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Exploration and Practice of Digital Supply Chain Operation Plan Design Project Feedback Course Teaching

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Abstract: This study aims to address the problem of the disconnect between theory and practice in supply chain teaching. Through reform measures such as decomposing real enterprise projects into the curriculum, forming project module learning groups, integrating online and offline resources, and establishing a dual assessment mechanism between schools and enterprises, the study systematically explores the implementation path of the "R&D feedback teaching" model. Practice has shown that this model significantly improves the adaptability of scientific research results transformation, optimizes the integration effect of teaching methods, enhances the accuracy of students' abilities and enterprise needs, increases students' knowledge absorption rate by more than 40%, and achieves enterprise satisfaction of 89%, providing a replicable practical paradigm for vocational education industry education integration. In the future, it is necessary to further deepen the application of new technologies and cross regional school enterprise collaboration mechanisms.

Keywords: Digital Supply Chain; Research and Development Support Teaching; Integration of Industry and Education; Teaching Reform.

1. Introduction

In the field of supply chain teaching, there is often a certain degree of disconnect between theoretical teaching and practical operation. But with projects as the driving force, real enterprise projects are introduced into curriculum teaching. Real enterprise projects involve the comprehensive application of multidisciplinary knowledge and skills, such as information technology, data analysis, logistics management, operations research, etc. During the process of participating in projects, students can continuously learn and integrate these knowledge, cultivate interdisciplinary thinking and comprehensive application abilities. At the same time, project practice can also exercise students' teamwork spirit, communication skills, problem-solving abilities, and innovative thinking, building a bridge between theoretical knowledge and practical applications. The improvement of these comprehensive qualities will make students more competitive in the future job market, better adapt to the diversified needs of supply chain talents in the digital age, and lay a solid foundation for their career development. Students are no longer just learning about supply chain structure models on paper, but are able to delve into real digital supply chain projects, experiencing firsthand a series of processes from data collection, analysis, decision-making, and operational process optimization. This enables them to have a deeper understanding and mastery of the theoretical knowledge of digital supply chain operations, apply what they have learned, and improve their knowledge conversion rate and application ability.

2. Analysis of the Teaching Status of the Course "Digital Supply Chain Operations"

The vitality of vocational education lies in practice and application. To deepen the reform of the modern vocational education system, the focus is on adhering to the integration of industry and education and school enterprise cooperation. In recent years, the digital economy has flourished. In order to promote the high-quality development of vocational education in the new era and match talent training with the digital economy, major universities have carried out explorations with distinctive local characteristics in related courses, majors, and talent training models.

Sun Xiuwei pointed out that case-based teaching is one of the most effective teaching methods to transform "teaching as the main focus" into "learning as the main focus", from mechanically "cramming" to flexibly "hands-on learning", with the aim of cultivating practical talents with practical operational abilities[1]. Gu Weidong and others, through case teaching and research and development process orientation, attach importance to the consistency between students' learning in school and practical work, highlight applicability and pertinence, focus on students, result oriented, teachers and enterprise engineers as the main body, and involve all staff to carry out case-based teaching and education[2]. Wang Jian, Zhang Long, Hui Chunmei and others designed PBL project tasks based on the logic of professional ability development to address issues such as outdated teaching content, insufficient display of supply chain management characteristics, and lack of business authenticity in teachers' self built resources in supply chain management courses. Based on interdisciplinary knowledge integration and teaching content reconstruction, they ensured the implementation of curriculum resource construction projects[3]. Jiao Haiyan has designed project-based teaching content from three perspectives: the roles of supply chain members, internal job responsibilities, and different industries. Through teachers designing teaching projects reasonably and guiding students to complete complete complete "work projects" for learning, further achieving the integration of teaching, learning, and doing[4]. Tian Bingqiang, Hu Shouzhong, Qu Hongjian and others analyzed the application of project-based teaching method in the clothing supply chain management course from the aspects of selecting supply chain management textbooks, designing course teaching projects, and evaluating students' performance. Through project-based teaching method, students can combine theory with practice, strengthen their grasp of supply chain knowledge, enhance their comprehensive professional competence, and promote the deepening of course teaching reform. Based on the actual situation of supply chain management teaching, with the goal of improving the quality required for innovation and entrepreneurship, and based on the work process orientation [5]. Shicheng has proposed reform ideas and suggestions involving learning goal setting, knowledge and skill system construction, practical learning, breaking through textbook limitations, strengthening quality improvement, full process assessment, and timely feedback[6].Yu Mei focuses on the teaching reform of the "Supply Chain Management" course, combines project-based teaching, explores diversified classroom teaching methods and evaluation systems, promotes three-dimensional teaching, and gradually forms a teaching system of "using case analysis to introduce the course - project task traction analysis - sand table training - competition inspection -1+X certificate grading - on-site practice", exploring the teaching method of combining engineering with practice[7]. Wang Changqiong, Huanghua Ye, Zu Qiaohong and others analyzed that the current supply chain management curriculum system is based on traditional business logic and lacks the knowledge and skills required for digital transformation. They proposed to establish a capability structure for supply chain digital management talents that meets the needs of digital economy development based on goal oriented principles, and to reconstruct the theoretical curriculum system and practical teaching content[8].

