

Research on Teaching Practice of Big Data Platform Deployment and Operation Course with Shipping Characteristics

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Abstract: In the era of big data, big data technology has been widely applied, and the operation and maintenance of big data platforms, as a crucial component supporting these applications, has gradually become an indispensable part of enterprise IT architecture. The demand for talents with big data platform operation and maintenance talents that meet professional requirements has become an urgent problem to be solved. In order to satisfy the enterprise demand for big data platform operation and maintenance talents and enhance students' employment competitiveness, this paper discusses the teaching content and teaching organization practice of the "Big Data Platform Deployment and Operation" course. The course adopts a project-based teaching mode, integrating the project case of "Ship Shore Power Data Analysis System" into the theoretical knowledge and technical explanations at various stages of the course. At the same time, it deeply excavates the ideological and political elements of maritime power and green environmental protection contained in the project, constructs a teaching mode with obvious shipping characteristics, and improves the quality of talent cultivation.

Keywords: Talent cultivation; Vocational education; Big data technology; Big data platform deployment and operation; Shipping characteristics.

1. Introduction

In the era of big data, the value of data has become increasingly prominent, serving as a crucial force driving innovation and development across various industries [1-2]. Big data technology plays a pivotal role in the shipping industry, leveraging its real-time monitoring and prediction capabilities to optimize ship operations and enhance cargo tracking and management efficiency, thereby injecting strong impetus into the sustained development of the industry [3]. Firstly, through real-time monitoring and prediction, it assists shipping companies in timely identifying and addressing potential risks. Secondly, refined ship operations and cargo management through big data analysis have improved efficiency and service levels. Lastly, it provides business intelligence and decision support, helping shipping companies formulate smart strategies to meet market challenges and propel the entire industry forward [4]. These aspects collectively drive the continuous improvement of intelligence and competitiveness in the shipping industry. Big data processing platforms and their technologies have become one of the core skills that big data professionals must possess.

The big data platform deployment and operation course not only encompass a series of core skills such as the construction, configuration, deployment, monitoring, and optimization of big data platforms, but also serve as an effective way to enhance students' practical operation abilities and problem-solving skills [5]. Through in-depth learning and practice, students can better adapt to the needs of the big data industry, thereby enhancing their employment competitiveness and career development potential. Therefore, the big data platform deployment and operation occupy a pivotal position in the cultivation of higher vocational big data talents, exerting a profound impact on the comprehensive improvement of students' overall qualities and professional

abilities. The "Big Data Platform Deployment and Operation" course integrates the digitization of big data platforms and shipping data, aiming to bridge the gap in students' application abilities in the big data industry. Through projects based on shipping data on big data platforms, the course reconstructs teaching content, implements the Outcome-Based Education (OBE) teaching philosophy, and adopts a "three stages, four steps" teaching mode. With shipping data as the core, it simulates the design of shipping business platforms, and the project-based teaching modules cover development, process design, and other aspects. Hierarchical teaching is implemented to cultivate students' ability to comprehensively consider platform influencing factors, ensuring data storage security, analysis efficiency, and governance norms. At the same time, it emphasizes the cultivation of teamwork spirit and normative awareness, laying a solid foundation for students' lifelong learning and growth. The course consistently adheres to the mission of cultivating virtue and talent, focuses on consolidating theoretical foundations, highlights job skills, values practical operations, and strives to cultivate high-quality skilled talents with patriotic feelings and the spirit of craftsmanship.

2. Curriculum Framework with Shipping Characteristics

2.1. Establishing composite teaching objectives for maritime + big data operations and maintenance

Based on the characteristics of big data technology and the needs of smart shipping, teaching objectives as shown in Figure 1, are formulated in three dimensions according to the big data technology professional talent training program and an analysis of students' learning situations, with a clear focus on key points and difficulties.

