Article

Teaching Innovation Based on Obe and Double Innovation Concept

Yixuan Xu [1,*]

[1] School of Computer Science, Guangdong University of Science and Technology, Dongguan, China
* Correspondence: Yixuan Xu, School of Computer Science, Guangdong University of Science and Technology, Dongguan, China

Abstract: In the context of the construction of new engineering disciplines and innovation driven development, this article proposes a teaching model based on the OBE education concept that integrates innovation, entrepreneurship, and competition to address the dual challenges of "lagging technical application ability" and "lack of innovative thinking" in the training of IT professionals. By constructing a third-order model of "competition targeting ability mapping dynamic feedback", deeply integrating professional competitions and entrepreneurship education, and taking "competition education integration", "competition promoting ability", and "competition assisting examination" as the main line, we promote the reform of the curriculum system, teaching methods, and evaluation mechanism. Taking the course of "Network Information System Design" as an example, the content of the National Network Technology Challenge is transformed into a step-by-step experimental project, modular teaching resources are developed, and real operation and maintenance scenarios are introduced to effectively connect course objectives with competition ability requirements. Practice has shown that this model significantly enhances students' innovation ability and practical level. Student teams have won competition awards and published software copyrights, and the results are fed back to teaching, forming a virtuous cycle of "teacher-student participation project transformation competition incentives", providing an innovative path for the cultivation of applied network engineering talents.

Keywords: OBE education model; integration of competition and education; innovation and entrepreneurship education; teaching reform; cultivation of innovative abilities

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1. Introduction

Against the backdrop of the construction of new engineering disciplines and the strategy of innovation driven development, the curriculum is facing a paradigm shift. Nowadays, many IT companies believe that there is a dual dilemma of "lagging technical application ability" and "lack of innovative thinking" in the current talent cultivation. The OBE education model emphasizes a closed-loop mechanism of "outcome oriented continuous improvement", which complements the methodology of "learning by doing and understanding by creating" required by entrepreneurship and innovation education. The synergistic integration of the two becomes the key path to solving teaching pain points [1].

There are three aspects to the existing teaching contradictions. The first aspect is the goal dimension. Traditional syllabi focus on knowledge coverage, which deviates from the "conception design implementation operation" ability chain required by CDIO engineering education. Only a small number of students can independently complete system level design. The second aspect is the method dimension. Experimental teaching often uses pre-set cases, lacking the complexity and uncertainty of real business scenarios, due

to the limited transformation of course practice results [2]. The third aspect is the evaluation dimension. The existing assessment focuses on functional implementation as the endpoint, neglecting the evaluation of innovation value throughout the entire lifecycle, resulting in the problem of "emphasizing demonstration over operation" in student participation projects.

The article is based on the OBE education concept and follows guided by the educational objectives of fostering innovation and entrepreneurship skills to construct a three-level model of "competition targeting ability mapping dynamic feedback". It fully integrates professional competitions and "innovation and entrepreneurship" competitions into the curriculum, conducts research and exploration on the education model around "competition education integration", "competition promoting ability", "competition assisting examination" and other aspects, summarizes the shortcomings in previous courses, analyzes professional competitions and "innovation and entrepreneurship" competitions, integrates them into the curriculum, establishes new era talent training goals, stimulates students' initiative and enthusiasm, and constructs a multi-level curriculum assessment system [3]. Promoting the reform of the education model through the integration of competition and education is conducive to comprehensively enhancing students' innovative thinking and abilities, and providing new ideas for cultivating applied network engineering professionals.

2. Framework Introduction

2.1. Transformation of Teaching Philosophy and Improvement of Curriculum System

Transforming the traditional teaching model centered on teaching into the OBE teaching philosophy, which focuses on students' ultimate outcomes, placing them at the core of teaching activities, and using reverse engineering to construct the entire talent development process based on expected learning outcomes. Moreover, the continuous improvement feature of OBE requires the establishment of an "evaluation feedback correction" loop, relying on big data analysis tools to monitor teaching effectiveness in real time. For example, in the course of "Network Information System Design", dynamic optimization of teaching strategies is achieved by collecting process data such as student code submission frequency and error repair cycle. This model emphasizes the close connection between the preset learning outcomes, the execution of the teaching process, and the evaluation of outcomes, which can comprehensively enhance students' comprehensive abilities.

The "integration of competition and education" teaching model focuses on reorganizing the curriculum system and teaching content, using classroom competitions as the carrier and actual teaching cases as the main line, and utilizing project-based and task-based teaching models to construct a student-centered classroom [4]. Through online and offline integration, innovative teaching models, and deepening school enterprise cooperation, we continuously strengthen the organic integration of teaching and competition, forming a "competition education integration" system of "teacher-student participation, project transformation, competition awards, and feedback incentives".

