowerment-application-practice,” building a simulation training and data analysis platform, and implementing a process-oriented and diversified evaluation system. This research provides a systematic theoretical framework and practical path for the digital upgrading of shipping management courses.

Keywords: Curriculum Redesign; International Shipping Management; Digital Transformation; Shipping Brain; Outcome-Based Education (OBE)

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1.Introduction

1.1 Research Background and Importance

As a pillar of global trade, the international shipping industry is undergoing a profound digital transformation driven by technologies such as big data, Artificial Intelligence (AI), the Internet of Things (IoT), and blockchain. Concepts like smart ports, digital twins, and intelligent ships are rapidly being implemented, signifying a shift in industry paradigms from experience-based traditional operations to data-driven intelligent decision-making. As a result, the industry now requires innovative shipping professionals who can combine solid knowledge of shipping operations with competence in digital tools and analytical thinking.

However, the reform of “International Shipping Management” course, which is the core carrier for cultivating high-end shipping service talents, has lagged significantly behind the rapid evolution of the industry. The current teaching content and methods are still deeply trapped in the traditional “knowledge container” approach, focusing on the indoctrination of static

and isolated knowledge, with clear disciplinary boundaries, making it difficult to stimulate students' systematic thinking, collaborative innovation ability and potential to work with intelligent systems^[1]. This gap between “teaching” and “business” makes it difficult for the course to shoulder the important task of cultivating core intellectual engines for the future shipping industry.

Therefore, an urgent education reform issue on how to systematically redesign the curriculum and transform it from a closed “knowledge container” into an open “shipping brain” incubator emerges. The “shipping brain” metaphor refers to professionals who operate as the central nerve of digital shipping, possessing abilities in perception (data collection), cognition (data analysis), decision-making (intelligent optimization), and execution (collaborative control). This research aims to respond to this real-world challenge by proposing a redesign framework centered on capability empowerment, supported by digital learning scenarios, and guaranteed by dynamic assessment. This framework provides systematic theoretical guidance and practical steps for the paradigm shift of the “International Shipping Management” curriculum, with the ultimate goal of cultivating “brain” builders and leaders capable of navigating the future digital ecosystem of shipping.

2. Industry Digital Transformation and Talent Development Challenges

The rapid development of generative artificial intelligence and large language model technology such as ChatGPT, continuously introduces new ideas and opportunities across many sectors including the shipping industry. Against this background, universities worldwide have been promoting the “artificial intelligence+” strategy, guided by the new knowledge and talent development, reforming the course teaching model and talent training system, and actively responding to the new requirements put forward by the digital intelligence era. The contemporary views of knowledge emphasizes that it is shifting from a static, hierarchical structure to a dynamic, networked ecosystem. With its stability decreasing and updates accelerating, it shows distinct characteristics such as fragmentation and contextualization^[2]. Under these conditions, traditional “encyclopedic” talent development can hardly adapt to the needs of social development. Instead, new quality talents with continuous learning ability, innovative thinking and human-machine collaboration qualities are needed. Therefore, universities are increasingly focusing on cultivating such flexible interdisciplinary graduates.

Focusing on the shipping industry, its digital transformation is centered on the online collaboration of the entire chain of “ship-port-cargo-chain.” This transformation mainly presents five major directions: smart ships, smart ports, smart cargo and documents (including full digitalization of trade documents, blockchain bills of lading, smart contracts, etc.), smart operation and decision-making (including route optimization, fleet scheduling, carbon emission and green compliance supervision, etc.), and smart customer and supply chain services. Studies have shown that the current digital strategies of major shipping companies focus more on improving operational efficiency and customer service levels by leveraging technologies such as artificial intelligence, big data, and the Internet of Things, thereby enhancing cost control capabilities and market competitiveness^[3]. However, in the process of transformation, persistent structural challenges such as information silos, process fragmentation, inefficient document processing, and insufficient system collaboration remain^[4].

Digital transformation permeates the entire shipping industry chain, involving multiple dimensions such as operations, management, and services. This profound transformation has significantly increased the demands on the capabilities of personnels engaged in advanced shipping roles. Previously, talent with only a strong foundation of textbook knowledge and application was insufficient to meet the current industry needs. Currently, the shipping industry is evolving simultaneously towards digital, intelligent, and green development, with emerging technologies deeply embedded in everyday practice.