3. Teaching Reform Measures for Digital Supply Chain Operations

3.1. Decompose Project Content into Teaching Course Content

The design project of digital supply chain operation plan involves multiple main research contents such as supply chain strategic planning, demand forecasting and planning, procurement management, production operation, logistics and distribution, customer relationship management, etc. The project relies on the course of "Digital Supply Chain Operation" to decompose the relevant research contents and apply them to course teaching.

3.2. Establish a Content Learning Group Based on Project Modules

To promote the deep practical transformation of course content and the cultivation of students' comprehensive abilities, a project-based content learning group will be established. Based on the completed project design objectives, the group comprehensively considers students' knowledge reserve level, skill strengths, and interest directions, and conducts dynamic grouping arrangements to enable students of different levels to work together in suitable groups. After the establishment of the group, the focus is on learning and training specific tasks for each module, adopting a gradual learning mode: starting with imitation learning, real project achievements such as "Agile Supply Chain Inventory Optimization" are selected as typical benchmark cases, guiding students to deeply analyze the entire process of data collection, model construction, and scheme design in the case, and through reasonable division of labor and cooperation, reproduce the key steps in the case. In this process, students proficiently master the standardized application of tools such as Python data processing and AHP analysis, and consolidate the foundation of theoretical knowledge and practical operation. After possessing a certain knowledge and skill reserve, actively organize brainstorming activities within the group, guided by cutting-edge industry issues such as "how to integrate blockchain technology into supply chain traceability", stimulate students' innovative thinking, encourage students to use innovative tools such as SCAMPER, boldly improve and optimize existing case solutions, and form innovative ideas and thoughts. Subsequently, these innovative ideas will be combined with the skills learned, relying on the school enterprise cooperation platform to connect with the real needs of enterprises and carry out project practice. For example, in response to the inventory optimization needs of a retail enterprise, the team needs to comprehensively apply knowledge such as time series forecasting and ABC classification to conduct demand analysis, model construction, and scheme design. The feasibility of the scheme should be verified through simulation and other methods, and a complete result document containing detailed data models, operation manuals, and other content should be formed to achieve the transformation from creativity to project results. In the process of operation, the group has established a sound management mechanism. On the one hand, through a points based assessment system, students' performance in team collaboration, program innovation, tool application, and other aspects is quantitatively evaluated to comprehensively reflect their learning outcomes; On the other hand, actively introducing enterprise mentors to participate in the process guidance of the group, through regular activities such as "monthly project consultation meetings" and "achievement simulation defense", the actual needs of the industry are integrated into the learning process, ensuring that students' learning and practice can closely follow the development trend of the industry, effectively improving students' ability to combine theory and practice, and building a practical and feasible implementation platform for "R&D feedback teaching".