2.2. Teaching Model

In daily teaching, on the basis of using a blended learning method that combines online and offline, learning forms such as flipped classroom, project-based learning, and collaborative learning are integrated. In combination with professional competitions, such as the Network Technology Challenge, the Internet plus "Undergraduate Innovation and Entrepreneurship Competition", the National Undergraduate New Generation Information and Communication Technology Competition, during the competition process, students will integrate their theoretical knowledge into the project and competition, and a series of feedback formed by competition awards, personal accomplishment and reward mechanism will further encourage students to practice deeply, improve the project, and

actively participate in the competition, so as to achieve the effect of "promoting learning through competition" and "applying learning to practice"[5].

On the basis of the original assessment mechanism, drawing on the evaluation models of professional competitions and "double innovation" competitions, project proposals, literature reviews, experimental plans, data analysis, final papers, reflections and insights will be added to the assessment system in the form of independent or group cooperation, enriching the assessment tools and methods. At the same time, referring to the characteristics of competitions that progress from shallow to deep, layer by layer, stage by stage, and routine, we do not evaluate students based on the final experimental results, but rather focus more on process assessment. Through continuous process feedback, we provide students with real learning effect evaluation, which can also strengthen the guiding role of teachers. By integrating with competitions, with the characteristics of mutual complementarity, rich content, and seamless process, students' experimental operation, experimental ability, and experimental quality are assessed from multiple perspectives, and a multi-level, multi angle, and multi-stage curriculum assessment system is constructed [6].

This model constructs a three-layer coupling system of "objectives, processes and resources": at the target level, by establishing the mapping relationship between the competition scoring standards and the curriculum capability matrix, the evaluation dimensions of innovation and commercialization of the network technology challenge and the "Internet plus" competition are broken down into quantifiable teaching indicators, such as the "system integrity" of the technical scheme scoring items into the modular design capability requirements of the curriculum; At the process level, a double helix propulsion mechanism is adopted, and the teaching process follows the technical route of "requirement analysis → prototype development → commercial verification", forming a synchronized timeline for teaching practice and competition preparation; At the resource level, build a dynamically updated three library system-including a technical case library of previous award-winning solutions, a commercial project library of real enterprise needs, and a knowledge tool library of supporting micro course videos. The three types of resources are intelligently matched and pushed according to the teaching progress.

The overall reform content of the teaching mode is shown in Figure 1:

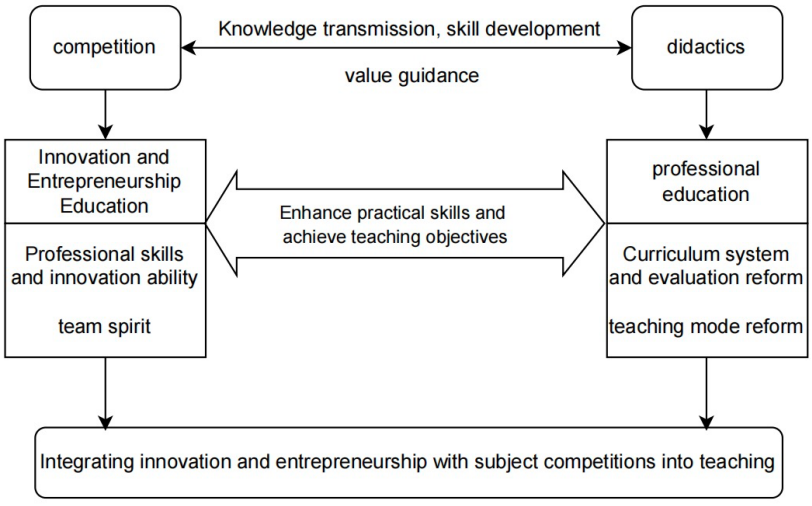

Figure 1. Overall Reform of Teaching Mode.

3. Implementation Plan for Teaching Reform

The project team members first select competition categories based on the talent training plan and course objectives, such as the Network Technology Challenge, the Internet+ "College Student Innovation and Entrepreneurship Competition", the National

College Student New Generation Information and Communication Technology Competition, etc. Integrate the competition content into the curriculum and develop a complete set of teaching resources for the course, including lesson plans, teaching PPTs, teaching videos, evaluation criteria, and other online and offline teaching resources. And organize teachers to promote the competition.

Then, fully utilizing teaching methods and tools such as case analysis, task driven, project-based, and flipped classroom, the teaching implementation process is carefully organized, and "double innovation" and competitions are integrated into the teaching content, allowing students to naturally understand and participate in competitions in the course learning, independently integrate the course content, and improve their innovation ability.

Taking the Network Technology Challenge as an example, the selection of A series works must be related to at least one of the following network technology branches: software defined networks, network security, network data analysis, IPv6, etc. It can be the research, design, development, deployment, and management of network systems. According to the course objectives, the research, design, development, deployment, and management of network systems are more in line.