Consequently, there is a pressing need for professionals with digital literacy, interdisciplinary thinking, innovative awareness, and practical skills. The growing demand for this new type of talent and the emergence of new job positions are forcing universities to shift their talent cultivation paradigms and systematically reform their curriculum systems.

3. Diagnosis of the “Knowledge Containerization” dilemma in the existing Curriculum System

For the past two decades, the “International Shipping Management” curriculum has functioned largely as a self-contained “knowledge container.” The course content is divided into chapters, covering modules such as the shipping market,

international shipping management indicators, and the organization and management of liner and irregular shipping operations. In this model, teachers are positioned as the primary source of knowledge, while examinations mainly measure how well students retain predefined content. Students are often considered qualified shipping professionals simply by “filling” in this predetermined knowledge. This traditional international shipping management curriculum follows a “knowledge container” paradigm, centered on disciplinary boundaries (container), teacher authority (knowledge) and static knowledge (core). Under this paradigm, it is difficult to cultivate high-end shipping service professionals suitable for the needs of the new era. The specific curriculum system faces the following main problems:

(1) Content lag: The textbook “International Shipping Management” is slowly updated, and cannot keep pace with new developments. Important emerging areas such as smart logistics, carbon emissions trading, and shipping big data analysis are not yet incorporated in a systematic way.

(2) Structural fragmentation: Topics related to shipping markets, route optimization, voyage estimation, and chartering decisions are taught separately without a central thread to connect them, making it difficult for students to form a comprehensive view. When confronted with complex real-world events such as major canal blockage, fragmented professional knowledge is far from sufficient to solve these problems. Students need integrated thinking and the ability to coordinate across systems.

(3) Traditional methods: Teaching is mainly teacher-centered and focused on theoretical instruction. Although recent teaching reforms have incorporated classroom case discussions, the overall proportion is still small and the forms are not diverse enough.

(4) Practice becomes abstract: Supporting activities such as the “Container Liner Company Management Simulation” experiment and “International Shipping Management Course Design” are excellent courses that apply theory to practice. However, they still do not provide students with opportunities to make decisions, experience failure, adjust strategies and improve through iteration.

(5) Simplified evaluation: The assessment is mainly based on test papers, accounting for more than 60% of the total score. It emphasizes knowledge memorization and neglects the application of skills, and cannot scientifically evaluate students’ data analysis, innovation and collaboration abilities.

The core challenge of curriculum reform lies not merely in updating content, but in achieving a fundamental shift from a “knowledge container” paradigm to a “shipping brain” paradigm—that is, moving from the traditional static, subject-divided, teacher-centered model to a dynamic, systemically intelligent, and student-data-scenario collaborative new form. It is worth emphasizing that the current digital transformation of the industry provides the practical foundation and technological possibility for this paradigm shift, enabling the curriculum to be structured around real-time data, supported by intelligent systems, and utilize complex scenarios in the classroom, truly empowering the cultivation of future shipping talent.

4.Implementation Path of “Shipping Brain” Curriculum Paradigm Design

4.1 Curriculum Design and Development Philosophy

Traditional courses tend to focus on the direct transfer of knowledge. Under this approach, students first ‘receive’ knowledge, and then are encouraged to develop skills of higher-level thinking afterwards. Due to this, knowledge mastery is prioritized while ability development remains secondary. In the digital age, however, the paradigm of knowledge and learning has undergone profound changes where knowledge updates are accelerated. The most important is not how much knowledge students store, but how quickly they can find, understand, and apply new information ^[5].

The ability to quickly identify and react to information, and to make sound decisions based on it, is the core quality for future professionals. This reality is particularly evident in shipping. Variables such as routes, fuel prices, carbon costs, and berthing conditions change constantly. Even the most complete knowledge base cannot keep pace. The key for practitioners is to “capture information - judge quickly - decide effectively”. For instance, practitioners must read AIS (Automatic Information System), fuel, and carbon quota data in real time, identify congestion or price difference signals at a glance, quickly run the cost-carbon emission-time model, and make timely decisions on adjusting speeds, rerouting, or switching ports. Digital twin sand table should be a standard feature in classrooms, allowing students to complete “data input→scenario

calculation→operational instructions” within a time limit. This will enable “rapid detection, rapid judgment, and rapid decision-making” to become the core competitiveness of new-type shipping talents, so as to navigate the ever-changing global maritime market.