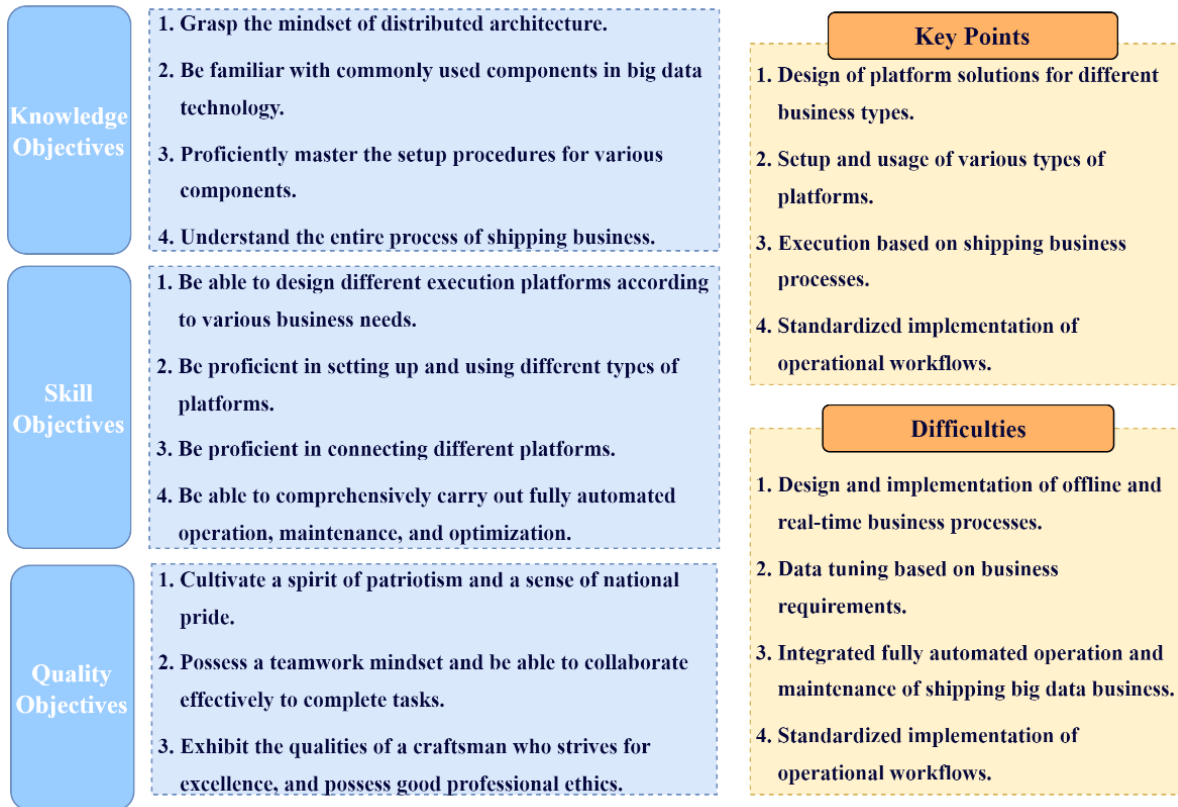


Fig.1 The teaching objectives with shipping characteristics

2.2. Integrating shipping big data application scenarios into teaching content

The teaching content relies on the teaching standards, talent training programs, and characteristics of the job clusters for big data technology majors, adapting to the demands of smart shipping. It fully considers the requirements of the "1+X" Big Data Governance Certificate and incorporates the knowledge and skills covered in the "Big Data Application Development" competition item of vocational college skills competitions. As shown in Figure 2, the course is driven by typical work tasks in the maritime industry and is divided into three interconnected modules with eight projects. The difficulty of each project increases progressively, and the content intersects, reflecting a progressive relationship from knowledge and skill accumulation to comprehensive application.

