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Research on the Construction Strategy of Big Data Technology Major Group from the Perspective of Integration of Science and Education

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Abstract

The report of the 20th National Congress of the Communist Party of China creatively proposed the new "three integrations" requirement: integrating vocational and general education, integrating industry and education, and integrating science and education. Among them, integrating vocational and general education is the key, integrating industry and education is the focus, and integrating science and education is the new direction. The big data technology major group of Jiangsu Maritime Institute, with the fundamental goal of cultivating virtue and fostering talents, focuses on implementing the integration of science and education based on the "1234" model. This model revolves around one integration, achieves two connections, facilitates three transformations, and promotes four aspects, aiming to optimize the talent cultivation model, curriculum system construction, and teaching mode innovation through science, and to align education with technological innovation, thereby strengthening the research foundation and research team.

Keywords

Vocational education, Integrating Science and Education, Innovative Research Platform, Big Data Technology Major Group, Maritime Power.

1. Introduction

The report of the 20th National Congress of the Communist Party of China (CPC) emphasized that education, technology, and talent are the cornerstones and strategic supports for national development. It explicitly proposes to thoroughly implement the strategies of rejuvenating the country through science and education, strengthening the nation through talent, and driving development through innovation. Regarding the development of vocational education, the report particularly highlights the importance of "three integrations": the integration of vocational education with general education, the deep integration of industry with education, and, notably for the first time, the organic integration of science with education – "the integration of science and education." This novel concept provides profound insights and important guidance for vocational colleges on how to systematically and collaboratively promote reform, innovation, and development in the new era [1].

The pairing of science and education can be traced back to the 19th century when the German educator Wilhelm von Humboldt proposed the idea of integrating research with teaching [2]. From von Humboldt's founding of the University of Berlin to the localized practices and developments by American educators such as Gilman and Boyer, the integration of science and education has been proven to play a crucial role in cultivating innovative talents. Since the 21st century, developed countries worldwide have successively introduced a series of programmatic documents for educational reform aimed at scientific and technological innovation and talent cultivation, emphasizing the integration of science and education

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development with talent cultivation [3-4]. Although the term "integration of science and education" originates from the 20th CPC National Congress, China's higher education system has been continuously promoting the integration of science and education since the 2000s. This integration has become an inherent requirement for implementing China's innovation-driven development strategy. In 2011, the Ministry of Education and the Ministry of Finance jointly formulated and implemented the "Plan for Enhancing Innovation Capacity in Higher Education Institutions" (also known as the "2011 Plan"), with the core mission of enhancing innovation capacity through the integration of talent, disciplines, and research [5]. This plan facilitated the construction of four types of collaborative innovation centers focused on scientific frontiers, deepening the reform of mechanisms and systems in higher education institutions and transforming innovation methods. In March 2016, the "13th Five-Year Plan" explicitly proposed promoting the integration of science and education, supporting a group of high-level universities and research institutes to form interdisciplinary and comprehensive educational and research teams. A series of national plans and strategic deployments, including the "14th Five-Year Plan" and the Long-Range Objectives Through the Year 2035 issued in March 2021, the "National Talent Development Plan for the 14th Five-Year Plan Period" deliberated in April 2022, and the "Opinions on Strengthening Organized Scientific Research in Universities to Promote High-Level Self-Reliance and Self-Improvement" issued by the Ministry of Education in August 2022, have presented new historical missions, contemporary requirements, and development directions for the innovative development of the integration of science and education in China.

Since the introduction of the concept of integrating science and education, the government, vocational colleges, and scholars have actively responded and taken a series of measures. In December 2022, the General Office of the CPC Central Committee and the General Office of the State Council issued the "Opinions on Deepening the Reform of Modern Vocational Education System Construction," which mentions taking the integration of science and education as a new direction to orderly and effectively promote the reform of modern vocational education system construction. In July 2023, the General Office of the Ministry of Education issued the "Notice on Accelerating the Key Tasks of Modern Vocational Education System Construction Reform," which assigns key tasks such as establishing municipal industry-education integration consortia, industry-education integration communities, and open regional industry-education integration practice centers. The construction of these tasks will have a positive impact on advancing industry-education integration and the integration of science and education, thereby fostering a high-quality vocational education development ecosystem.

To better empower high-quality economic and social development, numerous vocational colleges have seized the opportunities of the times, deeply promoted industry-education integration and the integration of science and education, constructed a new paradigm for high-quality vocational education development, and cultivated more high-quality technical and skilled talents. Rizhao Polytechnic has transformed the separated teaching and research into an integrated chain, establishing technical and skill innovation service platforms and pilot bases. They explore and promote joint technological research, collaborative talent cultivation, facilitate industrial clustering and advantage formation, address practical difficulties faced by enterprises, and serve the growth and success of students [6]. Guangdong Polytechnic of Science and Trade adheres to the integration of science and education, promoting construction, learning, teaching, and production through science, achieving the organic integration of technological research and development innovation with education and teaching, as well as practical training [7]. Changzhou Vocational Institute of Mechatronics Technology has established a "five-in-one" "Artificial Intelligence and Advanced Manufacturing Industrial Center" integrating production, learning, research, training, and innovation, which has

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promoted the effective linkage of the education chain, technology chain, industry chain, and value chain [8].