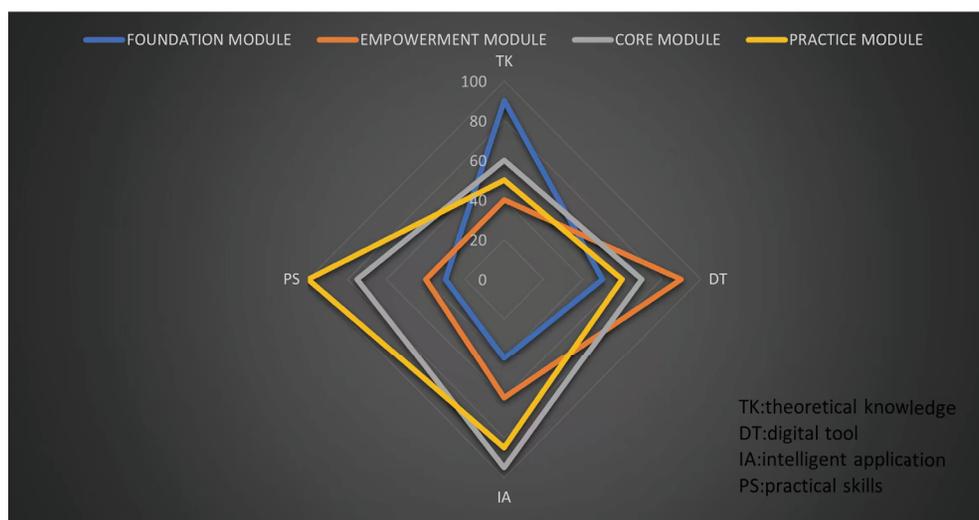
The redesigned curriculum is based on this philosophy, shifting its focus from the accumulating large volumes of theoretical knowledge to building students’ thinking capacity and practical abilities. It emphasizes learning new knowledge, cultivating new skills and ways of thinking, and reorganizing teaching content around practical problems to construct a completely new teaching system. The core concept of this redesign is a shift from “knowledge transmission” to “thinking and ability empowerment,” focusing on cultivating four core competencies: data thinking and analysis, technology understanding and application, system optimization and integration, and cross-disciplinary collaboration and innovation. This means graduates should function like a “brain”: perception (data acquisition), cognition (data analysis), decision-making (intelligent optimization), and execution (collaborative control).

4.2 Implementation path: Curriculum System Restructuring, Platform Support and Assessment Innovation

4.2.1 Curriculum system restructuring

The transformation of the curriculum from a “knowledge container” into a “shipping brain” model essentially reflects the evolution from traditional teaching to digital and intelligent teaching. To achieve this goal, the curriculum is organized into four major interconnected modules: a foundation module, an empowerment module, a core module, and a practice module. Among them, the ‘foundation module’ focuses on the construction of theoretical knowledge; the ‘empowerment module’ focuses on the application ability of digital tools; the ‘core module’ reaches the highest level in intelligent application and excels in other advanced abilities; and the ‘practice module’ emphasizes the comprehensive cultivation of practical skills, and it highly overlaps with the core module in terms of intelligent application and practical skills, reflecting the deep integration of the two (as shown in Figure 1).

Figure 1: Four modules of the International Shipping Management course



(A) Foundational Module (Cognitive Cornerstone): As shown in Table 1 below, this module builds the knowledge base of shipping operations management, covering an overview of international shipping activities, the fundamentals of international shipping operations, the international shipping market, international shipping management indicators, liner operations organization and management (route design and optimization, vessel scheduling, schedule formulation and adjustment, freight rate formulation and optimization, customer relationship and service management, container chartering, purchasing and allocation); irregular vessel operations organization and management (voyage estimation, irregular vessel decision-making organization and management); transport vessel management (vessel energy efficiency management, fleet renewal and strategy, green shipping and compliance); and shipping enterprise strategic decision-making (characteristics of shipping enterprise business strategies, shipping enterprise strategic objectives, shipping enterprise strategic analysis and evaluation).