Through the reconstruction of the course knowledge system, referring to the requirements of the "1+X" certificate and skills competitions, students are guided to design, deploy, and finally apply platforms based on the needs of the maritime industry. The deployment module mainly involves setting up data collection components, data processing components, data storage components, and full-link data debugging to gradually establish a big data monitoring system for ship navigation.

2.3. Adopting OBE + project-based teaching strategies

Centered on students and guided by course objectives, the OBE (Outcome-Based Education) teaching philosophy is implemented, emphasizing the output of learning outcomes[6]. Real enterprise projects are introduced into the

classroom, adopting a project-driven teaching strategy with "three links and four steps." The course breaks down specific projects into various tasks and integrates them into the "before class, during class, and after class" links for specific teaching. Before class, resources are pushed on the learning platform for students to study autonomously. During class, a four-step teaching mode of requirements analysis, solution design, task implementation, and platform optimization is adopted. In the requirements analysis stage, tasks are introduced to stimulate students' thinking. In the solution design stage, the key and difficult points of the task are clarified, and solutions are formulated. In the task implementation stage, tasks are completed according to the formulated plan, and outcomes are produced. In the platform optimization, students' practical outcomes are summarized and evaluated. After class, extended tasks are assigned to inspire students to further explore.

During the teaching process, online and offline continuous learning is achieved with the help of learning platforms and online simulation platforms, cultivating students' autonomous learning abilities. A dual-mentor system involving both school and enterprise is implemented to lay a solid knowledge foundation and grasp practical skills. Both on-campus and off-campus training bases are developed to expose students to real jobs and cultivate practical work abilities. Students are encouraged to collaborate in groups, actively participate in flipped classrooms, and cultivate critical thinking skills. Multiple measures are taken to help students grasp key points and overcome difficulties. Combining course content, ideological and political elements are cleverly integrated, enabling simultaneous improvement in professional ethics and skills.

2.4. Establishing a diversified evaluation system

A diversified evaluation system is established to comprehensively evaluate students' knowledge, skills, practical abilities, and professional ethics. Evaluation methods include exams, project assessments, and competitions. Enterprise evaluations are introduced to assess students' actual work abilities. For mainstream students, process evaluation and summative evaluation are combined, with each accounting for 50% of the grade. The focus is mainly on students' learning outcomes and attitudes, evaluated through various methods such as classroom Q&A, practical training (assignments), and final exams. Process

evaluation is conducted based on the teaching tasks of the course, including attendance (5%), classroom Q&A (10%), online learning resources (10%), practical training assignments (20%), and task quizzes (5%), mainly assessing knowledge understanding and skill mastery. Summative evaluation mainly assesses the mastery of comprehensive practical skills in the course. Process evaluation, combined with ideological and political elements, implements a feedback mechanism for learning effects. Vocational ability reports and comprehensive ability evaluations are released to assess and evaluate the ideological and political education objectives, enabling continuous tracking and improvement of the entire learning process and learners' comprehensive qualities.