Using the CNKI database as the source and "integration of science and education" as the keyword for retrieval, a total of 489 literature entries were found. Among them, there were 8 entries in 2022, 200 entries in 2023, and 392 entries predicted for 2024. The rapid increase in the number of literature entries indicates that a considerable number of scholars have focused on this area of research. Figure 1 displays the themes of research on the integration of science and education, with vocational education, vocational colleges, industry-education integration, high-quality development, productivity, and new forms of productivity being important research aspects. It can be seen that vocational colleges are the main research objects in the integration of science and education. Industry-education integration and the integration of science and education are closely related, and research on the integration of science and education and new forms of productivity is also interrelated. Gao et al. have constructed a coupling development mechanism for the integration of science and education and industry-education integration in vocational colleges, driving vocational colleges to empower the formation of new forms of productivity. Xu et al., based on big data technology, have studied the current situation of the integration of science and education in China's vocational colleges and found that the degree of development of the integration of science and education varies across regions in China. There are insufficient capabilities in scientific research services for industry and teaching, and a lack of adequate institutional guarantees. Overall, the integration of science and education in vocational colleges is still in its initial stage.

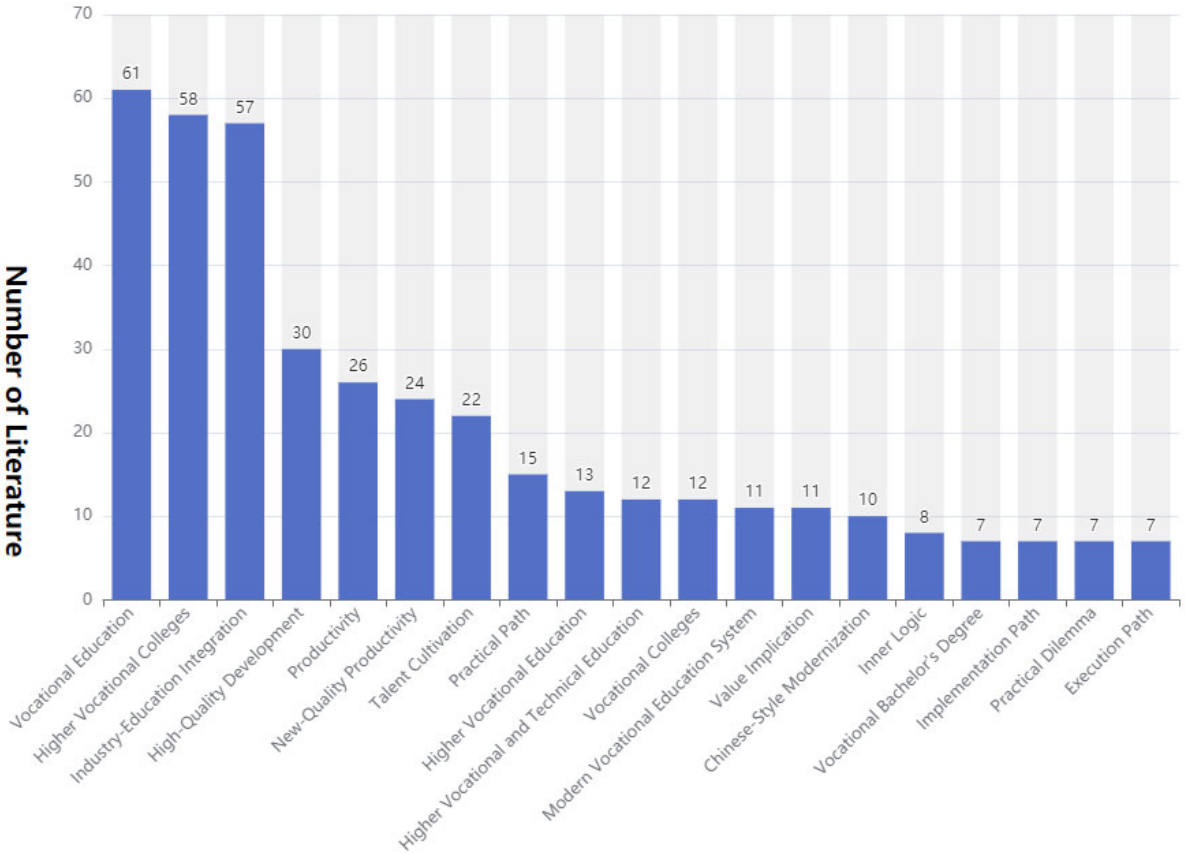

Figure 1. Research topics on the integration of science and education

Major group serve as a crucial platform for higher vocational education majors to actively align with industrial chains, job clusters, and knowledge chains. The big data technology major group leverages the "One Body, Two Wings" major layout of Jiangsu Maritime Institute. The major

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group focuses on cloud, big data, IoT, AI, and mobile technologies, and shifts its focus from the big data industry chain to the application of big data in shipping, achieving distinctive development. The major of electronics and information technology targets "IoT" and aligns with data acquisition, cultivating talents in data acquisition and sensor applications. The major of mobile communications focuses on "Mobile" and aligns with data transmission, nurturing talents in communication network deployment, management, and optimization. The major of cloud computing technology aims at "Cloud" and aligns with data storage, fostering talents in system setup, operation and maintenance, and cloud data migration. The major of big data technology addresses "Big" and aligns with data applications, training talents in data modeling, analysis, and visualization. The major of software technology runs through all these links, transitioning towards "AI" to cultivate talents in software and AI technology services. The integration of science and education marks a new direction for the high-quality development of major groups, highlighting key points for their advancement. Practices from other institutions offer valuable insights for the big data technology major group to better integrate science and education. The establishment of provincial engineering centers and high-level major group provides impetus for the big data technology major group to promote this integration. To ensure the high-quality development of the major group, the institute actively explores mechanisms for deep integration of industry, education, and science, jointly building an ecosystem for such integration. It also explores a new model of science and education integration based on the "1234" approach, enabling the major group to comprehensively promote deep integration of industry, education, and science, transitioning from industry following and cooperation to industry leadership.

