Scientific Research Publishing

Open Journal of Social Sciences, 2025, 13(3), 94-106
https://www.scirp.org/journal/jss
ISSN Online: 2327-5960
ISSN Print: 2327-5952

# Innovative Research on Talent Cultivation Mode under the Synergy of Curriculum-Certification-Competition Integration and Project-Based Learning

## —A Case Study of Software Technology (Blockchain Technology Application)

**Guoxia Zou**

School of Artificial Intelligence, Guangdong Open University (Guangdong Polytechnic Institute), Guangzhou, China
Email: 43784660@qq.com

**How to cite this paper:** Zou, G. X. (2025). Innovative Research on Talent Cultivation Mode under the Synergy of Curriculum-Certification-Competition Integration and Project-Based Learning. *Open Journal of Social Sciences, 13,* 94-106.
https://doi.org/10.4236/jss.2025.133008

**Received:** February 19, 2025
**Accepted:** March 9, 2025
**Published:** March 12, 2025



## Abstract

As blockchain technology continues to advance, the demand for high-quality blockchain application talents has soared. However, Chinese vocational colleges rarely offer blockchain majors, and traditional training models are inadequate due to outdated curricula, insufficient practical skills training, and a misalignment with industry needs. To address this issue, our study proposes a collaborative talent training model that integrates "Course-Certification-Competition" with Project-Based Learning (PBL), using blockchain technology applications as an illustrative example. Despite the absence of a dedicated blockchain major, this model establishes a diversified talent cultivation system by incorporating extracurricular self-study, vocational exams, and competitions through PBL. It aims to cultivate talents with robust theoretical foundations, practical skills, and innovative spirits. Through a literature review and investigative research, we have clarified the theoretical and practical value of this model, establishing a competency-oriented system that enhances students' practical abilities and innovative awareness. Real-world, project-based tasks encourage students to improve their problem-solving skills through teamwork and exploration. The research demonstrates significant improvements in learning interest, practical abilities, and professional qualities, meeting enterprise needs and fostering industry-academia-research integration.

## Keywords

Course-Certification-Competition Integration, Project-Based Learning,

Blockchain Technology, Talent Training Model, Innovative Research

## 1. Introduction

Blockchain technology stands as the pivotal force driving the new generation of information technology, igniting a global wave of technological revolution and industrial transformation. Since the publication of the Bitcoin white paper in 2008, blockchain technology has evolved from its initial application in digital currencies to encompass various fields, including finance, supply chain management, healthcare, education, and the Internet of Things (Bhutta et al., 2021; Wang et al., 2019). This evolution underscores its immense development potential and application value. As blockchain technology rapidly advances and gains widespread adoption, the demand for blockchain professionals has soared.

To excel in this field, blockchain talents must possess a solid foundation in computer science and information technology, coupled with a profound understanding of blockchain principles, architecture, and application scenarios. They must also demonstrate innovative thinking and practical skills to tackle complex technical challenges and adapt to the rapidly evolving market demands. However, the current cultivation of blockchain talents faces numerous challenges and shortcomings. Despite the existence of approximately 45 vocational colleges in China offering majors in blockchain technology application (University Artificial Intelligence and Big Data Innovation Alliance, 2024; Ministry of Education, 2024), the market demand for blockchain talents still significantly outstrips supply, highlighting an acute talent shortage.

Furthermore, blockchain technology spans multiple disciplines, including cryptography, distributed systems, and database management, necessitating interdisciplinary knowledge backgrounds and comprehensive application abilities among students. The rapid pace of blockchain technology's development also requires continuous learning of new knowledge and technologies to stay abreast of evolving market demands. However, current talent cultivation models often fall short of these requirements, resulting in insufficient innovative and competitive abilities among students.

Therefore, exploring a novel blockchain talent cultivation model is of paramount importance. Based on an in-depth analysis of the shortcomings of current blockchain talent cultivation models and industry demands, this paper proposes a blockchain talent cultivation model that integrates "course-certificate-competition" with project-based learning. This model aims to comprehensively enhance the quality of blockchain talent cultivation by optimizing the curriculum system, strengthening practical teaching, and fostering closer cooperation with industry enterprises.