Teaching may combine micro-videos + electronic or printed textbooks + quizzes, allowing students to learn at their own pace while receiving guided support from instructors through organized review and Q&A sessions.

(B) Empowerment Module (Digital Tools): This module is a digital empowerment module, which mainly cultivates students' ability to collect, organize and analyze shipping data and master a number of digital tools. For example, digital tools (such as shipfleet, shipwatch, HiFleet, etc.) can be used to collect, organize and analyze shipping data, and at the same time, visualization, prediction, optimization and decision-making can be carried out. This part mainly ensures that students are proficient in the application of digital tools and equips students with key digital tools. This idea of "introducing ships into teaching" is not the first of its kind. In similar course reforms, attempts have been made to realize the remote presentation of the shipping production process in the classroom by using shipfleet, shipping network and electronic chart to track the position of ships in real time ^[6]. This module further systematizes and develops upon this foundation. For example, it converts AIS, shipping schedules, and carbon emissions into dynamic route maps and fleet heat maps, allowing easy identification of congestion and anomalies. The China Classification Society's "Ship Energy Efficiency Data Acquisition and Monitoring Software" enables one-click collection of fuel consumption, mileage, and cargo volume from the ship, automatically generating International Maritime Organization Data Collection System (IMO DCS) or European Union Monitoring, Reporting and Verification Regulation (EU MRV) emission reports and supporting fleet-level data comparison and verification. This allows students to complete digital training in the entire process of shipping operations management, from data acquisition and cleaning to visualization and shipping decision-making reporting.

(C) Core Module (Intelligent Application): This module trains students' core digital literacy and practical skills through Project-Based Learning (PBL) projects. Students work in teams to analyze real industry challenges using data, scenarios and collaborative reasoning to provide solutions to their case studies. This project-based learning method centered on real-world scenarios continues to deepen the concepts of "case teaching method" and "group discussion method" in the early curriculum reform ^[7]. It aims to upgrade traditional case analysis into intelligent deduction that integrates data-driven and collaborative decision-making through structured and systematic project training. The case design of this module is also aligned with cutting-edge research on sustainable shipping management. Its content closely follows key success factors such as "acceptance of new technologies" and "internal resource management of enterprises"^[8], ensuring that project training directly targets the core capabilities of sustainable development in the industry. In addition, the case design fully considers the multi-dimensional requirements of sustainable development in the shipping industry, and embeds elements such as environmental resource management (renewable energy utilization), environmental impact assessment (emission reduction and waste management), environmental compliance (IMO/EU regulatory compliance), social sustainability (crew rights and community well-being) and economic sustainability (cost optimization and circular economy) into the project tasks, thereby systematically cultivating students' ability to solve complex sustainability problems as "visible" and "inclusive" talents ^[9]. To support teaching, a special project case library needs to be established. The cases are mainly designed for issues related to liner operation organization management and irregular ship organization management. Each student is required to complete at least two to three projects per semester. The PBL case study library includes the following content: schedule optimization projects (AIS data collection and analysis, on-time performance balancing), voyage estimation projects (from simple to complex, including problems under various constraints such as ship speed, carbon emissions, and fuel consumption), differentiated pricing for a liner route (freight index fluctuation analysis, competitor analysis, strategy and tactics formulation, customer management), shipowners' detour decisions during sudden congestion in the Suez Canal (or Panama Canal), liner companies' route strategy adjustments under trade war tariff changes, analysis of temporary port calls under port strikes and congestion, shipowners' fuel and carbon cost management strategies under the IMO's new low-carbon regulations, fleet planning and vessel renewal strategies (considering the impact of carbon emissions and other factors), the impact of Consortia Block Exemption Regulation (CBER) termination on the liner shipping market, analysis of geopolitical conflicts on shipping security, and comparative analysis of liner freight rate regulatory systems. The case study library needs to be updated annually to keep pace with the realities of the shipping market.

(D) Practical Module (Comprehensive Exercises): This section cultivates students' comprehensive practical problem-

solving abilities, addressing real-world issues in the shipping market and shipping companies. Through the “Comprehensive Simulation Experiment of Shipping Management” and the “Shipping Company Project” at the end of the semester, students will encounter and solve real-world business problems, achieving knowledge integration and skill enhancement. This module requires students to work in groups, collaborating on shipping management issues encountered in actual business operations, with joint guidance from both university and industry mentors.