2. Practice Path for the Integration of Science and Education Based on the "1234" Approach

Vocational education, positioned at the forefront of production, bears the dual responsibilities of cultivating more high-quality technical and skilled talents to tackle "bottleneck" issues, and serving as a "pilot plant" for the transformation of scientific and technological achievements by facilitating precise connections between the innovation chain and the industrial chain, thereby contributing to the national innovation-driven development strategy [11]. To better empower high-quality economic and social development, the big data technology major group at Jiangsu Maritime Vocational and Technical College seizes the opportunities of the times, deeply promotes the integration of industry and education as well as the fusion of science and education, and constructs a new paradigm for high-quality vocational education development to cultivate more high-quality technical and skilled talents. The major group, based on its unique features, establishes a new model for major group construction that integrates science and education based on the "1234" model, as illustrated in Figure 2, achieving the integration of dual construction tasks for provincial engineering research centers and provincial high-level major groups, and practicing a new method of cross-boundary integration that integrates "industry, education, and science".

Here, "1" refers to platform integration, namely the integration of research platforms and teaching platforms. "2" signifies breaking down barriers between the research process and the teaching process, as well as between research achievements and academic credits. "3" represents achieving three transformations: the transformation of research projects into teaching cases, the transformation of research achievements into teaching resources, and the transformation of research achievements into teaching norms. "4" indicates that through the integration of science and education, four promotions are realized: promoting more distinctive development of the major group, more precise talent cultivation, more efficient teacher development, and more significant social services.

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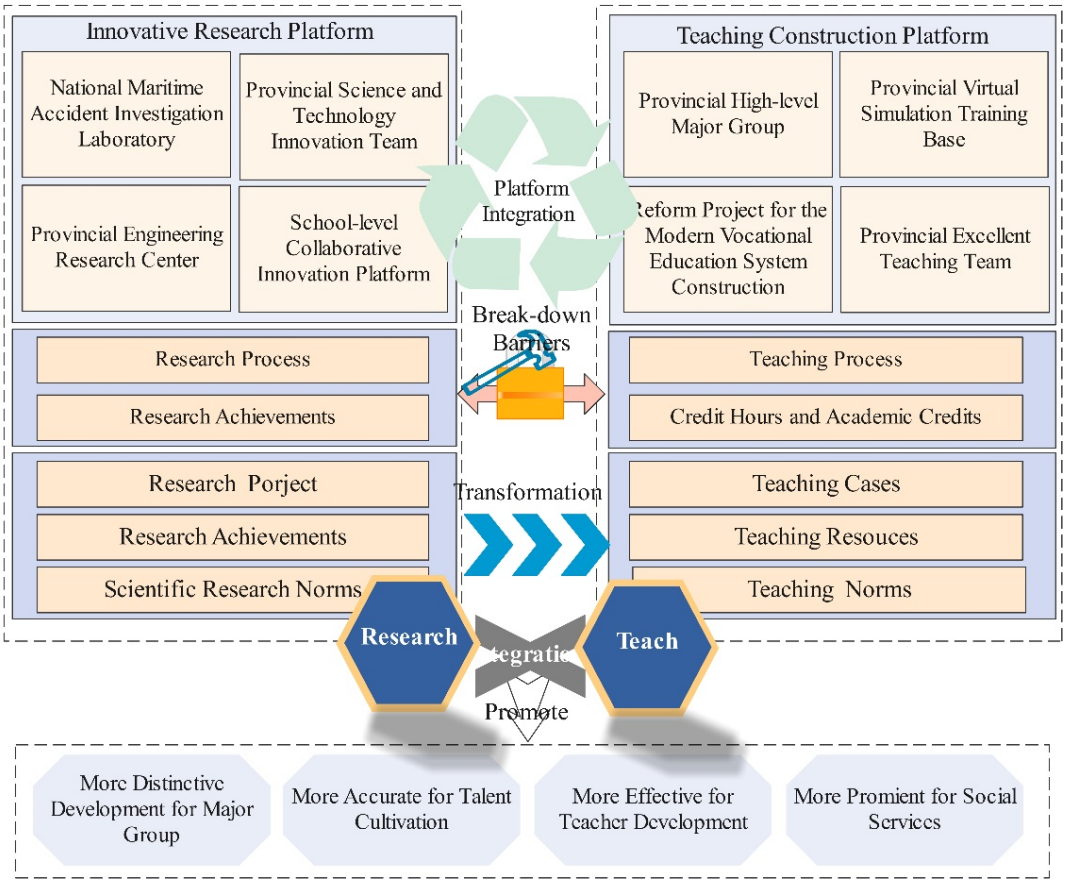

Figure 2. The reform of the educational model based on the integration of science and education

2.1. The integration of research platforms and teaching platforms

"One Integration" refers to the merging of research and teaching platforms, creating an innovative platform that integrates science and education, providing a high-level stage for teachers to pursue their careers and entrepreneurial endeavors. Leveraging the Jiangsu Provincial Shipping Big Data Engineering Research Center and the High-Level big data technology major group in Jiangsu Province, the big data technology major group has become a new carrier for the "professional group + platform" integration of science and education. This integration achieves the dual-line construction and fused development of research platforms represented by provincial engineering centers and technological innovation teams, and teaching platforms represented by provincial high-level professional groups and teaching teams. It realizes the reform of the teaching system, the reconstruction of the curriculum system, the building of the faculty, and the initiation of new paradigms of scientific research within the professional group under the integration of science and education. It constructs an interactive, spirally ascending development model for the professional group, primarily driven by the industry, to meet the economic development needs of the region.