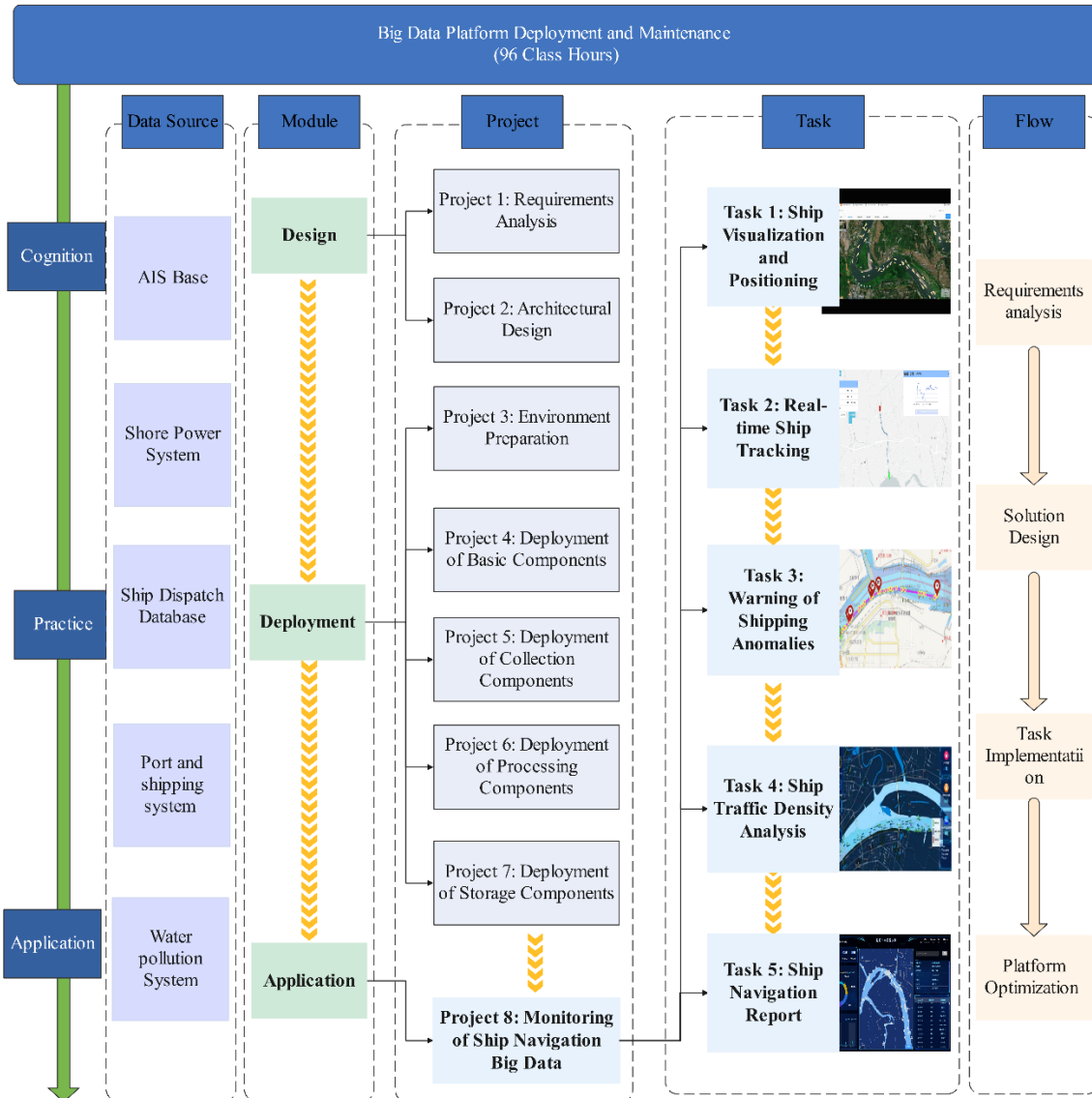


Fig.2 The teaching contents integrated shipping big data application scenarios

3. Teaching Practice Integrating Shipping Characteristics

3.1. The "Three Links and Four Steps" teaching mode

To adapt to the requirements of blended online and offline teaching, the teaching process is divided into three links: pre-class online self-study, in-class task implementation, and after-class extension and enhancement. During class, a four

steps teaching mode of requirement analysis, solution design task implementation and platform optimization is adopted. Taking the second task, "Real-time Tracking of Ship Navigation", as an example, this unit requires designing components of a big data platform and running a project for real-time tracking of ship trajectories. Functions include familiarizing with the business, contemplating solutions, importing projects, and evaluating tasks. The teaching implementation process is shown in Figure 3.

