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Research and Practice on Developing Teaching Teams for AI General Education in Higher Vocational Colleges

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Abstract: This study examines how teaching teams can develop the complementary capabilities in technology application, industry understanding, and translation of expertise into teaching required for AI general education in higher vocational colleges. Taking Jiangsu Maritime Institute as a case, it explores pathways for team development and mechanisms for teaching delivery. Within the "1+M+N" curriculum framework, shared platforms bring together faculty from different disciplines, research–teaching integration converts projects supporting industrial digital and intelligent transformation into teaching resources, and a three-setting professional development initiative strengthens teachers' capabilities. Collaboration between general education and disciplinary faculty, structured mentoring, and human–AI collaboration supports the division of teaching responsibilities, knowledge sharing, and classroom improvement. The resulting approach connects team development with teaching practice and offers a reference for industry-oriented vocational colleges developing AI general education teaching teams.

Keywords: AI General Education; Teaching Team Development; Research-teaching Integration; Collaborative Teaching; Higher Vocational Education.

1. Introduction

As a strategic technology driving a new wave of scientific and technological advances and industrial transformation, artificial intelligence (AI) is increasingly embedded in economic and social activity, bringing profound changes to production methods, organizational structures, and workplace tasks. The State Council's Opinions on Further Implementing the "AI Plus" Initiative calls for the broad and deep integration of AI across economic and social sectors and the accelerated development of an intelligent economy and society characterized by human–AI collaboration, cross-sector integration, co-creation, and shared benefits [1]. In the maritime sector, AI applications in vessel navigation, port operations, shipping services, and safety regulation are reshaping business processes and occupational competency requirements, creating new demands for technology application, collaborative decision-making, and risk identification.

AI general education in higher education is currently at a stage in which curriculum frameworks are taking shape and teaching approaches continue to evolve. The "AI Plus Education" Action Plan calls for improving AI literacy among teachers and students and providing differentiated teacher training [2]. Li et al. explore curriculum development that integrates general and discipline-specific education [3], while Xia et al. propose a "1+N" model addressing interdisciplinary knowledge, modular courses, and faculty development [4]. Han et al. identify shortcomings in vocational teachers' use of AI in teaching and innovation, highlighting the need to strengthen their capabilities through teaching practice and industry–education integration [5]. Introducing AI general education therefore requires both course development and teaching teams capable of applying technology, understanding industry contexts, and adapting expertise for teaching.

Jiangsu Maritime Institute introduced Introduction to Artificial Intelligence as a general education course in 2025 and has progressively developed a "1+M+N" curriculum framework. One compulsory general education course establishes the foundations, M application-focused electives extend practical skills, and N industry cases and laboratory packages connect AI with disciplinary learning. As course content expands from general-purpose tools to maritime data analysis, vessel inspection, and port scheduling, teaching increasingly requires interdisciplinary collaboration and industry experience. Supported by the Shipping Big Data Engineering Research Center and the Smart Port Virtual Simulation Training Base, the institute is exploring team development involving information technology faculty, disciplinary faculty, and industry experts to sustain teaching delivery, resource development, and curriculum renewal.

2. Team Development through Shared Platforms Research–Teaching Integration and Practice in Three Settings

To meet the demands of AI general education for technology application, industry understanding, and translation of expertise into teaching, the institute has established mutually reinforcing development pathways based on shared platforms, research–teaching integration, and professional practice in three settings. Research and training platforms bring together faculty from different disciplines; authentic projects enable research outputs to be adapted into teaching resources; and placements in research institutions, leading enterprises, and maritime workshops broaden opportunities for teacher development. Together, these pathways connect team organization, teaching capability development, and industry practice.