The innovative platform for the integration of science and education promotes reform through science, empowering the optimization and upgrading of professional groups with technology. Guided by the technical challenges faced by industry enterprises, the professional group systematically plans its development direction and enhances the platform's research and innovation level. The innovative platform enhances the level of science-education integration through science-driven fusion, with a focus on deepening the integration of industry and education to achieve systematic collaborative innovation between teaching and research, promoting comprehensive research and collaborative innovation among teachers. Through the "melting pot" effect, the innovative platform promotes construction by collaborating with small

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internet companies and port and shipping informatization enterprises to jointly build a science-education integration team. The professional group sends teachers to port and shipping informatization enterprises for exchanges, temporary assignments, and conducting enterprise research and training, continuously forging them in the enterprise "melting pot" to ensure they resonate with the enterprises. Through the integration of science and education, every teacher in the professional group has research projects and educational reform initiatives, enhancing their technological innovation and practical teaching abilities, thus achieving research empowerment.

2.2. Bridge the gap between research and teaching

Breaking down the barriers between the processes of scientific research and teaching, we aim to integrate scientific research, social services, and teaching into one cohesive entity. Leveraging research and innovation platforms, we establish workshops that undertake both vertical and horizontal projects, implementing a talent cultivation model reform characterized by "project-based learning, enterprise-style management, and studio-based education". This model involves commissions from enterprises, leadership by teachers, and participation by students, driven by real-world projects that are organically integrated with professional courses, enabling students to learn and improve while assisting teachers in research and service activities.

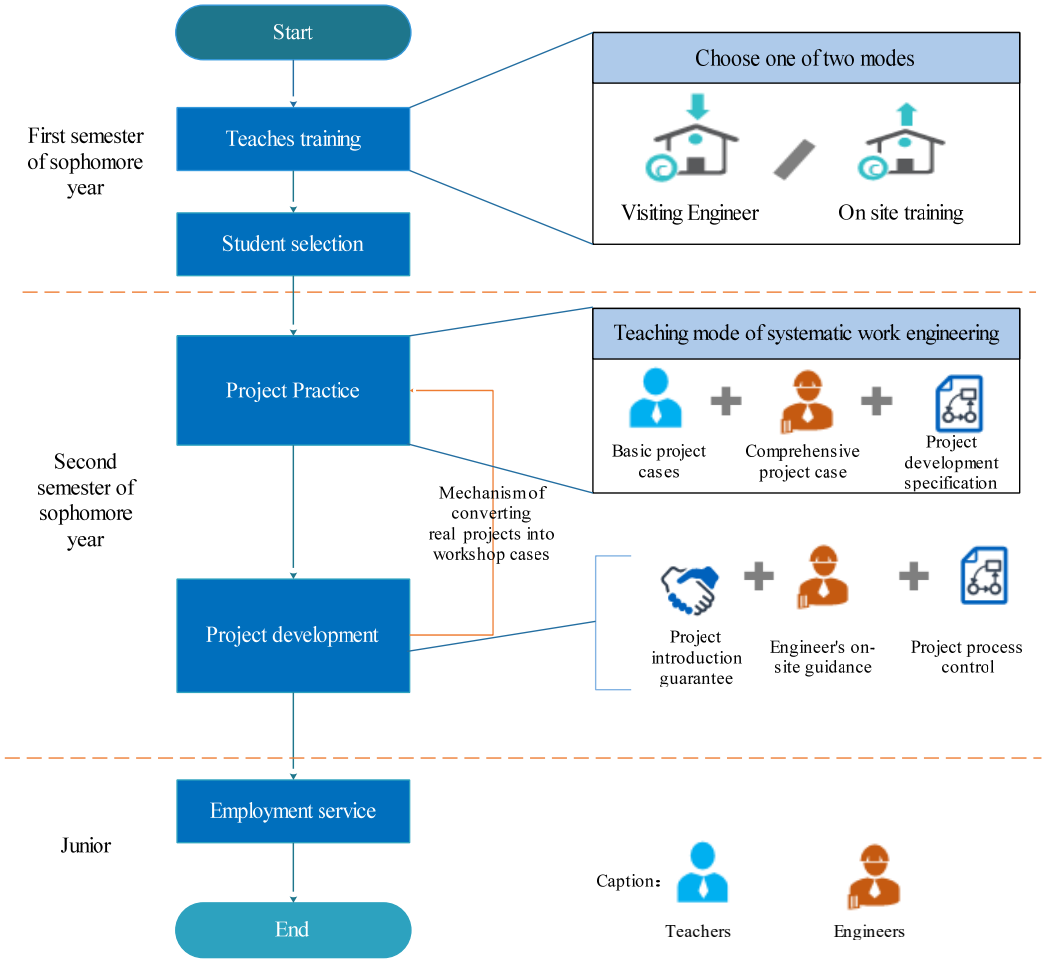

Figure 3. The workshop construction based on the integration of science and education

As depicted in Figure 3, the workshops use specific projects as carriers and work tasks as drivers to organically combine theory with practice, allowing students to acquire knowledge and skills in the process of completing tasks. At the same time, the workshops fully leverage the

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talents and disciplinary advantages of the institution, serving as project incubators within the college. They actively develop professional industries, closely integrating industry with teaching, and enabling the college to actively engage with and serve local economic and construction needs.