In this model, "course-certificate-competition integration" refers to the combination of course learning (Chen, 2024; Niu, 2023), vocational qualification certif-

icate examinations, and academic competitions to create a mutually reinforcing and complementary talent cultivation framework. Through course learning, students acquire the basic knowledge and principles of blockchain technology. Vocational qualification certificate examinations provide an opportunity for students to assess their learning outcomes and obtain industry-recognized certifications. Academic competitions, on the other hand, offer students a platform to exercise their practical abilities and innovative thinking, thereby boosting their competitiveness.

Project-based learning is a student-centered (Iserte et al., 2023; Rengifo & Bravo, 2020) approach to talent cultivation that revolves around projects. It emphasizes learning and practice in real or simulated project environments, enabling students to hone their knowledge and skills by solving practical problems. In the context of blockchain talent cultivation, project-based learning facilitates the application of learned knowledge to actual projects, deepening students' understanding and proficiency in blockchain technology.

In conclusion, the blockchain talent cultivation model proposed in this study, which integrates "course-certificate-competition" with project-based learning, holds significant theoretical and practical value. It not only enriches the theoretical framework of blockchain talent cultivation, providing valuable insights for future research, but also guides vocational colleges and training institutions in improving their talent cultivation models, enhancing the quality of talent cultivation, and offering robust support for the rapid development of the blockchain industry.

**Innovative Aspects of the Research**

- Innovative Synergy Mechanism Combining "Curriculum-Certification-Competition Integration" with Project-Based Learning

Traditional talent cultivation models often segregate curriculum learning, vocational qualification certificate exams, and skills competitions, leading to a lack of systematization and synergy. This research introduces an innovative integration of "Curriculum-Certification-Competition Integration" with Project-Based Learning, establishing a synergistic cultivation mechanism. This mechanism is based on curriculum learning, guided by vocational qualification certificates, fueled by skills competitions, and implemented through project practice. Through Project-Based Learning, curriculum content, certificate exam requirements, and competition tasks are seamlessly integrated into real-world projects. As a result, students can master theoretical knowledge, enhance practical abilities, obtain vocational qualification certifications, and accumulate competition experience while completing projects, leading to a comprehensive improvement in talent cultivation.

- Innovative Practice of Project-Based Learning

In the implementation of Project-Based Learning, this research introduces an innovative multi-tiered project system that encompasses "real enterprise projects, competition projects, and simulation projects". Real enterprise projects offer students insights into actual industry demands, competition projects stimulate stu-

dents' innovative abilities and teamwork spirit, and simulation projects help consolidate their basic knowledge and skills. With a layered and progressive project design, students can achieve targeted skill enhancement at different stages, ensuring a smooth transition from theoretical learning to practical application.

- Innovative Cultivation Form

The cultivation mechanism presented in this research serves as a supplementary addition to existing talent cultivation programs. It features flexible cultivation forms tailored to students' interests and hobbies, fully embracing Project-Based Learning. The learning progress follows a "curriculum-competition-certification-curriculum-competition" format. For example, in the existing talent cultivation process for software technology majors, when nurturing talents in blockchain technology applications, it is unnecessary to incorporate the entire blockchain technology application training process into the curriculum. Instead, extracurricular training is conducted using a combination of "Curriculum-Certification-Competition Integration" and Project-Based Learning.

## 2. Design of Talent Cultivation Mode Curriculum-Certification-Competition Integration with Project-Based Learning

### 2.1. Construction of the Curriculum-Certification-Competition Integration Mode

#### 2.1.1. Job Demand Orientation

With the rapid development and widespread application of blockchain technology, the market's demand for blockchain professionals is steadily increasing. Based on the application scenarios and job responsibilities of blockchain technology, blockchain talents in higher vocational education can be broadly categorized into several roles: blockchain application operators, blockchain operation and maintenance engineers, blockchain testing engineers, smart contract developers, front-end/back-end developers, technical support engineers, and blockchain community operation specialists. All these roles necessitate a thorough understanding of the blockchain workflow and the operating mechanisms of blockchain platforms. After acquiring fundamental blockchain knowledge, students can be trained in areas such as blockchain application operation and smart contract development, according to their strengths and interests, with the ultimate aim of transitioning into front-end/back-end development.