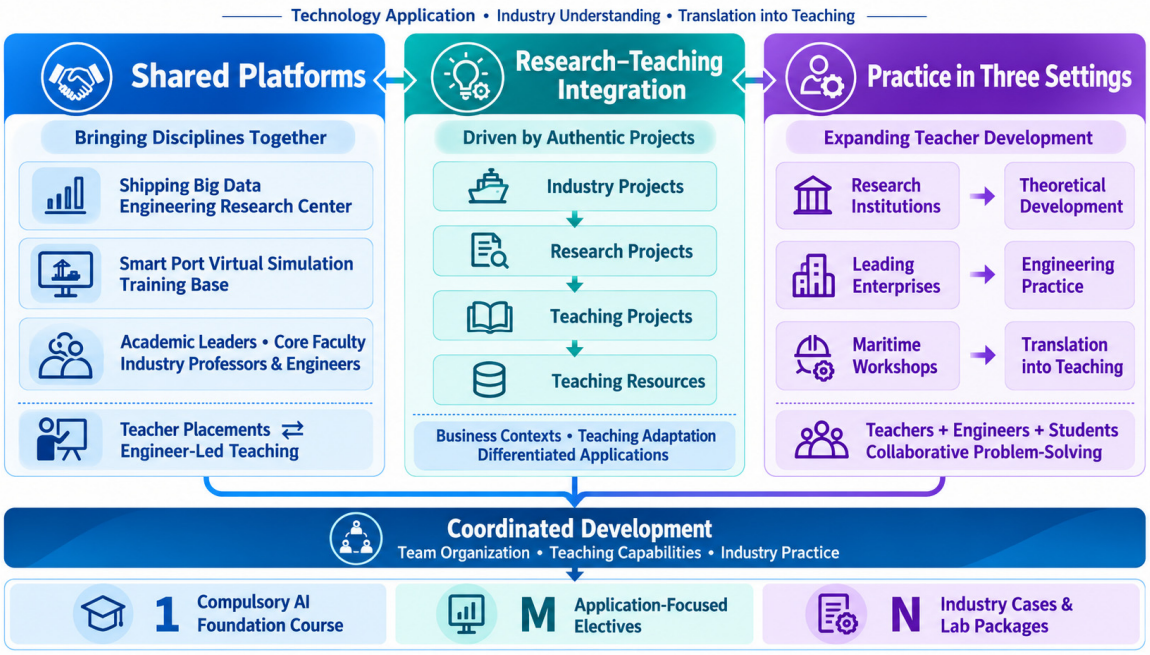


Figure 1. Development pathways for an AI general education teaching team

2.1. Shared Platforms for Interdisciplinary Collaboration between the Institute and Industry

The Shipping Big Data Engineering Research Center and the Smart Port Virtual Simulation Training Base bring together faculty specializing in AI, electronic information, navigation technology, and marine engineering. The team combines coordination by academic leaders, support from early- and mid-career core faculty, and participation by industry professors and enterprise engineers. Academic leaders oversee the general education curriculum, development priorities, and quality assurance; core faculty undertake technical research, module development, and classroom teaching; and industry experts contribute business contexts, engineering standards, and workplace guidance. Shared tasks turn individual expertise into collective team capability.

The "1+M+N" framework combines joint curriculum development with responsibilities assigned by module. Core faculty jointly develop the standards, foundational resources, and assessment requirements for Introduction to Artificial Intelligence, ensuring consistency across student majors. Elective modules in AI-assisted office work, data analysis, and AI-assisted programming are developed according to faculty expertise. Information technology faculty, disciplinary faculty, and enterprise engineers jointly develop cases involving vessel inspection, shipping documentation, and port scheduling, balancing technical feasibility, business relevance, and suitability for teaching.

Platform operations emphasize task-based collaboration and resource sharing. Industry needs are incorporated through research proposals and challenge-based project calls, enabling team members to work together on requirements analysis, technical research, and case development. A reciprocal arrangement places teachers in enterprises and brings engineers into classrooms: teachers learn business processes through workplace practice, while engineers contribute to classroom and practical instruction. Shared datasets, algorithm models, and experimental environments support clearly defined responsibilities, collective resource accumulation, and collaborative problem-solving.

2.2. Research–Teaching Integration for Resource Renewal through Industrial Digital and Intelligent Transformation Projects

Research and technical services connect industrial development, teacher growth, and curriculum renewal by responding to the shipping sector's needs for intelligent upgrading and digital transformation. Through the Shipping Big Data Engineering Research Center, teachers participate in projects on intelligent vessel management, vessel water pollution management and monitoring in the Yangtze River basin, and large-scale Automatic Identification System (AIS) data processing. Their research addresses vessel detection, multisource data fusion, and navigational risk assessment. Working on industry problems helps teachers understand how AI enters business processes, the conditions required for its use, and its limitations. Typical tasks from industrial upgrading projects are then incorporated into general education, keeping teaching aligned with technological developments and changing workplace requirements.