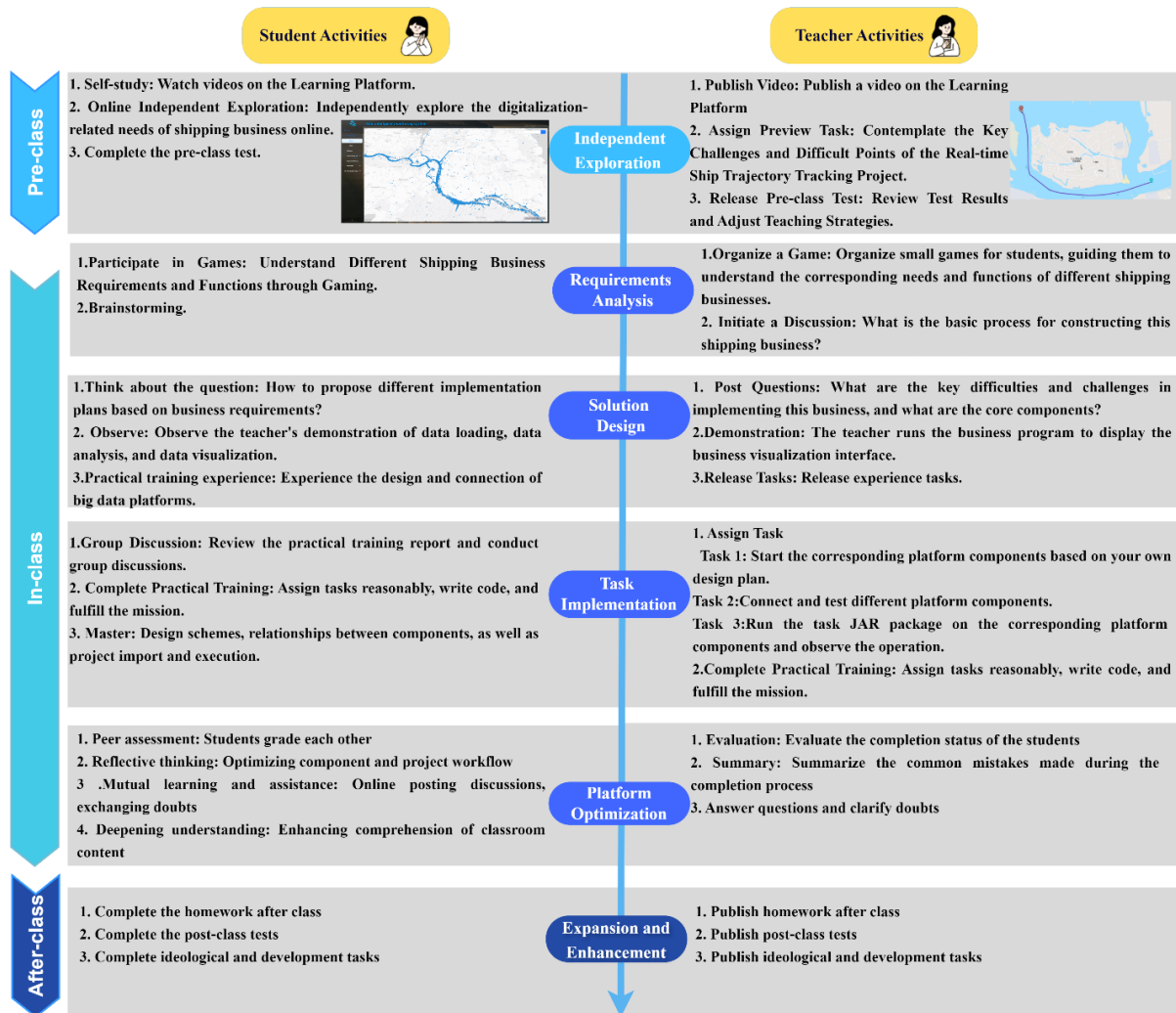


Fig.3 The "Three Links and Four Steps" teaching mode

3.2. Granular and diversified resource application

The course closely aligns with the background of shipping big data applications, focuses on cultivating technical application abilities for zero-basis learners, uses teaching projects as carriers, and designs the knowledge and skill system and selects teaching content according to the "20/80 Principle". Following the idea of "step-by-step progression and spiral ascent", it is divided into three modules: platform design, platform deployment, and platform application, with each chapter including several job skill training points.