#### 2.1.2. Curriculum Content Integration

Curriculum content serves as the cornerstone of the "Curriculum-Certification-Competition Integration" mode. By integrating curriculum content, students can simultaneously prepare for certificate exams and skills competitions during their learning journey. For example, after studying "Fundamentals of Programming", students can apply their newly acquired knowledge to smart contract development. Similarly, after mastering "Web Application Technology" and "Web Client Technology", they can engage in project-based learning tailored for front-

end/back-end development engineers.

#### 2.1.3. Promotion through Competition Activities

Skills competitions play a pivotal role in accelerating the effectiveness of the "Curriculum-Certification-Competition Integration" mode. Organizing students to participate in blockchain-related skills competitions, such as the National Vocational College Skills Competition and the World Innovation and Entrepreneurship Competition, can spark students' learning enthusiasm and competitive drive. Competition tasks are often highly integrated and challenging, thereby effectively enhancing students' practical abilities, innovative capabilities, and teamwork skills. The learning and innovation involved in competition projects further reinforce and integrate curriculum content.

#### 2.1.4. Vocational Qualification Certificate Certification

Vocational qualification certificates represent one of the key objectives of the "Curriculum-Certification-Competition Integration" mode. By aligning competition tasks with vocational qualification certificates, students can systematically acquire the knowledge and skills required for the exams. For instance, during preparation for blockchain technology application competitions in the National College Computer Design Contest, students engage in project-based learning based on the competition content. Following the competition, mock exams and specialized training sessions related to the blockchain developer certificate exam are conducted to ensure that students can successfully pass the exam and obtain the certificate upon course completion. Vocational qualification certificates not only acknowledge students' learning achievements but also signify their professional competitiveness in the job market.

### 2.2. Design of Project-Based Learning (PBL)

Project-Based Learning (PBL) constitutes a student-centered teaching approach that underscores the acquisition of knowledge and skills through the resolution of practical problems. Within this learning framework, students, propelled by a specific project, engage in self-directed inquiry and collaborative efforts throughout the entirety of the process, spanning from problem identification to its resolution. PBL not only prioritizes the final outcome but also emphasizes the thinking, exploration, and reflection embedded within the learning journey, with the aim of fostering students' comprehensive abilities and fostering an innovative spirit.

#### 2.2.1. Student-Centered Design

The cornerstone philosophy of PBL revolves around student-centeredness, which encourages active participation from students throughout the learning process. In contrast to traditional teacher-led instruction, PBL places students at the forefront of the project, while teachers assume a more supportive and guiding role. This design is intended to spark students' interest and initiative in learning, thereby enhancing their sense of responsibility and self-management skills. Depending on the requirements of competition tasks, pertinent knowledge learning platforms

are provided, with teachers offering guidance as students undertake self-study to complete the exercises associated with these tasks.

#### 2.2.2. Integration with Real-World Practices

PBL underscores the integration of learning content with real-world scenarios, enabling students to apply their acquired knowledge in authentic contexts. By addressing practical problems, students not only gain a deeper understanding of theoretical knowledge but also enhance their capacity to tackle intricate issues and accumulate practical experience. The ultimate objective of this approach in talent cultivation is to align with real-world applications, thereby encouraging students to engage in university innovation and entrepreneurship competitions. These competitions provide university students with the necessary social resource support to facilitate the implementation of their innovative and entrepreneurial endeavors.

