

Key Exploration of Four-in-One Practice Teaching Research for the Software Industry Chain: “Learning, Training, Competition, and Innovation”

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Abstract:

The “Learning-Training-Competition-Creation” four-in-one practical teaching model is a significant exploration in vocational education to deepen industry-education integration and achieve precise alignment between the education chain and the industrial chain. It aims to systematically reconstruct the teaching system, innovate practical implementation approaches, establish school-enterprise collaboration mechanisms, and improve evaluation and monitoring systems. As the core hub for cultivating talent in the field of information technology, the education sector in the software industry is directly linked to the quality of technical and skilled talent supply through its deep coupling with the industrial chain. Based on this, this paper analyzes the connotation of the “Learning-Training-Competition-Creation” four-in-one model and further proposes key path elements for the four-in-one practical teaching approach tailored to the software industry chain. The goal is to provide a systematic solution for cultivating high-quality technical and skilled talent in the software industry, facilitating the shift from knowledge transmission to ability cultivation in vocational education for talent development in the software industry, and promoting dynamic balance between educational supply and industrial demand.

Keywords:

Software Industry Chain, Learn, Practice, Compete and Create, Practical Teaching, Integration of Industry and Education

1. Introduction

With the rapid iteration of information technology and the vigorous development of the digital economy, the software industry, as a fundamental, strategic, and leading industry of the national economy, has an increasingly urgent demand for high-quality technical and skilled talents and presents diversified and multi-level characteristics. [1] However, the current software industry education still faces problems such as a disconnect between teaching content and actual industry needs, weak practical

teaching links, and an incomplete mechanism for school enterprise collaboration in nurturing talents, which makes it difficult for the trained talents to fully match the actual requirements of various positions in the software industry chain in terms of knowledge structure, skill level, and innovation ability. Therefore, in the future, vocational education should explore the construction of a four in one practical teaching model of “learning, training, competition, and innovation” oriented towards the software industry chain, to overcome the current difficulties in talent cultivation in the software industry and enhance the ability of vocational education to serve the development of the industry.

2. The Connotation of the Four in One of “Learning, Training, Competition, And Innovation”

2.1. Create a systematic and ecological practical teaching paradigm

In the context of modern vocational education reform, the technological development trend of the software industry chain and the demand for job capabilities require education to break the scattered and isolated state of various links in traditional teaching, and build a systematic and ecological practice paradigm. On the one hand, integrating theoretical knowledge input of “learning”, strengthening practical skills of “practice”, enhancing competitive ability of “competition”, and transforming innovative achievements of “creation” are key elements that form an organic whole that is interrelated and coordinated, ensuring that the teaching process and software industry chain are highly compatible with social development. On the other hand, by building an open and shared practical teaching platform, gathering resources from various parties such as government, enterprises, schools, and industry associations, and constructing an ecosystem that covers curriculum systems, teaching staff, training bases, industrial projects, and other elements, we can achieve optimal allocation and efficient utilization of teaching resources, thus creating a sustainable practical teaching ecosystem. This paradigm emphasizes student-centered approach, integrating the real projects, technical standards, and job requirements of the software industry chain into the entire teaching process, forming a self iterative and continuously optimized teaching loop, ensuring that practical teaching always resonates with the development of the software industry.

1.2. Form a virtuous cycle of “learning for application, practicing for excellence, competing for improvement, and creating for success”

The core value of the “learning practice competition creation” four in one practical teaching model lies in building a dynamic closed loop of “learning to apply, practicing to refine skills, competition to promote improvement, and creation to become successful”.

Firstly, “learning” aims to enable students to master the professional theoretical knowledge and technical principles required for the software industry chain through systematic course learning, laying a solid foundation for subsequent practical activities. Secondly, “practice” relies on real industry projects and practical training environments, allowing students to transform their learned knowledge into practical operational abilities, continuously improving their skill proficiency and problem-solving abilities. Furthermore, “competition” aims to test students’ comprehensive abilities through practical participation, stimulate their competitive awareness and innovative potential, and reverse drive the optimization and improvement of teaching

content and methods, making teaching more in line with the forefront needs of the industry. Finally, “innovation” encourages students to combine learning, practice, and competition with the development trends of the software industry to engage in technological innovation or entrepreneurial attempts, transforming excellent ideas and project achievements into commercially valuable products or services, ultimately achieving the goal of “talent development” by crossing from skill mastery to self value creation. These four links support and promote each other, forming a virtuous cycle of spiral upward movement, ensuring the continuous improvement of talent cultivation quality to meet the needs of the continuous development of the software industry chain. [2]

3. Key to the Four in One Practical Teaching of “Learning, Training, Competition, and Creation” in the Software Industry Chain

The four in one practical teaching of “learning, training, competition, and innovation” for the software industry chain requires the reconstruction of the teaching system of the software industry chain, in order to innovate the implementation path of practical teaching for the software industry chain, construct a school enterprise collaboration mechanism and operational guarantee, and create a high-quality talent evaluation system and quality monitoring mechanism, thereby achieving deep integration of the education chain, talent chain, and software industry chain.