Table 1: Functional Table of International Shipping Management Course Modules

Module Name	Core Elements (Brief)	Teaching Methods and Tools	Interaction	Reversible Interaction
① Basic Module	Shipping knowledge framework: market, indicators, liner/ scheduled shipping organization, green shipping	Electronic textbooks + micro-lecture videos + online quizzes	Provide a theoretical context for ② and ③.	Students review and fill in the gaps
② Empowerment Module	Shipping data “collection-washing-viewing-strategy”: AIS, shipping schedules, and carbon emissions	Computer lab training + Shipxy.com/HiFleet/Classification Society energy efficiency software + Python/Excel templates	Provide data and models for ③ and ④.	① Practical demonstration of video embedding.
③ Core Module	PBL projects include: schedule optimization, voyage estimation, canal detours, and carbon cost management.	Group discussions + case study library + Gantt chart + Python/AnyLogic model.	Provide a template for solution ④.	② The code can be reused directly.
④ Practical Module	Exam questions for enterprises: route optimization, fleet scheduling, and carbon compliance.	Dual mentorship + 1 week of simulation sandbox + 6 weeks of on-site enterprise training.	Feedback ①②③ Updated case studies.	④ Excellent projects may be approved for funding.

4.2.2 Digital teaching platform and resource construction

The “Smart Shipping Simulation Laboratory” will serve as the core support platform. It will introduce or co-develop professional simulation software and data analysis platforms, and equipping them with anonymized real-world industry datasets (AIS data, freight rate indices, etc.). Simultaneously, a supporting digital teaching case library and micro-course video library will be developed, and practical training bases will be jointly established with leading enterprises. This is to introduce industry mentors to ensure that teaching resources remain current and closely aligned with industry needs.

The intelligent shipping simulation laboratory serves as the “digital foundation” for curriculum reform, but its development goal should not stop at “purchasing advanced equipment.” Instead, it should be upgraded to a growing and evolving shipping education operating system. To this end, we can adopt the Digital Twin Learning Space (DTES) framework, breaking down the platform into a three-layer architecture: physical, data, and algorithm layers. Each layer connects to teaching scenarios, forming a closed loop of “hardware-data-computing power-case studies.” To ensure a dual-drive of “cutting-edge technology + practical application,” the platform introduces two major mechanisms: “dynamic task generator” and “industry mentor responsibility contract.” The case study library is upgraded to a “dynamic task” generator, automatically generating training tasks containing complex scenarios such as sudden risks and capacity fluctuations by connecting to real-time dynamic data from the shipping market, strengthening students’ ability to cope with real challenges. Meanwhile, the university signs a legally binding “Dual Mentor Responsibility Contract” with leading companies. Industry mentors are deeply involved in task design and process guidance according to the contract, ensuring that task logic iterates synchronously with industry evolution, forming a continuously updated educational closed loop. For example, the dynamic task generator automatically captures the latest freight rates, fuel prices, IMO and EU ETS policies every quarter, generating decision-making tasks such as port and route selection, and freight rate formulation. Student groups select tasks, analyze them using digital tools based on their respective company backgrounds, and, under the guidance of both company and university mentors, propose the optimal solution. Finally, the system and mentors provide a solution review. This allows students to compare their solutions with real-world market conditions, intuitively understanding the changes in benefits and risks associated with their chosen solutions.