## 3. Model Implementation and Effect Analysis

### 3.1. Pilot Implementation

To explore the synergistic benefits of merging the "Course-Certification-Competition" model with Project-Based Learning (PBL), it's crucial to note that vocational college students can only engage in competitions during their first four semesters. Thus, to keep pace with the scheduled plan, preparations must commence in their freshman year. Consequently, I have voluntarily undertaken the responsibility of teaching the same class consecutively from freshman to sophomore year. In this context, we launched a pilot program within the 2023 Software Technology curriculum, emphasizing three core elements: the implementation timeline, seamless integration of courses, certifications, and competitions, and the structuring of PBL projects. Our ultimate goal is to cultivate a diversified and multifaceted educational system that fosters practical talents with solid theoretical knowledge, robust practical skills, and an innovative mindset.

#### 3.1.1. Implementation Timeline

When exploring the synergistic benefits of combining "Course-Certification-Competition" with PBL, a meticulously crafted timeline is essential for ensuring the seamless progression of the educational process. To this end, we meticulously planned and organized the timeline for the 2023 Software Technology curriculum. This arrangement took into account not only students' learning pace and cognitive traits but also the practical application contexts and evolutionary requirements of blockchain technology. By employing a scientifically devised timeline, we aimed to progressively augment students' theoretical understanding and practical proficiency at various stages, ultimately fostering a cohort of applied talents with solid theoretical foundations, formidable practical abilities, and an innovative spirit. The implementation timeline is depicted in **Figure 1**.

According to the implementation timeline detailed in **Figure 1**, teachers have clearly defined the teaching priorities and objectives for each semester, ensuring

that students acquire the necessary knowledge and skills at every stage of their academic journey.

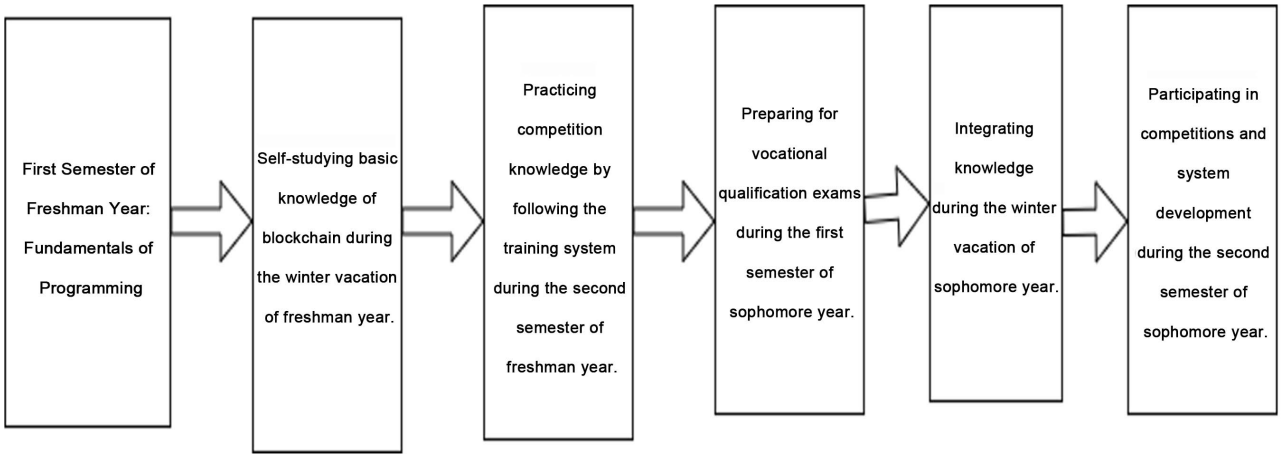


**Figure 1.** Implementation timeline.

During the first semester of their freshman year, students primarily adjust to university life and the learning environment. Consequently, the primary emphasis of this semester is on foundational courses, such as programming languages, which establish a solid groundwork for subsequent academic pursuits.

Throughout the freshman winter break, students concentrate on acquiring fundamental knowledge and skills related to blockchain technology. Course materials encompass basic concepts, operational principles, and application scenarios of blockchain. Additionally, courses in programming languages, such as Solidity, are introduced to further reinforce the foundation for future studies. Simultaneously, introductory training sessions on blockchain are provided to expedite students' onboarding process and ignite their interest in learning.