Breaking down the barriers between scientific research achievements and academic credits, we encourage students to participate in scientific research, social services, and innovation and entrepreneurship activities. We establish a credit bank and revise the credit accumulation and conversion system, allowing students to earn academic credits for their achievements in scientific research, business incubation, patent inventions, and other accomplishments, thereby encouraging personalized growth among students.

2.3. Transforming research content into teaching content

Transforming research projects into teaching cases. We introduce horizontal and vertical projects such as the Intelligent Ship Control System, Water Pollution Management and Monitoring System for Ships in the Yangtze River Basin, Research on Water Traffic Characteristics Based on AIS Data, and Research on the Reliability of Inland River AIS Data Based on Stream Computing. These are then transformed into project-based teaching cases for majors like big data technology, cloud computing technology, and software technology. Following the progressive requirement of "basic skills, specialized skills, and composite skills," we design a three-tiered, progressively advancing practical teaching system. To accommodate the large variability in students' practical abilities, different modules from research projects are developed into "basic, advanced, and extended" levels to meet the training needs of students at different levels.

As shown in Figure 4, the Intelligent Ship Control System is introduced into the big data analysis and development course for the big data technology major. The project is divided into basic, advanced, and extended content. For the basic content, students use Spark to clean, process, and analyze ship trajectory data. The advanced content involves statistically analyzing ship trajectories based on time and space to achieve higher-level data analysis. The extended content requires students to cluster ship trajectories and classify ship navigation behaviors.

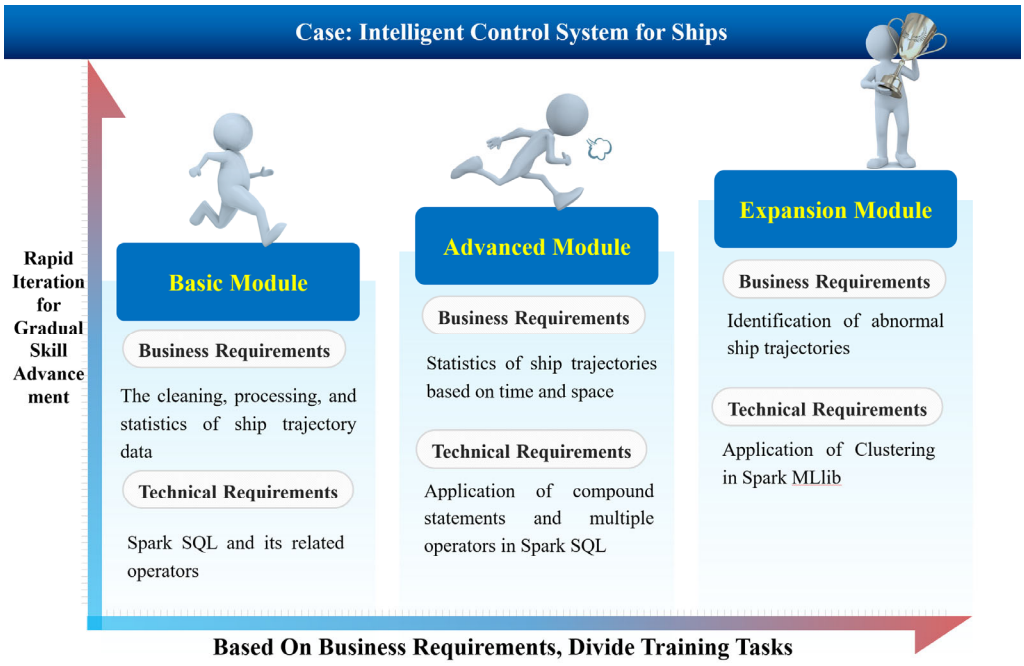

Figure 4. Transform research project into teaching cases under the integration of science and education

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Transforming research achievements into teaching resources. Combining scientific and technological research, think tank consulting, and technical services, we integrate research achievements into professional courses. A total of 21 research achievements, including the "Massive AIS Data Storage Platform," are transformed into professional teaching standards, specialized courses, and new forms of textbooks.

Transforming technical specifications into teaching specifications. We introduce the CMMI standard for software development and software testing standards as teaching specifications to guide students, help them understand the standardized and normalized processes in software development, and cultivate their project management abilities, team collaboration skills, and quality control awareness, laying a solid foundation for their future careers.