A threefold conversion mechanism turns research projects into teaching cases, research outputs into teaching resources, and research standards into teaching standards. First, business contexts are extracted from projects, and data are selected, technical implementations simplified, and workflows broken down to create differentiated tasks suited to students' prior knowledge and progressive capability development. For example, vessel detection tasks from intelligent vessel management projects become image-recognition activities with output verification; AIS processing tasks become experiments in data cleaning, visualization, and anomaly identification; and vessel water pollution monitoring tasks become cases integrating imagery and sensor data. These activities support compulsory general education, application-focused electives, and workshop practice respectively. Second, datasets, algorithm models, technical documents, and system demonstrations become task sheets, laboratory

packages, and digital textbook resources, building reusable and renewable maritime teaching content. Third, drawing on Capability Maturity Model Integration (CMMI) and software testing standards, practical teaching incorporates requirements analysis, process documentation, testing, verification, and quality control, with particular attention to data provenance, verification of generated outputs, and human review in AI applications.

2.3. Teacher Capability Development through Professional Practice in Three Settings

Building on the school's initiative for professional practice in research institutions, leading enterprises, and maritime workshops, the team addresses the wide disciplinary coverage, varied student backgrounds, and rapid technological change characteristic of AI general education. Teacher development focuses on explaining technology, designing learning tasks, and guiding practical learning.

Practice in research institutions strengthens teachers' ability to explain technology. Advanced professional development, joint research, and master's supervisor workstations update their knowledge of generative AI and intelligent agents. Teachers learn to turn technical principles into accessible concepts and examples and to explain AI capabilities, limitations, and conditions of use accurately. Practice in leading enterprises strengthens task design. Temporary appointments and workplace placements expose teachers to AI applications in office collaboration, data analysis, and business services. They develop skills in task decomposition, tool selection, workflow organization, and output verification, enabling them to design activities relevant to students' learning and future work. Practice in maritime workshops strengthens differentiated guidance. Trial lessons and collaborative lesson refinement use tasks ranging from basic operations to workflow optimization and disciplinary extensions. Cross-faculty guidance, industry mentor feedback, and student responses inform improvements to learning scaffolds and assessment criteria, strengthening teachers' ability to meet diverse learning needs.

3. Collaborative Teaching through Disciplinary Collaboration Mentoring and Human–AI Collaboration

To meet the demands of interdisciplinary, application-oriented, and continually updated teaching, the team connects foundational learning with disciplinary applications through faculty collaboration, supports knowledge sharing and classroom improvement through mentoring, and uses human–AI collaboration to assist instructional design, learning support, and analysis of learning needs. Together, these mechanisms translate technical expertise and industry experience into classroom teaching capability, practical guidance, and continuous improvement.

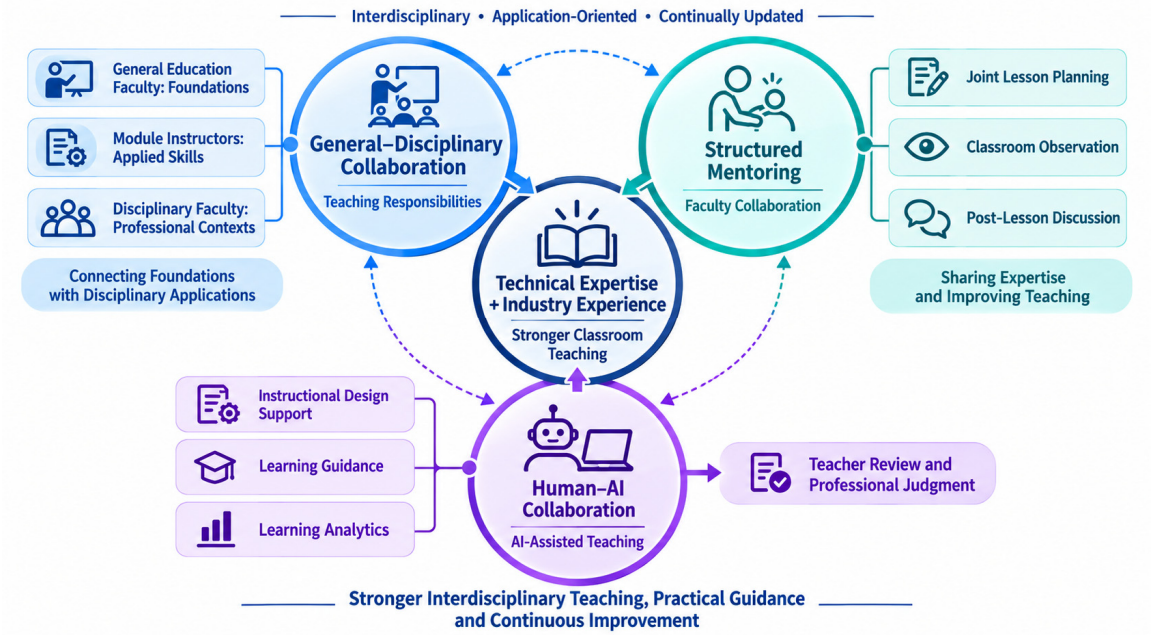


Figure 2. Collaborative teaching mechanisms for an AI general education teaching team