In the second semester of their freshman year, students are encouraged to form teams and participate in various blockchain technology-related competitions, such as the National College Blockchain Competition and provincial computer design competitions focusing on blockchain technology. These competitions enable students to apply their knowledge to solving real-world problems, thereby enhancing their practical and innovative capabilities. Furthermore, these competitions provide students with platforms to showcase their talents, share experiences, and bolster their self-confidence and teamwork spirit.

The first semester of their sophomore year is devoted to preparing for vocational qualification certificate exams. We have selected the 1 + X Blockchain Technology Application Intermediate Certification offered by Shenzhen Tencent Technology Co., Ltd., which aligns with the competition platform. This certification not only validates students' professional knowledge but also serves as a pivotal means to enhance their employment competitiveness.

During the sophomore winter break, students who have completed foundational courses in front-end and back-end development engage in project-based

learning by preparing for the World Skills Competition. They utilize competition cases and training videos to facilitate their learning of knowledge points, integrating the knowledge accumulated over the previous three semesters for case analysis and code interpretation.

In the second semester of their sophomore year, students participate in both the World Skills Competition and the National College Students' Innovation and Entrepreneurship Competition. These two competitions necessitate students to apply their knowledge to solving practical problems, swiftly refining their practical and innovative abilities. We incorporate real-world blockchain projects into their learning tasks, guiding students through the entire process, from requirement analysis and scheme design to implementation and testing, through team collaboration.

### 3.1.2. Implementation of Curriculum, Certification, and Competition Integration

In our pursuit of educational innovation within the software technology specialty, the integration of curriculum, certification, and competition has emerged as a pivotal aspect of our practice. This concept is designed to achieve a profound integration of knowledge, skills, and practical application through systematic course learning, the acquisition of professional certifications, and engagement in technical skill competitions. By seamlessly blending course learning with professional qualification certifications and incorporating competitive elements, we aim to not only ignite students' interest in learning but also significantly elevate their professional skills and practical abilities. Taking into account the current advancements in talent cultivation within the software technology specialty, we have devised a comprehensive integration plan for the blockchain direction, as illustrated in Figure 2.