3.1. The path of reconstructing the teaching system for the software industry chain

3.1.1. Systematically reshape the existing teaching system

Each educational field must break the traditional linear teaching structure with subject knowledge system as the core, attach great importance to the dynamic demand for talent ability in the software industry chain, and shift towards modular restructuring based on industrial job ability modules.

Firstly, vocational education requires in-depth research and ability element decomposition of typical job groups in the software industry chain, sorting out the knowledge, skills, and literacy requirements for core positions such as software development, testing, operation and maintenance, and project management. Based on this, the teaching content is integrated into several interrelated and relatively independent ability modules. Secondly, universities should eliminate outdated knowledge points that are disconnected from industry demand, adjust course settings and teaching content, integrate cutting-edge software industry technologies such as cloud computing, big data, artificial intelligence, and blockchain, and ensure that teaching content is updated in sync with industrial technology development.

It should be noted that vocational education must be based on practice, breaking down barriers between courses, reconstructing the curriculum system according to the workflow and project implementation logic of industry chain positions, forming several curriculum chains covering different technical directions and job levels, and achieving precise alignment between curriculum content and job tasks.

3.1.2. Build a deep integration mechanism between teaching resources and industrial elements

On the one hand, vocational education should actively connect with upstream and downstream enterprises in the software industry chain, and jointly build and share a

library of practical teaching resources. Among them, there are industry-leading development tools, real enterprise project case libraries, dynamically updated technical documents, industry expert resource libraries, etc. On the other hand, universities should transform elements such as technical standards, process flows, and project management norms in the industry into trainable resources. [3]

For example, vocational colleges should first organize teachers and technical backbone of enterprises to jointly transform the development process, code specifications, testing standards, etc. of software enterprises into practical training manuals, teaching cases, and assessment indicators, so that students can be exposed to the real technical requirements and work norms of the industry on campus; Colleges and universities should promote enterprises to transform their research projects and technical difficulties into practical or competitive topics for students, guiding students to master cutting-edge industrial technologies in the process of solving practical problems; Colleges and universities introduce real development environments and tool platforms from enterprises, allowing students to conduct practical training in simulated or real industrial scenarios through cloud based training, school enterprise joint laboratories, and other forms. This achieves deep integration of teaching resources and industrial elements at multiple levels such as technology, projects, and environment, ensuring that students' knowledge and skills can directly meet the actual needs of the industry.

3.2. Innovative Implementation Path of Practical Teaching for the Software Industry Chain

3.2.1. Design a progressive implementation chain

With the gradient changes in students' cognitive patterns and the requirements for software industry chain positions, universities need to scientifically decompose the four stages of "learning, practice, competition, and innovation" into four stages: basic cognitive layer, skill enhancement layer, comprehensive application layer, and innovation and expansion layer.

Firstly, basic cognitive education and teaching should focus on the introductory learning of basic knowledge and tools in the software industry chain through course lectures, online experimental platform operations, and other methods. This will help students master core concepts such as programming languages, development environment construction, and basic algorithms, and enable them to have a preliminary understanding of the basic processes and job responsibilities in the software industry. Secondly, the skill enhancement layer requires universities to rely on training bases or virtual simulation platforms jointly built by schools and enterprises, and carry out modular special training around basic job tasks such as software development and testing in the industry chain. In addition, the comprehensive application layer needs to organize students to participate in the full process development of simulated enterprise projects in a team collaboration form, encourage students to integrate the knowledge and skills learned in the early stage, and cultivate project management skills and teamwork awareness through phased achievement display and mutual evaluation. Finally, the innovation and expansion layer needs to comprehensively guide students to independently select topics and carry out innovative project research and development based on cutting-edge technology trends in the software industry. Support students to form teams to participate in various software design competitions and innovation and

entrepreneurship competitions, further polish competition results or excellent projects, explore cooperation with enterprises for technology transfer or incubation of entrepreneurial projects, and achieve a leap in ability from skill application to innovation and creation.

3.2.2. Promote the conversion of commercial products or services

The ultimate goal of vocational education is to achieve the industrialization of teaching outcomes, and promoting the transformation of commercial products or services is the key path to achieving this goal. In the new era, under the “learning practice competition creation” four in one practical teaching mode, colleges and universities need to establish a full chain support mechanism from teaching achievements to commercial transformation.