3.3. Establish a Learning Resource That Integrates Online and Offline Learning

In the course teaching, teachers focus on teaching the most core and profound knowledge points in "Digital Supply Chain Operations", such as SCOR model construction and the technical principles of blockchain in supply chain traceability, to ensure that students establish a solid theoretical foundation. However, the actual operation of enterprises involves a multitude of complex contents, covering multi-dimensional knowledge such as intelligent prediction algorithms and cross-border supply chain collaboration. It is difficult to fully penetrate them in just 45 minutes of physical classrooms. In order to break through the limitations of time and space and create a "three-dimensional" learning field, the course team decomposed real enterprise cases into 12 modular contents such as "demand forecasting", "inventory optimization", and "supply chain finance". They carefully produced digital resources including operation demonstration videos, data case libraries, and simulation toolkits, and uploaded them in batches to the online course platform. The platform is set with a three-level advanced threshold of "basic cognition skills training innovative application". Students need to pass the previous test (such as completing the Python data cleaning task) to unlock the next module. The specific manifestation of the online and offline linkage mechanism is that in the classroom, teachers overcome key and difficult points through "core knowledge lectures+real-time case studies", and after class, students independently choose online resources to deepen their learning based on their own level - top students can challenge the development of "supply chain intelligent optimization algorithms" and other expanded content, while lagging students can trace back basic operations through slow video playback and error analysis functions. This interactive mode of "laying the foundation in the classroom and promoting improvement online" not only avoids the inefficiency of knowledge imparting, but also allows students of different levels to grow in the "zone of proximal development", shifting teaching from "standardized supply" to "personalized cultivation".

3.4. Establish a Multi-Party Assessment and Evaluation Mechanism for Course Teachers and Enterprise Mentors

In the reform of the course assessment and evaluation system, a "three-dimensional" evaluation mechanism has been established to accurately measure students' ability to solve real project problems. On the basis of retaining the formative assessment of classroom teachers (accounting for 40%, focusing on learning attitude and the quality of phased task completion) and the final assessment (accounting for 30%, focusing on the comprehensive application of theoretical knowledge), the enterprise mentor evaluation dimension (accounting for 30%) is heavily introduced. The evaluation team is composed of senior engineers from cooperative enterprises to conduct in-depth evaluations of students' performance in practical projects such as "supply chain strategic planning" and "inventory optimization plan design". Based on industry standards, enterprise mentors provide quantitative ratings and qualitative feedback that combine professionalism and practicality in terms of feasibility (such as reducing inventory costs by more than 10%), proficiency in tool application (such as Python code running efficiency), and team collaboration professionalism (such as clarity of project reporting logic). For example, in the evaluation of a supply chain optimization project in a manufacturing enterprise, the enterprise mentor not only pointed out the technical loophole of "not considering seasonal demand fluctuations" in the student plan, but also proposed an improvement suggestion of "introducing rolling prediction models" based on industry experience. During the evaluation process, students who perform outstandingly can receive a "pre employment agreement" from the company on the spot. For example, if a group is adopted by the company for its "blockchain traceability solution", three members will directly enter the company's talent reserve pool. This dual evaluation mechanism of "school+enterprise" not only breaks the closed nature of traditional assessment, but also motivates students to polish their skills according to professional standards through the model of "evaluation is practical, feedback is improvement", achieving a seamless transition from "classroom learners" to "job preparers".

4. The Effect of Teaching Reform on Digital Supply Chain Operations

4.1. The Adaptability of Scientific Research Results Transformation Has Been Improved, and the Effectiveness of Layered Teaching is Significant

By constructing a "teaching transformation model for scientific research achievements", we can effectively solve the problem of adapting complex technologies to students' cognitive levels. The team has broken down research projects such as "Collaborative Optimization of Agile Clothing Supply Chain Inventory" into three levels of content: "Basic Version Advanced Version Innovative Version". The basic layer focuses on Excel data processing and ABC classification application, and designs a simulation task for "Optimization of Inventory Inventory in a Convenience Store" for freshmen; Introduce Python programming and time series forecasting models into the hierarchy, requiring sophomore students to complete the "Regional Retail Enterprise Quarterly Demand Forecasting" practical project; The innovation layer integrates blockchain and smart contract technology, guiding junior students to develop a "cross-border e-commerce supply chain traceability solution". The index of cutting-edge teaching content has increased from 32% before the reform to 78%, and the classroom absorption rate of students at different levels has increased by more than 40%. According to a questionnaire survey, 91% of students believe that "teaching content not only follows the trend of the industry, but also can be mastered at their own pace", especially for students who are lagging behind, their learning confidence has significantly increased, and the failure rate of courses has decreased from 15% to 5%.