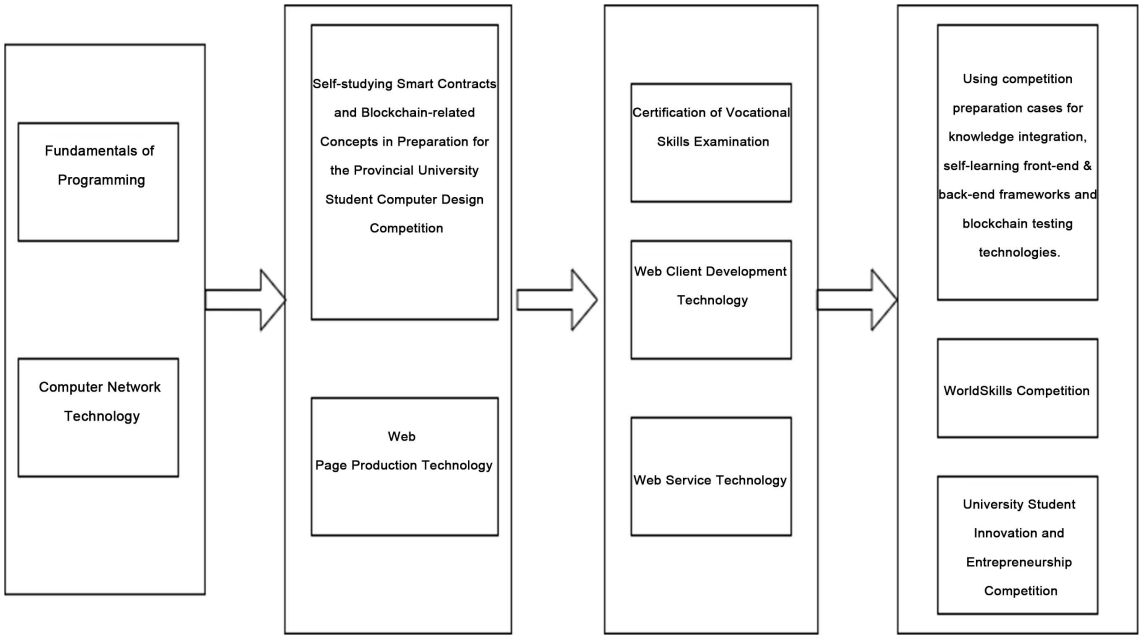


Figure 2. Curriculum-Certification-Competition integration plan.

**1) Curriculum Design**

In the realm of curriculum design, our focus lies in seamlessly integrating blockchain technology into the existing software technology talent training program. We have introduced pivotal courses such as "Blockchain Fundamentals," "Smart Contract Development," and "Fisco BCOS Blockchain Network Construction," while implementing tiered teaching methodologies tailored to students' individual proficiency levels. Students are encouraged to engage in specialized module learning that aligns with their strengths and the competition modules of the National College Student Computer Design Competition. Additionally, through self-directed learning opportunities on our training platform, students can further consolidate their foundational knowledge of blockchain.

**2) Professional Certifications**

Building upon the platforms utilized in previous student competitions, we have chosen a professional certification that complements our educational framework: the Tencent Technology (Shenzhen) Co., Ltd. 1 + X Blockchain Application Software Development and Operation (Intermediate) certification, scheduled for November 2024. Our training approach involved competition students undertaking initial basic knowledge training, followed by instructors conducting mock exam sessions. Given that a majority of students taking the certification exam had prior competition experience, we adopted a mentorship model, pairing experienced students with newcomers for comprehensive exam preparation. This strategy culminated in an impressive pass rate of 96.97%, surpassing the platform's average pass rate of 87.43%.

**3) Academic Competitions**

To recognize and reward students who excel in blockchain-related academic competitions, the university has established a dedicated reward mechanism, significantly boosting students' enthusiasm for participation. The competition content, closely aligned with students' professional knowledge, serves as a holistic assessment and enhancement of their technical skills. During competition preparation, students exhibited remarkable self-directed learning initiatives. This competition-driven learning model has effectively stimulated students' initiative, deepened their understanding of professional knowledge, and enhanced their ability to apply this knowledge comprehensively. To align with the talent development progress, academic competition selection and arrangement are based on students' capabilities.

First Year, Second Semester: With limited professional knowledge at this stage, students are well-suited for the Blockchain Technology Application Competition within the National College Student Computer Design Competition. The preliminary round, conducted online, focuses on blockchain fundamentals, working principles, consensus mechanisms (such as PoW and PoS), encryption algorithms, and distributed ledger technology. The final round encompasses blockchain network construction and maintenance, as well as smart contract development. Students can utilize the training platform for their learning needs.

Second Year, Second Semester: Having acquired foundational knowledge in front-end and back-end development, students are ready for the Blockchain Technology Application Competition at the World Vocational Skills Competition. Both the preliminary and final rounds of this competition emphasize blockchain platform construction and operation, smart contract development and deployment, and blockchain application development.

### 3.1.3. Project Arrangement for the Project-Based Learning Approach

Since a specialized track focusing on blockchain technology applications has not yet been established, students are required to independently explore a substantial portion of the related knowledge. To enhance the efficiency of self-directed learning and validate the learning outcomes, instructors must meticulously plan and design projects. Drawing on our extensive experience, we have innovatively adopted a project-based learning approach, with the detailed project arrangement outlined in Figure 3. This approach is intended to help students master the knowledge more effectively and improve the results of their self-directed learning efforts.