Based on the progressive learning teaching strategy, it aims to gradually establish students' knowledge system, enhance their skill level and thinking ability [7]. The teaching content is divided into multiple levels, each building on the previous one, unfolding from simple to complex and from shallow to deep. Through tasks and activities with increasing difficulty and depth, students continuously challenge their cognitive and problem-solving abilities. Customized learning resources can be provided based on students' different ability levels. The teaching content spans various levels, emphasizing the integration of knowledge and the cultivation of application abilities. Through comprehensive learning, students can not only grasp knowledge points but also apply them to practical problems, cultivating comprehensive analysis and problem-

solving abilities.

3.3. "Point, Line, and Plane" ideological and political education in courses

Ideological and political education in curriculum plays a vital role in higher vocational education, as it helps cultivate students' comprehensive qualities by integrating ideological and political education into specialized courses, thereby enhancing their professional ethics and social responsibility [8]. Each unit of the course corresponds to an ideological and political education "point" (theme), which is reflected in the unit title, runs through the project, and is internalized in programming practice. With the main "line" of cultivating big data technology application craftsmen with social responsibility, national sentiment, and innovative spirit, it organically integrates ideological and political elements such as socialist core values and the spirit of the 20th National Congress, systematically depicting the "plane" of ideological and political content supply. Combined with the characteristics of the school, it incorporates the spirit of navigation and the strategy of marine power into the course content, guiding students to accurately grasp the characteristics of shipping demand during social practice, apply interdisciplinary knowledge systems for innovative design, and possess comprehensive coordination abilities after thorough research, cultivating high-skilled talents in

shipping big data who are urgently needed by the country and have both moral integrity and ability.

3.4. Student learning outcomes

Through the reform of the teaching mode, students have further consolidated their knowledge reserves in the analysis, planning, and design of shipping big data platform solutions. Through comprehensive evaluation, compared with the previous generation of students, their comprehensive abilities have improved from an average score of 80 to 91. Teaching tasks have been completed, teaching objectives have been achieved, and key and difficult teaching points have been broken through.

Focusing on teaching projects, a "teacher-student teaching community" has been established, implementing group teaching. The adoption of the "three links and four steps" teaching method won the second prize of provincial teaching achievements in 2022 and was approved as a provincial educational reform project and a provincial educational research project.

The teaching aligns with job requirements, and students have steadily improved their operational skills in big data platform construction and equipment installation and deployment. Students have repeatedly achieved excellent results, such as first prizes in national vocational college skills competitions, and the pass rate for the "1+X" big data governance certificate exam has been 100% for three consecutive years. Combined with specific project content, students have a clear understanding of the industry status of smart transformation of big data and shipping. By extracting typical application scenarios, students have clarified the responsibilities of positions such as smart shipping, big data platform configuration, installation, and operation and maintenance. Combined with teaching evaluation indicators, students have enhanced their team collaboration abilities within and between groups.

4. Conclusion

Based on the characteristics of big data technology and industry features, the course creates a realistic project scenario of "smart shipping construction", enabling students to comprehensively construct and deploy shipping big data collection, processing, storage, and automated operation and maintenance, creating a realistic business scenario and enhancing students' full-link design abilities.

Based on the background of intelligent shipping big data, the intelligent improvement and development of teaching resources need to be continuously promoted. During the teaching process, the course has revealed issues of insufficient integration. Most platform designs rely more on experience sharing and lack optimal solution calculations

based on actual needs. In the future, it is necessary to plan and integrate digital teaching resources, establish and improve an intelligent resource platform, and simultaneously build VR immersive resources through school-enterprise collaboration.

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