The combination of the course and the competition is shown in Figure 2:

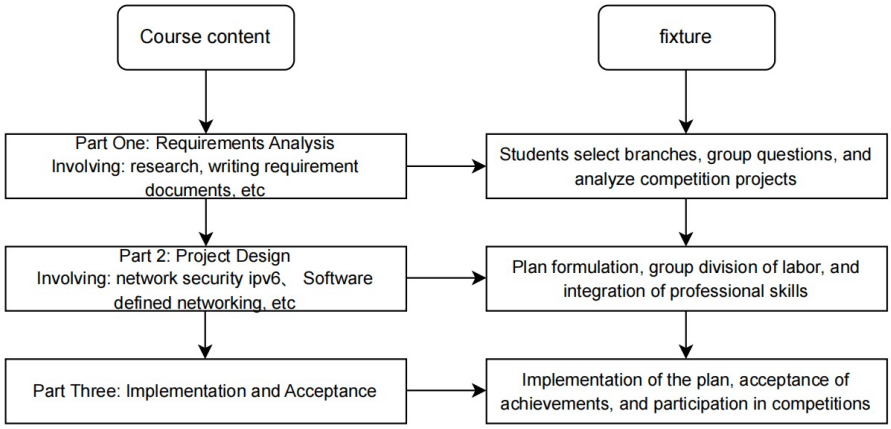

Figure 2. Case Study of Competition and Course Integration.

Finally, in the teaching practice of "competition education integration" based on OBE and entrepreneurship, a summary of teaching implementation should be made, integrating multidimensional evaluation indicators such as professional knowledge and skills, innovative thinking ability, teamwork spirit, and social responsibility, to comprehensively measure students' comprehensive abilities. And lead students to transform and apply the results.

4. Effectiveness Case

"Network Information System Design" is a compulsory course for network engineering majors, allowing students to conduct a comprehensive review of their learning by attempting to solve a complex and integrated engineering project problem. At present, the teaching of this course mainly adopts traditional teaching methods, which generally have the following problems:

Firstly, there is a lack of cultivation in innovative thinking. Traditional teaching methods tend to select a single item, which limits students' comprehensive understanding of the curriculum and also leads to a loss of motivation to explore new ideas and solutions; Secondly, there is a disconnect between competition and teaching. Although competition can stimulate students' interest and motivation, promote knowledge application and skill improvement, the lack of integration between competition and daily teaching content and

goals may cause a sense of disconnection in students' learning, making it difficult to effectively transform competition results into learning outcomes. Finally, the evaluation methods for the course are relatively single. After the course is completed, it is mainly assessed through large assignments to conduct a rough statistical analysis of students' mastery of knowledge points. Therefore, it is impossible to analyze in depth whether they have met the graduation requirements and training objectives. Therefore, it is difficult to objectively and comprehensively evaluate the course, which is not conducive to continuous improvement of the course.

In response to the problems of insufficient innovation cultivation and disconnection between competition and teaching in the course, the course team has taken three improvement measures:

1) Transforming the real questions of the National Network Technology Challenge into a step-by-step experimental project, designing a three-stage task chain of basic operation and maintenance, intelligent monitoring, and fault self-healing (Python script development).
2) By breaking down the technical key points of competition winning cases and developing a modular experimental manual, the connection between the curriculum and competition ability requirements can be achieved.
3) Introduce real campus network operation and maintenance scenarios to guide students in developing automated configuration tools.

Taking a group of students' topic selection of Python automation network operation and configuration distribution scheme as an example, in terms of practicality, Python scripts can quickly configure a large number of network devices and improve consistency; Automatically collect and analyze logs, locate and restore faults; Real time monitoring of equipment status, automatic alarm in case of abnormalities; Automatically deploy security policies, regularly check their effectiveness, and automate repetitive tasks such as backup and updates. It can quickly complete complex tasks, manage devices in batches, execute based on preset rules, and reduce human errors. Automatically maintain security policies, detect threats in real-time, and enhance their security. By setting alarm conditions, problems can be detected in a timely manner, ensuring network stability and reducing interruption losses. Finally, with this project, he won the third prize in the South China Division of the Network Technology Challenge and published a software copyright, continuing to apply for college student innovation and entrepreneurship projects. This achievement has been included in the curriculum teaching case library and promoted as a demonstration project for the integration of competition and education on campus. By rewarding teaching through competitions and transforming scientific research achievements into practical applications, students' learning enthusiasm and innovative potential can be effectively stimulated. The project team will continue to improve system functionality and plan to open source core code to promote technical exchange and talent development.

5. Conclusions

The article integrates the OBE education concept with the practice of entrepreneurship and innovation, and solves the pain points of traditional teaching such as goal deviation, method solidification, and single evaluation, achieving a deep integration of curriculum system and competition ability. Taking the reform of the course "Network Information System Design" as an example, through measures such as transforming competition questions, decomposing cases, and embedding real-life scenarios, students' innovative thinking and technical application abilities have significantly improved, and the results of achievement transformation have been outstanding (such as competition awards, software copyright, and project incubation). The construction of a multidimensional evaluation system not only strengthens the process assessment, but also promotes the dynamic optimization of the teaching loop. In the future, this model can be further promoted

through open source core code and expanding school enterprise cooperation, providing sustained motivation for cultivating new engineering talents with engineering practice ability and innovative literacy. Research has shown that the collaborative path of promoting learning through competition and empowering innovation is an effective practice for higher education to adapt to industry demands and serve innovation driven development strategies.

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