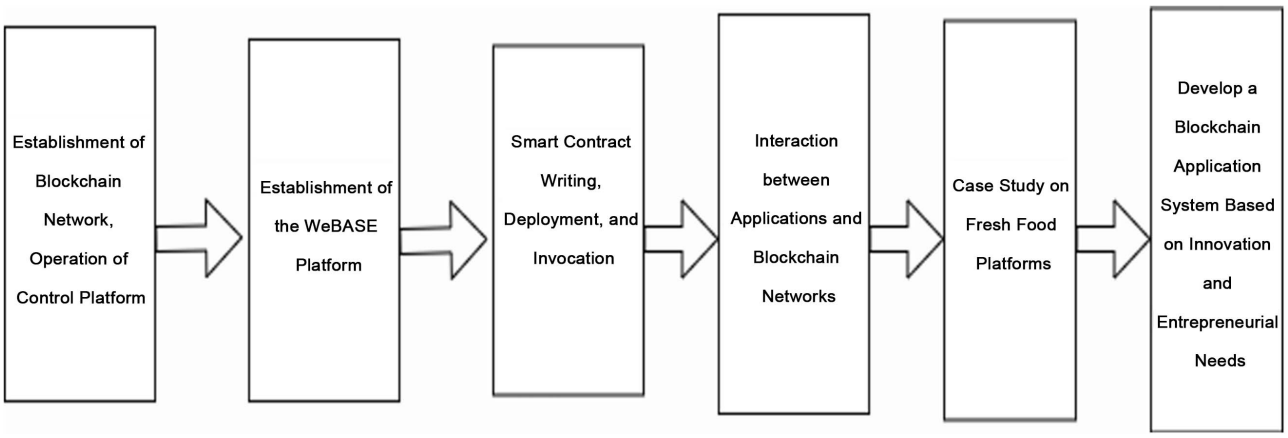


Figure 3. Project arrangement.

Through the use of self-designed project task sheets, the Fisco BCOS online documentation, and provided operational procedure guides, students can independently complete the self-study of Establishing a Blockchain Network, Operating the Control Platform, and Establishing the WeBASE Platform. By utilizing the smart contracts and online video resources offered by Fisco BCOS, students can self-teach themselves the processes of writing, deploying, and invoking smart contracts. By adhering to the guidance manuals, they will learn to develop applications that invoke the HelloWorld smart contract, gaining insight into how applications interact with smart contracts. Through the Case Study on Fresh Food Platforms, students will gain mastery in utilizing front-end and back-end frameworks for application development. Ultimately, they will put their skills to practical use by participating in innovation and entrepreneurship competitions, engaging in real-world project development.

### 3.2. Effectiveness Evaluation

Through the synergistic application of the "Curriculum-Certification-Competition Integration" model and the project-based learning approach, we have achieved notable success in the implementation for the 2023 cohort of the software technology program. This diversified educational model not only enriches the teaching content but also sparks students' interest in learning and bolsters their overall competitiveness. Specifically, real-world project-driven learning enables students to gain a deeper understanding of blockchain technology's application scenarios and market demands, while also amassing invaluable practical experience that sets a solid foundation for their future careers. As a result, the 2023 cohort of software technology students has already obtained professional technical qualifications in their sophomore year, a milestone previously only attainable by junior-year students.

### 3.3. Areas for Optimization and Improvement

**Strengthening Collaboration with Enterprises**

By providing students with internship opportunities, we can empower them to accumulate valuable experience through practical engagement. By integrating industry and education, we aim to enhance students' comprehensive qualities and establish a robust foundation for their future employment prospects.

**Enhancing Project Continuity**

We plan to implement a mentorship model where experienced students guide newcomers. This approach will not only foster greater unity among students but also further elevate their learning motivation and engagement.