3.1. Collaboration between General Education and Disciplinary Faculty to Connect Foundations with Applications

Within the "1+M+N" curriculum framework, general education instructors, application-module instructors, and disciplinary faculty share teaching responsibilities and conduct joint pedagogical inquiry. General education instructors focus on basic AI concepts, general-purpose tools, and ethical judgment. Application-module instructors develop specialized skills in AI-assisted office work, data analysis, and AI-assisted programming. Disciplinary faculty contribute maritime workplace contexts and professional standards. The three groups jointly formulate learning objectives, task requirements, and assessment criteria to connect general AI capabilities with disciplinary application needs.

The team jointly adjusts case contexts, operational guidance, and expected outcomes to accommodate students' different disciplinary backgrounds and learning needs. AI general education instructors calibrate the difficulty of tool use and technical implementation, while disciplinary faculty review business logic and the applicability of conclusions. Joint reviews of student work feed identified problems back

into curriculum design and teaching guidance, supporting the transfer of foundational capabilities to disciplinary contexts.

3.2. Structured Mentoring for Knowledge Sharing and Classroom Improvement

A mentoring system pairs experienced faculty with early-career teachers and embeds guidance throughout teaching delivery. Experienced faculty draw on their teaching expertise and industry experience to help newer teachers establish the scope, depth, and practical difficulty of general education courses. Early-career teachers contribute their strengths in learning new technologies and using emerging tools to case development and resource renewal. The arrangement supports reciprocal learning through the exchange of teaching experience and technical knowledge.

Joint lesson planning, classroom observation, and post-lesson discussions are organized around AI general education courses such as Introduction to Artificial Intelligence and AI-Assisted Office Work. Before lessons, teachers jointly refine task designs, procedures, and assessment criteria. During lessons, they examine the difficulties and practical performance of students from different disciplines. After lessons, they adjust teaching methods using student work and recurring errors. Focused lesson-refinement sessions address shared issues such as verification of generated outputs and interdisciplinary case design. The resulting teaching examples, task templates, and guidance resources support both early-career teacher development and collective improvement in classroom teaching.

3.3. Human–AI Collaboration for Instructional Design and Feedback on Learning

AI tools are incorporated into team lesson planning, classroom guidance, and post-lesson assessment, combining intelligent assistance, teacher review, and collective interpretation. Before lessons, AI assists with organizing industry materials, designing task contexts, and generating differentiated exercises, while teachers review content and difficulty. During lessons, tools provide operational prompts and basic answers, allowing teachers to focus on task analysis and critical evaluation of outputs. After lessons, class-level learning assessment reports for Introduction to Artificial Intelligence help identify common problems, which are checked against classroom observations and student work. The team then adjusts explanations, operational guidance, and practical activities, clarifies teachers' review responsibilities, and ensures appropriate use of learning data. This creates a collaborative improvement cycle of learning analysis, collective interpretation, instructional adjustment, and review of outcomes.

4. Conclusion

To develop teachers' capabilities in technology application, industry understanding, and translation of expertise into teaching, Jiangsu Maritime Institute has explored a team development approach built around its "1+M+N" curriculum framework. Shared platforms, research–teaching integration, and professional practice in three settings support team development, while collaboration between general education and disciplinary faculty, structured mentoring, and human–AI collaboration strengthen teaching delivery. The central contribution is to connect industrial digital and intelligent transformation needs with teacher development and classroom improvement, enabling authentic projects to generate teaching resources and individual expertise to become collective educational capability. This approach offers a practical reference for industry-oriented higher vocational colleges developing AI general education teaching teams.

As AI evolves and the shipping industry transforms, team development should further strengthen mechanisms for technical professional development, resource renewal, and teaching assessment. Collaboration across disciplines, institutions, and industry should be expanded, with continuing evaluation of curriculum implementation and teacher development outcomes. Data governance, ethical judgment, and awareness of human–AI responsibilities should also be embedded throughout teacher development and teaching practice. These efforts can help faculty move beyond tool proficiency toward the effective organization of human–AI collaborative learning, providing sustained support for the development of technically skilled professionals with the combined expertise required for smart maritime operations.

Acknowledgments

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