3. Practice-based Validation of Major Development Under the Integration of Science and Education

3.1. Promoting the development of major group with more distinctive features

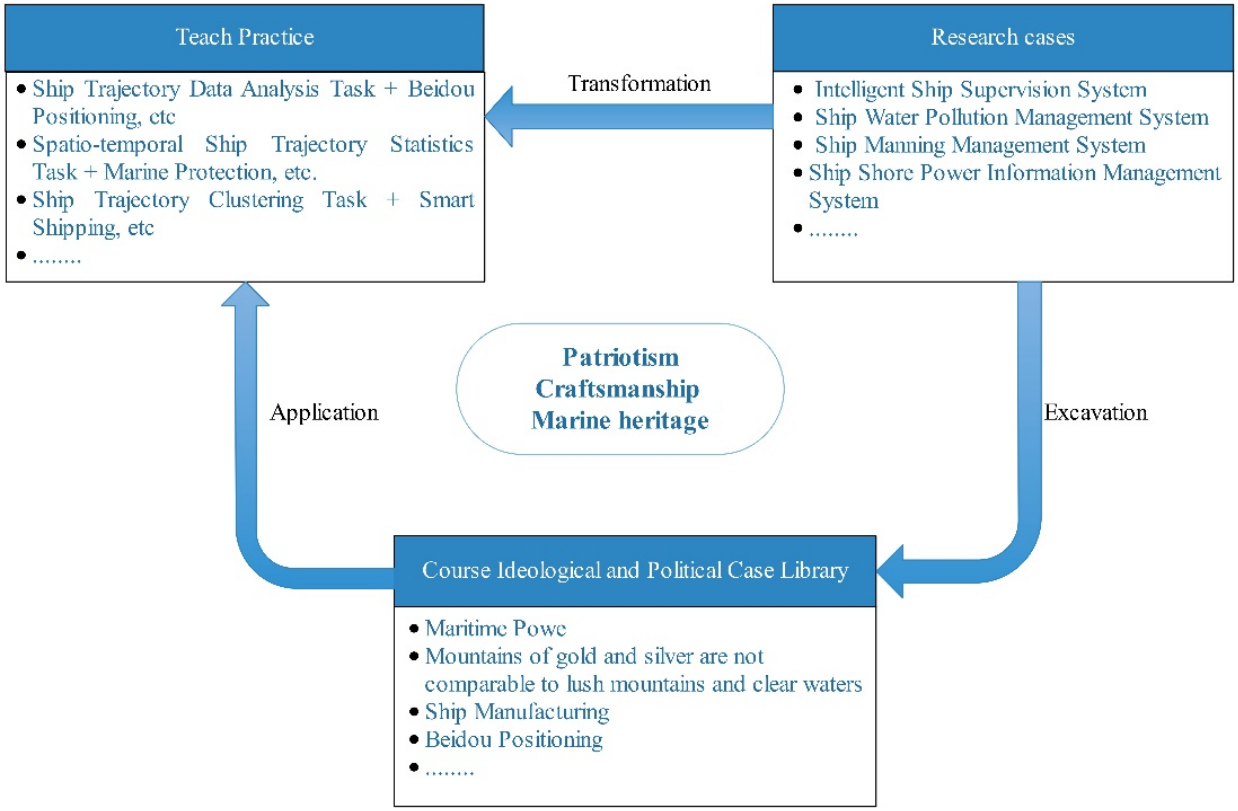

Figure 5. The exploration of ideological and political elements embedded in scientific research projects

The Jiangsu Provincial Shipping Big Data Engineering Center and the Jiangsu Maritime Big Data Application Innovation Research Team, along with other high-end scientific research platforms, closely align with the national strategy of building a strong shipping nation. They are dedicated to conducting in-depth research in areas such as fundamental big data applications, maritime management big data applications, and ship sensing big data applications. These fruitful research achievements have been effectively integrated into teaching practices, significantly enhancing the uniqueness and competitiveness of professional development. By incorporating teaching, student competitions, and student innovation and entrepreneurship projects into scientific research projects, more teachers and students are engaged in scientific research. This

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approach aligns "teaching" with technological innovation, strengthens the research foundation and research teams, and further promotes the distinctive development of major groups, forming a virtuous cycle. The research platforms revolve around the strategy of building a strong shipping nation, and the projects themselves are rich in ideological and political elements. As shown in Figure 5, relying on the research platforms, the major groups have constructed a curriculum ideological and political package centered on building a strong shipping nation with maritime characteristics and innovation, cultivating technical and skilled talents with patriotism, craftsmanship, and marine heritage.

In the past five years, the major group has been approved for over 30 provincial-level teaching and research projects, including the "13th Five-Year Plan" for Education Science in Jiangsu Province, the Jiangsu Science and Technology Think Tank Young Talent Plan, the Philosophy and Social Science Research Project of Jiangsu Colleges and Universities, the Jiangsu Higher Education Teaching Reform Research Topic, and the National Computer Basic Education Research Topic. The major group has also established 2 subprojects of the National Resource Library, won 1 first prize in the Teacher Teaching Ability Competition, been approved for 1 provincial-level virtual simulation training base, been approved for 12 courses on 2 platforms of the Jiangsu Continuing Education System, and received the first prize of the Jiangsu Higher Education Science Research Achievement Award.

3.2. Promoting more precise talent cultivation

Through deep integration of industry, education, and research, a curriculum system featuring "integration of positions, courses, competitions, certificates, and research" has been constructed. Relying on the Huawei ICT Academy and targeting small internet companies, IT outsourcing enterprises, and other units, we align with the big data industry chain and determine the professional foundation courses and core courses based on the basic skill requirements and workflow of various positions. By integrating skill competitions, 1+X certificates, Huawei HCIA certificates, and various research projects of teachers into the curriculum, we have established a dynamic curriculum system of "integration of positions, courses, competitions, certificates, and research," which features courses derived from positions, courses integrated with research, courses promoted through competitions, and courses validated by certificates. This system adapts to the constantly changing demand for talented individuals in positions resulting from technological transformations and forms a dynamic adjustment mechanism of "stimulus-response-regulation" with both internal and external cycles, enabling more precise talent cultivation within the major group and maximizing the benefits for students.