Firstly, universities should establish specialized guidance centers for achievement transformation, equipped with a guidance team composed of industry experts, entrepreneurial mentors, and technical advisors, to provide students with full process guidance from creative evaluation, technical optimization to business model design. Secondly, the major should establish a school enterprise joint incubation platform, integrate enterprise resources to provide technical support, market research, funding docking and other services for student projects, and help students transform excellent project prototypes, technical solutions, etc. generated in practical training or competitions into commercially competitive products or services. [4] For example, for software applications developed by students with practical value, the guidance center can assist in connecting with relevant enterprises for demand verification, jointly improving product functions and formulating market-oriented promotion strategies, or supporting students to form entrepreneurial teams and promote products to the market through school enterprise cooperation channels.

The ultimate goal of vocational education also requires colleges to establish incentive mechanisms for the transformation of achievements, incorporating the effectiveness of commercial transformation into student practice credits, teacher teaching assessments, and school enterprise cooperation evaluation systems, stimulating the enthusiasm of all parties to participate in the transformation of achievements, and forming a complete ecological chain.

3.3. Construction and Operation Guarantee of School Enterprise Collaboration Mechanism

Colleges and universities need to build a collaborative education community based on the deep “learning practice competition creation” model to integrate industry and education. Firstly, universities can establish a school enterprise joint council, which is composed of university leaders, corporate executives, and industry experts as a decision-making body to coordinate the planning of practical teaching directions, resource allocation, and major project cooperation, ensuring that both schools and enterprises reach a consensus on talent cultivation goals. Secondly, the profession should explore diverse collaborative education models. For example, by jointly building a modern industrial college with software companies, the real R&D environment, project resources, and technical teams of the enterprise can be introduced into the campus as a whole, achieving scenario based teaching of “classroom as workshop, project as textbook, and teacher as engineer”. For example, the implementation of the “dual subject, dual mentor system” allows students to alternate between school and enterprise for phased learning and practice during their

learning period. School teachers are responsible for imparting theoretical knowledge, while enterprise mentors provide guidance on job skills to ensure a seamless connection between students' learning and industrial practice.

To ensure the long-term operation of the collaborative mechanism, universities should establish a dynamic interest coordination mechanism to clarify the rights and obligations of both schools and enterprises in talent cultivation, technology research and development, resource sharing, and other aspects. By jointly building training bases, jointly developing courses, and jointly applying for scientific research projects, complementary advantages and shared interests can be achieved.

3.4. Innovative Design of Evaluation System and Quality Monitoring Mechanism

With the continuous development of the times, vocational education needs to use big data analysis tools to quantitatively evaluate the entire learning process of students, in order to construct a diverse, dynamic, and full process evaluation system. Therefore, software industry education needs to break through the traditional single evaluation model centered on exam scores, and design an evaluation index system from multiple dimensions such as knowledge mastery, skill level, innovation ability, and industry adaptability, in order to construct a “learning practice competition creation” four in one learning practice.[5]

Learning requires universities to introduce big data and intelligent learning tools to dynamically track students' theoretical knowledge learning process. By analyzing data such as online course learning duration, accuracy of knowledge point testing, and classroom interaction participation, accurate assessment of students' knowledge mastery and learning progress can be made, and weak learning areas can be identified in a timely manner and personalized tutoring can be provided.

The “practice” stage requires the establishment of a skill assessment mechanism based on industry standards, relying on the practical training platform jointly built by schools and enterprises to record students' operational data and achievements in project development, code writing, testing and debugging, and inviting enterprise technical backbones to participate in skill evaluation. Multi dimensional evaluation should be conducted from the aspects of task completion quality, technical specification compliance, and problem-solving efficiency to ensure that skill evaluation is consistent with industry job requirements.

The evaluation of “competition” focuses on the combination of process and outcome. Therefore, teachers not only pay attention to competition results and award levels, but also analyze students' teamwork ability, technological innovation ideas, project management level, and problem-solving ability in the preparation process. The performance during the competition process should be included in the comprehensive evaluation system to promote evaluation and stimulate students' competitive potential and innovation consciousness.

Innovation requires teachers to comprehensively consider the actual effectiveness of guiding students to promote innovative projects or entrepreneurial achievements to the market, the transformation value of technological achievements, the feasibility of business plans, and the operational and management capabilities of entrepreneurial teams. Multiple parties such as venture capital institutions, industry experts, and enterprise representatives are introduced to participate in the evaluation, and the achievements of “innovation” are evaluated from the dimensions of market prospects,

technological innovation, and business model sustainability, promoting the true implementation and rooting of innovative achievements.

4. Conclusions

In summary, the four in one practical teaching model of “learning, practice, competition, and innovation” is an effective path to cope with the rapid changes in the software industry and improve the quality of applied talent cultivation. It requires vocational education to continuously deepen educational and teaching reforms, strengthen research on the integration of various links of “learning, practice, competition, and innovation”, explore personalized implementation plans that adapt to the characteristics of different levels of colleges and diverse student sources, and strengthen dynamic adaptability to industry development trends, promoting high-quality development of the software industry.

Conflicts of Interest

The author declares that there is no conflict of interest regarding the publication of this article.

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