

# **Discussion on the Comprehensive Promotion of CDIO Engineering Education Model in Higher Vocational Colleges**

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***ABSTRACT.** Based on the needs of CDIO engineering education, the author starts from the reform of traditional educational concepts, personnel training system, teaching mode and management system problems existing in higher vocational colleges, author also proposes to construct measures to meet the needs of CDIO engineering education. And the author emphasizes the integration of "artisan spirit" into the whole process of CDIO engineering education, allow students to develop in terms of professional skills and professionalism, to meet the needs of higher vocational colleges to train high-end skilled professionals.*

***Keywords:** CDIO; Engineering Education Model; higher vocational colleges*

## **1. Concept of CDIO Engineering Education Model**

The CDIO engineering education model divides the ability of engineering graduates into four levels: engineering basic knowledge, personal ability, interpersonal team ability and engineering system ability. The CDIO engineering education model provides comprehensive and systematic guidance and standards for implementation testing from training programs, teaching methods, student assessments, and implementation tests, providing schools and students with a new model for teaching and learning engineering education.

## **2. Application Status of CDIO Engineering Education Concept in Higher Vocational Colleges in China**

CDIO engineering education has been applied in China for nearly 13 years, and with the joint efforts of the Ministry of Education and related schools, it has achieved gratifying results. However, all the pilot schools in the National CDIO Engineering Education Alliance are undergraduate colleges and there are no higher vocational colleges. The concept of CDIO engineering education meets the characteristics of higher vocational education, it is highly compatible with the concept of talent training in higher vocational colleges, which provides an entry point for higher vocational education to learn from the CDIO model.

In 2008, Xu Bing, a teacher of the Vocational and Technical College of Jiangsu Industrial Park, began to introduce CDIO engineering education into higher vocational colleges. Since then, higher vocational colleges have focused on and studied CDIO engineering education and applied it to curriculum reform and practical teaching. The number of higher vocational colleges has gradually increased, reaching a peak in 2012-2015, and then the growth rate has slowed down.

Due to the short time of contact with CDIO engineering education in higher vocational colleges, more attention is paid to “project-based teaching“ and “learn by doing“ in the process of CDIO engineering education exploration and implementation. Some colleges have begun to apply the CDIO engineering education concept to the reform of teaching reform, curriculum reform, and post-internship reform. However, many reform measures are often partial, single, and unsuitable. Some colleges have also weakened CDIO engineering education into a learning model.

The CDIO engineering education model is a brand-new engineering education model. It has great differences from traditional engineering education models in terms of educational concepts, teaching methods, and management systems. Therefore, in the process of promoting CDIO engineering education, if we do not comprehensively and systematically reform the curriculum system, teaching methods, evaluation systems, and management methods from the perspective of personnel training, it is difficult to learn CDIO engineering education. And difficult to learn deep professional connotation, improve the quality of personnel training, meet the requirements of talent training in the new era.

### **3. Constructing the teaching mode and operation mechanism of higher**

### **vocational colleges with CDIO engineering education concept**

The teaching mode refers to a relatively stable teaching activity structure framework and activity program established under the guidance of certain teaching ideas or teaching theories. The teaching mode determines the relationship, function of the teaching activities and the various elements, so that the teaching process is orderly and operable <sup>[2]</sup>.

#### ***3.1 Building a new curriculum system***

The new curriculum system is not based on the proportion of the school hours to simply adjust the proportion of theoretical and practical courses or rearrange the original curriculum content, but according to the requirements of the talent training model and professional characteristics in the curriculum and curriculum content to design, innovate and optimize. The core of the new curriculum system construction is to systematically and completely reduce the theory and integrity of the chemical science theory, blur the professional boundaries, and build a curriculum system with the purpose of product life cycle from product development to product operation. Conditional colleges should also build a multi-level, modular curriculum system based on the concept of individualized training to meet the needs of students' hierarchical and individualized development.

#### ***3.2 Reform teaching methods***

Use CDIO engineering education theory and modern educational technology to promote teaching-driven, problem-oriented, participatory, heuristic, discussion, case teaching and other interactive teaching modes, and develop project-driven and exploration-oriented teaching methods and training program.

#### ***3.3 Reform the teaching evaluation system***

Teaching evaluation should focus on students' ability to ask questions, analyze problems and solve problems, and establish various forms of teaching evaluation standards and methods, such as interviews, small papers, curriculum design, experimental assessment, open book exam closed book combination, skill

competition, internship evaluation, professional course completion exam and social vocational qualification examination and other evaluation methods, to make diversify teaching evaluation.

#### ***3.4 Develop students' ability to learn independently***

Using the CDIO engineering education platform, using innovative theories and modern educational techniques to stimulate students' interest and enthusiasm for learning. Guide students to face problems, actively think, explore independently, find ways and methods to solve problems, and enhance their ability to understand, to use knowledge.

#### ***3.5 Emphasis on the construction of campus laboratories, training bases and college-enterprise cooperation platforms***

The on-campus training base is the main place for implementing practical teaching links. It is necessary to set up a laboratory or training base in a professional category based on the training objectives of talents, highlighting the characteristics of “industry“ characteristics, disciplines, and professional integration. The on-campus training base enables the laboratory and training base have the functions of simulation and actual field combination, routine operation and troubleshooting combination, science and technology and scientific research combination, and create good environment for student training, science and technology research, teacher education reform and scientific research. The off-campus training base is the basic mode of college-enterprise cooperation in running colleges, strengthens the in-depth cooperation between colleges and enterprises, and forms a stable and mutually beneficial cooperation mechanism and community of interests.

#### ***3.6 Strengthening the cultivation of teachers' engineering practice ability***

With the help of the CDIO education model reform platform, strengthen the cultivation of teachers' practical ability, and form a team of teachers who are both theoretically and practically applied as soon as possible; Reform the existing assessment, evaluation, training and incentive mechanism for young teachers, The

experience and performance of bringing students to an internship or participating in professional practice as one of the indicators for the assessment of a teacher or promotion of a professional title, through the incentive mechanism and institutional guarantees, it is normal to relieve the worries of young teachers and let young teachers go to enterprises for professional practice. Improve the structure of teachers, hire enterprise engineering and technical personnel to serve as part-time teachers, plan to arrange enterprise engineering and technical personnel to attend classes and conduct business training and technical guidance for teachers, and continuously improve teachers' engineering practice ability.

#### **4. Conclusion**

Although the CDIO engineering education model has achieved positive progress and phased results in China after more than ten years of practice and development, in the implementation process, the traditional educational concepts, teaching models, management systems reform the CDIO engineering education model and there is still a lot of resistance or influence in practice. Therefore, to comprehensively promote the CDIO engineering education model, it is necessary to start from reforming traditional educational concepts, teaching models, and management systems, constructing new talent training models, and reforming traditional teaching models and operational mechanisms. Establish a student-centered, teacher-led educational philosophy, innovative teaching methods, and strengthen the cultivation of students' basic knowledge, personal ability, interpersonal team ability and engineering system ability. While paying attention to the cultivation of students' ability, the "artisan spirit" is integrated into the whole process of CDIO engineering education, and the students' craftsmanship spirit is cultivated in a way of "smooth and quiet", so that students can develop in a comprehensive way and become the high-end skills required specialized personnel by enterprises.

#### **5. Note**

This paper is a research results of key research base of humanities and social sciences of the Education Department of Sichuan Province--Coordinated Urban and Rural Education Development Research Center Project<Exploring the Cultivation of

Higher Vocational Talents by Integrating Craftsman Spirit into Engineering Education (CDIO) (Project Number: CCXJY-2018-B05)>.

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