4.2.3 Construction of a Process-Oriented and Diversified Teaching Assessment System

With the rise of new liberal arts and the rapid evolution of digitalization in shipping, the traditional summative assessment of “one exam determining grades” is no longer sufficient to support the talent cultivation goal of international shipping management that emphasizes “higher-order cognition—digital skills—complex situation decision-making” in three dimensions. Process-oriented and diversified teaching assessment is not simply about increasing the number of assessments, but rather about using the learning evidence chain as the core to comprehensively track and dynamically intervene in the entire process of students’ “knowledge construction—tool application—problem solving—value reflection.” This responds to the institutional requirements of continuous improvement in the Outcome-Based Education (OBE) concept and aligns with the industry requirements of immediate feedback and rapid iteration in shipping operations. Based on this, the International Shipping Management curriculum has restructured its assessment framework, forming a three horizontal and three vertical model: horizontally covering cognition, ability, and literacy; vertically integrating pre-class diagnosis, in-class iteration, and post-class transfer, realizing “assessment as learning, assessment as teaching, and assessment as service.” First, the assessment system establishes process-oriented assessment. Process-oriented assessment emphasizes the evidence chain rather than score points. The course uses the essential “ship log” in shipping practice as a metaphor, requiring students to continuously submit digital ship logs throughout the semester. Log templates are embedded in the learning management system, automatically capturing process data upon completion of each task node: viewing time of micro-lectures in the theoretical knowledge module, chapter quiz accuracy, and number of incorrect answers are all recorded and weighted; in core project tasks, PBL group route optimization reports and peer review records; and feedback from corporate mentors in practical sessions are also sequentially uploaded to the blockchain, forming a traceable and verifiable learning trajectory. Simultaneously, assessments need to be diversified. Addressing the context-dependent nature of shipping decision-making, introduces a three-dimensional matrix of “multi-subject, multi-dimensional, and multi-scenario” approaches. Teachers, corporate mentors, data systems, peers, and student self-reflection share a common standard, providing multiple benchmarks for the same ship, avoiding the limitations of a single standard answer. Finally, the assessment results become a new guide for teaching improvement. The course team uses data to iterate teaching: if it finds that students from two consecutive cohorts consistently score low on the “Temporary Port Closure Decision in Port Congestion Situations” module, a teaching diagnosis mechanism will be activated. First, the matching degree between the question design and the students’ abilities will be analyzed. If it is confirmed that the timeliness of the cases needs to be strengthened, the latest front-line cases such as the reopening of the Port of Los Angeles due to congestion and the closure of the Port of Ningbo during the fog season will be introduced first to ensure that the teaching content keeps pace with the pulse of the industry.

Through process-oriented and diversified assessment, the International Shipping Management course moves the classroom into the “bridge” and transforms exams into voyage audits. This not only cultivates students’ lifelong learning ability in the face of complex shipping systems but also provides a replicable, scalable, and verifiable paradigm for the reform of higher education evaluation in the digital shipping era.

5. Difficulties and Countermeasures

The redesign of the international shipping management curriculum represents a significant innovation in teaching philosophy. Any standard shift is accompanied by numerous uncertainties and faces considerable difficulties and challenges. These difficulties primarily stem from three aspects: students’ lack of initiative in acquiring knowledge due to longstanding learning habits; teachers’ difficulty in keeping their professional knowledge fully aligned with the new teaching model; and the relatively outdated current teaching management system, which fails to effectively guide and guarantee curriculum reform.

Interestingly, these challenges reflect the deeper structural problems encountered by the shipping industry itself during digital transformation. Empirical studies have shown that the main obstacles to the digital transformation of the shipping industry are not the technology itself, but rather the inertia of organizational culture, the psychological resistance of employees to change, the barriers to cross-departmental collaboration, and the huge shortage of digital talents ^[10].

Related studies, through interviews with senior executives of several shipping companies, pointed out that “people and culture” and “departmental silos” are the primary challenges hindering transformation. Companies often face the dual

pressure of aging traditional talent skills and a shortage of new digital expertise, while the traditional “waterfall” project management thinking is difficult to adapt to the rapid iteration required by the digital process. From this perspective, the curriculum reform aimed at cultivating “shipping brains” is actually guiding students and teachers to overcome typical obstacles in the macro-transformation of the industry at the micro-level of teaching.

Conclusion

Only by establishing comprehensive institutional support covering teaching, personnel, assets, quality, and finance can the curriculum reform avoid falling into a “pilot cycle” and truly transform from a short-term project into sustainable, regular teaching. Firstly, the “Shipping Brain” teaching model breaks down the traditional teacher-student binary relationship, constructing a three-dimensional interactive structure of “teacher-student-intelligent system.” Yet ingrained perceptions persist, as teachers are still seen as knowledge authorities, while students are in a passive receiving state. Some students are slow to adapt to active learning roles, which weakens motivation. The teacher’s role shifts from the “center of the lecture” to a “facilitator,” and this power relinquishment can create a sense of “weightlessness” in teaching. This shift can produce discomfort: excessive invisibility leading to a loose learning community, or excessive intervention turning the intelligent tool into mere electronic lecture notes. Therefore, curriculum development must emphasize stimulating students’ learning initiative and assembling a team of teachers with experience in digital teaching.