Taking the "Big Data Platform Deployment and Maintenance" course as an example, this course focuses on the competencies required for big data maintenance engineer positions and integrates teachers' research projects. By incorporating research achievements such as the shipping big data platform into the course and student skill competitions, we have achieved the goal of promoting teaching through research and improving the quality of talent cultivation.

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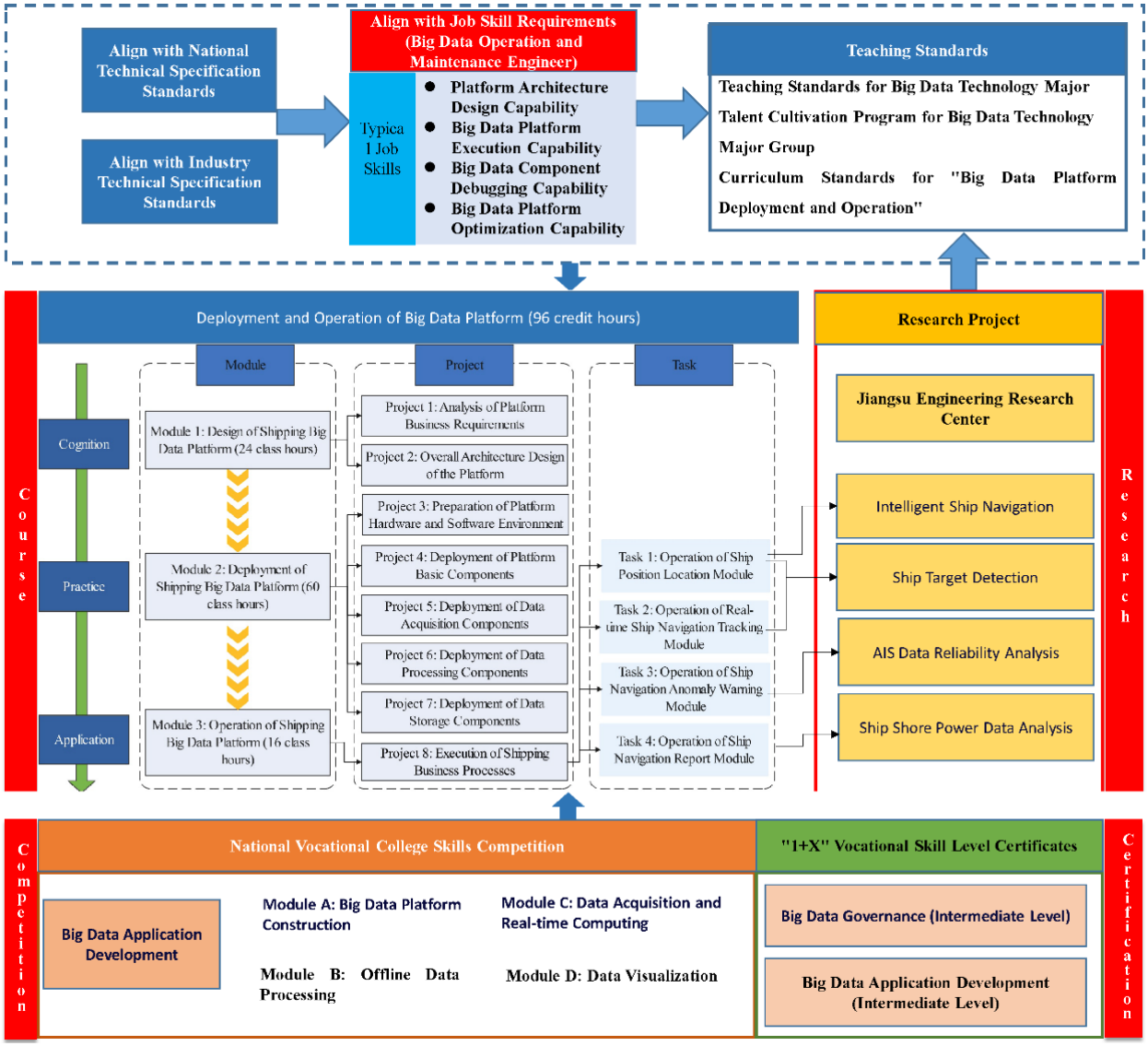

Figure 6. Practice of talent cultivation based on the integration of science, education, and industry

In the past five years, focusing on digital projects related to ports and shipping, the major group has achieved remarkable results in students' graduation designs, with annual provincial awards including 1 first prize, 1 second prize, 5 third prizes, and 3 team awards. Over 100% of the students in the major group have participated in various competitions above the school level. Students have won 2 national first prizes in the Big Data competition category of the Vocational College Skills Competition, as well as over 40 awards in provincial competitions, the Belt and Road competition, the Lanqiao Cup, the Software Cup, and other industry competitions. Additionally, students in the major group have obtained over 100 intellectual property rights, including patents and software copyrights.

3.3. Promoting more efficient teacher development

Leveraging the dual-line integrated development of the provincial engineering center and high-level major group, we have built a maritime-oriented big data major group teaching team through collaborative innovation. This team is capable of embedding shipping knowledge, applying shipping projects, and integrating the spirit of navigation. Several teachers in the team have held positions in shipping information enterprises for more than a year. While serving these enterprises, they not only initiated multiple research projects but also introduced

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enterprise projects, resources, and specifications into teaching, supporting high-quality talent cultivation with high-level scientific research and social services.