4.2. Integration and Innovation of Teaching Methods Lead to A Significant Increase in Classroom Effectiveness

By implementing a three-dimensional integration strategy of traditional teaching and new methods, the teaching system and participation have been significantly improved. In the knowledge transmission stage, the advantage of traditional classroom lectures on supply chain basic theories (such as SCOR model) is retained, while embedding a "5-minute project introduction" stage, such as introducing theoretical application scenarios through a video of inventory crisis in a new energy enterprise; In the skill training stage, the three-stage method of "teacher demonstration group imitation enterprise practice" is adopted. For example, in the "procurement management" module, the JIT procurement process is first demonstrated through PPT, then the virtual simulation system is used for group simulation, and finally the procurement plan design is completed by connecting with a real enterprise; At the level of innovation cultivation, the "dual track driving method" is introduced, with traditional classrooms focusing on methodology teaching, and online platforms opening up expanded resources such as Python algorithm development and Tableau visualization. After the reform, the frequency of student classroom interaction increased by 2.8 times, the average number of iterations of project plans increased from 2 to 5, and the third-party evaluation showed that the comprehensive index of teaching effectiveness increased from 65 points to 89 points, forming an efficient classroom ecology of "depth in theory, intensity in practice, and space for innovation".

4.3. The Accuracy of School Enterprise Capability Docking Has Been Enhanced, And the Adaptability to Employment has Been Comprehensively Improved

By constructing a closed-loop mechanism of "demand research capability modeling teaching mapping", precise alignment between talent cultivation and enterprise needs can be achieved. The team collaborated with 8 leading companies to conduct job competency analysis, extracting four core competency modules: "digital tool application (35%), cross departmental collaboration (25%), supply chain optimization (20%), and risk identification (20%)", and reconstructing course objectives and training projects based on these modules. For example, in response to the high-frequency demand of enterprises, the ability to identify supply chain finance risks is developed, and a practical project called "Design of Supply Chain Finance Solutions for a Manufacturing Enterprise" is developed, requiring students to use blockchain technology to track fund flows and identify fraud risks. After the reform, the average number of enterprise level tools mastered by students increased from 2.3 to 5.1, the award rate in the "National Supply Chain Competition" increased by 42%, and the satisfaction of graduates from enterprises increased from 58% to 89%. Employment data shows that graduates participating in the reform class have a starting salary 23% higher than the industry average, and the proportion of promotion to core positions within 6 months reaches 37%, confirming the effectiveness of "what you learn is what you use" training.

5. Conclusion

Firstly, by constructing a "hierarchical transformation model for scientific research achievements", the complex technological process is deconstructed into teaching content that adapts to different learning levels, achieving a balance between cutting-edge and operability. For example, breaking down the supply chain inventory optimization project into three levels of tasks: basic simulation, Python modeling, and blockchain innovation, can increase the knowledge absorption rate of students at all levels by more than 40% and reduce the failure rate by 10%, proving the effectiveness of hierarchical teaching strategies in solving adaptability problems.

Secondly, the innovative "traditional teaching+project driven+simulation" integrated teaching mode, through the closed-loop design of classroom theory introduction, online resource expansion, and enterprise practical verification, has increased the frequency of student classroom interaction, increased the number of project plan iterations, and improved the comprehensive index of teaching effectiveness, verifying the feasibility of integrating new teaching methods with traditional modes.

Finally, establish a "dual capability docking system between schools and enterprises" to accurately match the core needs of enterprises for digital tool applications, cross departmental collaboration, etc., promote students to double the number of enterprise level tools, and improve the award rate of competitions and enterprise satisfaction. Research has shown that the "R&D feedback teaching" model significantly enhances curriculum practicality, student competitiveness, and the depth of industry education integration, providing a replicable practical paradigm for the digital transformation of vocational education. In the future, it is necessary to further deepen the innovative application of new technologies such as AIGC and blockchain in teaching, and improve the long-term mechanism of cross regional school enterprise collaboration.

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