## 4. Conclusion and Prospects

The seamless integration of the "Curriculum-Certification-Competition Integration" model with Project-Based Learning has demonstrated substantial talent cultivation effects in the implementation for the 2023 cohort of software technology majors. This study innovatively established a collaborative cultivation mechanism, with curriculum learning serving as the foundation, vocational qualification certificates acting as the guide, skills competitions functioning as the driver, and project practice acting as the carrier. This approach has effectively bolstered students' theoretical knowledge, practical abilities, and innovative spirits. By introducing a multi-tiered project system encompassing real enterprise projects, competition projects, and simulation projects, students achieved targeted ability enhancements at various stages, facilitating a smooth transition from theory to practice. Additionally, the flexible cultivation form allows for guided cultivation tailored to students' interests, ensuring that they can acquire systematic knowledge and skills through extracurricular training following a "curriculum-competition-certificate-curriculum-competition" schedule. The pilot implementation has shown that students can obtain professional technical qualification certificates in their sophomore year, a full year earlier than before, thereby laying a solid foundation

for their employment and career development.

Despite the notable achievements made in the collaborative application of the "Curriculum-Certification-Competition Integration" model with Project-Based Learning in this study, there is still room for further optimization and improvements. Future research and practice will focus on strengthening cooperation between schools and enterprises, providing more internship opportunities and practical platforms to enhance students' comprehensive qualities and employment competitiveness through the integration of industry and education. Deepening the theoretical research on the collaborative mechanism of the "Curriculum-Certification-Competition Integration" model with Project-Based Learning is also a crucial direction for future work, aiming to explore its internal mechanisms and operational laws and provide robust theoretical support for the further development and application of this cultivation mode. Currently, the talent cultivation model utilizes the Fisco BCOS blockchain platform tailored to the needs of competitions, requiring self-study of interdisciplinary knowledge based on application development demands. In the future, we will adapt the talent cultivation model in accordance with advancements in blockchain technology in the market and shifts in competition knowledge, with the aim of establishing a more refined and comprehensive talent cultivation system.

## Acknowledgements

This project is generously supported by the Guangdong Open University research project titled "Research on the Talent Training Model for Software Technology (with a Focus on Blockchain) Based on Blockchain 1 + X Certificates" (Project Number: 2024JYJG012).

## Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

## References

Bhutta, M. N. M., Khwaja, A. A., Nadeem, A., Ahmad, H. F., Khan, M. K., Hanif, M. A. et al. (2021). A Survey on Blockchain Technology: Evolution, Architecture and Security. *IEEE Access, 9,* 61048-61073. https://doi.org/10.1109/access.2021.3072849

Chen, H. Y. (2024). On Curriculum Design Based on the Integration of "Post, Course, Certification, Competition, and Innovation". *Journal of Liaoning Higher Vocational Education, 26,* 55-59.

Iserte, S., Tomás, V. R., Pérez, M., Castillo, M., Boronat, P., & García, L. A. (2023). Complete Integration of Team Project-Based Learning into a Database Syllabus. *IEEE Transactions on Education, 66,* 218-225. https://doi.org/10.1109/te.2022.3217309

Ministry of Education (2024). *Notice of the Ministry of Education on Announcing the Filing and Approval Results of Specialty Settings for Junior College Programs in Higher Vocational Education in 2024.* http://www.moe.gov.cn/srcsite/A07/moe_953/202404/t20240408_1124472.html

Niu, Y. (2023). Research on Teaching Reform Integrating Courses, Certifications, and Competitions Based on the 1 + X Certificate System. *Science Education Journal, No. 3,*

75-77.

Rengifo, C. F., & Bravo, D. A. (2020). A Project-Based Learning Approach to Teach Identification and Control Systems. *IEEE Revista Iberoamericana de Tecnologias del Aprendizaje, 15,* 10-16. https://doi.org/10.1109/rita.2020.2979171

University Artificial Intelligence and Big Data Innovation Alliance (2024). *Ministry of Education Announces List of 45 Vocational Colleges Successfully Approved for Blockchain Technology Application Major, Enrolling Students in 2024*. https://m.163.com/dy/article/IVB0RSO30532N2UB.html

Wang, S., Ouyang, L., Yuan, Y., Ni, X., Han, X., & Wang, F. (2019). Blockchain-Enabled Smart Contracts: Architecture, Applications, and Future Trends. *IEEE Transactions on Systems, Man, and Cybernetics: Systems, 49,* 2266-2277. https://doi.org/10.1109/tsmc.2019.2895123