Secondly, since most digital teaching materials need to be derived from real shipping markets, it is necessary to gradually establish and continuously update a systematic resource system covering textbooks, databases, and case studies. At the same time, the application of new technologies also places higher demands on teachers’ professional capabilities. Given the distinct industry characteristics of this course, industry experts can be introduced into the faculty. On the other hand, a “dual-mentor system” can be implemented by establishing long-term internship bases, allowing industry mentors to bring real projects into the classroom and conduct teaching and evaluation jointly with university teachers, thereby promoting the integration of new technologies and teaching practice.

Finally, institutional guarantees are crucial for the sustainable implementation of curriculum reform. The “Shipping Brain” course must be integrated into the school’s regular teaching management system, rather than relying solely on project-based or temporary funding. Specifically, the Academic Affairs Office can designate the course as a flexible credit unit, allowing dynamic credit hours based on projects and tasks, and reserving a certain amount of flexibility for credit adjustments; the Human Resources Department should incorporate the part-time teaching and guidance work of industry mentors into the management system, linking their contributions with professional title evaluation; the State-owned Assets Management Department should also treat shipping data, software interfaces, and other digital resources as teaching assets for unified management; the Quality Monitoring Department must include data security and information anonymization in the teaching accident evaluation system; and financially, a curriculum reform risk reserve fund can be established to address potential short-term fluctuations and investment needs during the reform process.

The transformation of the international shipping management course still requires the joint efforts of teachers and students, and continuous exploration and innovation in practice, in order to truly achieve the leap from a “knowledge container” to a digital and intelligent course that is the “brain of shipping”.

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Conflict of Interests

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Reference

- [1] Zhu, Z. T., Chen, Y., Zhu, X. Y., et al. (2025). Problem-based integrated classroom: Construction and practice prospect of a new teaching model. *China Educational Technology*, (7), 1–8.

- [2] Wang, Z. L. (2017). A new theory on knowledge and learning perspectives in the intelligent era. *Journal of Distance Education*, 35(3), 3–10. <https://doi.org/10.15881/j.cnki.cn33-1304/g4.2017.03.001>
- [3] Ichimura, Y., Dalaklis, D., Kitada, M., et al. (2022). Shipping in the era of digitalization: Mapping the future strategic plans of major maritime commercial actors. *Digital Business*, 2(1), 100022.
- [4] Ahmed, W. A. H., & Rios, A. (2022). Digitalization of the international shipping and maritime logistics industry: A case study of TradeLens. In *The digital supply chain* (pp. 309–323). Elsevier.
- [5] Wang, Z. L., Guan, X. D., & Luo, L. (2025). Digital intelligence integration curriculum: A new direction for curriculum reform with "artificial intelligence + curriculum". *Open Education Research*, 31(1), 34–41. <https://doi.org/10.13966/j.cnki.kfjyyj.2025.01.004>
- [6] Xu, M. L. (2020). An exploration of the construction of shipping management practice course. *Logistics Engineering and Management*, 42(3), 177–179.
- [7] Li, Z. (2014). Research on the teaching reform of "international shipping management" course. *Journal of Jimei University (Education Science Edition)*, 15(2), 125–127.
- [8] Tran, T. M. T., Yuen, K. F., Li, K. X., et al. (2020). A theory-driven identification and ranking of the critical success factors of sustainable shipping management. *Journal of Cleaner Production*, 243, 118401.
- [9] Raza, Z., Woxenius, J., Vural, C. A., et al. (2023). Digital transformation of maritime logistics: Exploring trends in the liner shipping segment. *Computers in Industry*, 145, 103811.
- [10] Pantouvakis, A., & Vlachos, I. (2020). Talent and leadership effects on sustainable performance in the maritime industry. *Transportation Research Part D: Transport and Environment*, 86, 102440.