The major group has established 2 provincial-level excellent teaching teams and 1 provincial-level technological innovation team, cultivating 14 talent projects at or above the provincial level. Teachers have presided over 2 major projects funded by the Provincial Natural Science Foundation for Colleges and Universities, undertaken 1 national natural science foundation project and 3 provincial natural science foundation projects, and obtained over 100 intellectual property rights. They have completed 26 provincial and ministerial-level smart shipping projects for the Jiangsu Maritime Safety Administration, the Provincial Department of Science and Technology, and others, and received 11 awards for scientific and technological research achievements.

3.4. Promoting more prominent social services

Based on the "melting pot" role of Huawei ICT Academy, we have collaborated with small internet companies and port and shipping information enterprises to jointly establish an industry-education-research integration team. This team facilitates resource integration and sharing, promotes close alignment between scientific and educational research & enterprise innovation, as well as talent cultivation & industry demands, achieving a supply-demand coupling of "technology + education".

The major group has signed a strategic cooperation agreement with the Jiangsu Maritime Safety Administration, and the Maritime Safety Administration's Intelligent Sensing and Data Sub-center has been established within the academy. Five teachers from the major group have been selected as deputy directors of science and technology, and 11 teachers have practiced in enterprises for more than a year. Nine industry-university-research collaboration projects have been initiated, with an average annual research funding exceeding 3 million yuan in the past five years. The crew question bank system, jointly developed by the school and enterprises, has been applied in crew training. The AIS massive data storage and query platform, developed in collaboration with Nanjing Huihai Transportation Technology Co., Ltd., has been widely used in multiple systems such as "ShipE", which is used by over 300,000 crew members, the Joint Supervision and Information Service Platform for Water Pollutants from Ships on the Yangtze River Trunk (administered by the Changjiang Maritime Safety Administration), and the Administrative Inspection System of the Jiangsu Maritime Safety Administration. Additionally, we have participated in the establishment of the Jiangsu Smart Fisheries Technology Innovation Strategic Alliance.

4. Conclusion

The big data technology major group, rooted in the integration of science and education, has established a high-level dual-qualified teaching team with a concentration of masters through the "One Integration, Two Connections, Three Transformations, and Four Promotions" approach. It has cultivated a group of high-quality, compound technical and skilled talents in new-generation information technology serving smart shipping, produced a series of influential application achievements in the information industry and smart shipping industry, and built a leading skills innovation and technology research and development service platform within the province. The social recognition of the major group has significantly increased, and it plays a leading role in the field of "big data + shipping" within the province.

Looking forward, the major group will focus more closely on the strategy of building a powerful shipping nation and the development needs of the regional big data industry chain. With the fundamental goal of cultivating virtue and fostering talents, it will further deepen and innovate the "1234" major group development model that integrates science and education,

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comprehensively improve the educational quality and core competitiveness of the major group, and take on new responsibilities, demonstrate new achievements, and make new contributions in the new journey of accelerating the smart upgrade of the shipping industry and the development of the big data industry in Jiangsu.

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References

[1] Wang, Geng, and Z. Wang. "Vocational education: a poor second choice? A comparison of the labour market outcomes of academic and vocational graduates in China." Oxford review of education 49.3 (2023): 408-427.

[2] Youvan, Douglas C. "Wilhelm von Humboldt's Educational Reforms: Foundations of the Modern Research University." (2024): 1-36.

[3] Olszewski-Kubilius, Paula, and Eric Calvert. "Implications of the talent development framework for curriculum design." Modern curriculum for gifted and advanced academic students. Routledge, 2021: 37-53.

[4] Tobon, Sergio, and J. Luna-Nemecio. "Proposal for a new talent concept based on socioformation." Educational Philosophy and Theory 53.1 (2021): 21-33.

[5] Fan, Wei., C. Wang, A. Li, et al. "Research on the Current Situation of Innovative Talent Cultivation in Agricultural Universities under the Background of the '2011 Plan': A Case Study of Hunan Agricultural University." Higher Agricultural Education, 2022, (02): 71-78.

[6] Zhao, Hanbin, F. Xia, B. Xia, et al. " Science and Education Integration: Turning 'Two Skins' of Teaching and Research into 'One Chain'. Science and Technology Daily, September 15, 2023, p. 006.

[7] Zhang, Renyuan. "Exploration of the International Academic Model of High Vocational Education in Landscape Architecture in China: Take Guangdong Polytechnic of Science and Trade (GPST) for example." International Journal of Education and Humanities 14.1 (2024): 5-8.

[8] Gao, Wenqian. "A Review of Chinese Higher Vocational Colleges' Research on Studying Abroad in China Based on Citespace." 2022 8th International Conference on Humanities and Social Science Research (ICHSSR 2022). Atlantis Press, 2022.

[9] Gao, Xiuye, and S. Pei. "Construction of a Coupled Development Mechanism for the Integration of Science-Education and Industry-Education under the Background of 'One Unity and Three Integrations' in Higher Vocational Colleges." Vocational and Technical Education, 45.25 (2024) : 47-52.

[10] Xu, Jianling, Z. Qing, and L. Yuan. "Current Situation, Problems, and Countermeasures of Science-Education Integration Development in China's Higher Vocational Colleges: From the Perspective of Big Data Analysis." Vocational and Technical Education, 2024, 45(22):60-67.

[11] Maitra, Srabani, Saikat Maitra, and Manish Thakur. "Uncertain itineraries: dual system of training and contemporary TVET reforms in India." Journal of Vocational Education & Training 76.3 (2024): 556-575.