

Application of CDIO Theory in Specialty Construction

Di Wu^{1,a*}, Guojun Sheng^{1,b} and Chuanlin Huang^{1,c}

¹ Dalian Neusoft University of Information

^awudi@neusoft.edu.cn; ^bshengguojun@neusoft.edu.cn; ^chuangchuanlin@neusoft.edu.cn

*the corresponding author

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Abstract. Specialty construction is one of the most important teaching infrastructure, reform and development of institutions has a profound impact. In order to meet the needs of talent training in the market, colleges and universities continue to carry out education and teaching reform. As the mainstream engineering education mode in the world, CDIO pays attention to the cultivation of students' skills and practical abilities. This model has been recognized by many colleges and universities. In this paper, it discusses the international CDIO training mode and method of application based on information management and information system's specialty construction.

Introduction

At present, China's economy has entered a period of adjustment of weak growth. During this period of adjustment, change and transformation will be the main theme of China's economic development. Change and transformation involve the transformation of economic structure, industrial structure, environmental impact and urban-rural structure. These require a large number of engineering talents to adapt to this economic situation. They are required not only to master the increasing professional knowledge and skills, but also to know more about humanities than ever before, to understand many global problems, and to have cultural diversity and efficient communication and communication skills.

With the popularization and popularization of higher education, it is an unavoidable problem for higher education to meet the needs of society. Exploring the reform of higher education, researching the new mode and method of engineering education are the main tasks of higher education reform. This paper discusses the application of international CDIO training mode and method in the construction of information management and information system specialty.

CDIO Theory

CDIO engineering education model is the latest achievement of international engineering education reform in recent years [1]. The meaning of CDIO is: Conceive, Design, Implement and Operate. It takes the life cycle from product (system) development to product (system) operation as the carrier to enable students to acquire engineering knowledge, ability and attitude in an active, experiential and integrated way. CDIO engineering education mode takes the life cycle of products from R&D to operation as the carrier, which enables students to learn engineering in an active, practical and organic way. CDIO training program divides the abilities of engineering talents into four levels: basic engineering knowledge, personal ability, interpersonal team ability and engineering system ability. It requires that students achieve their intended goals in these four levels by comprehensive training methods [2].

The guiding ideology for the construction of information management and information system in our university is to focus on cultivating enterprise information engineers with comprehensive competitiveness. Guided by the CDIO engineering education model, this paper integrates the talent training ability index, the theoretical curriculum system, the practical curriculum system, the teaching method and the organization mode, and explores a new educational model suitable for the training of innovative talents in information engineering.

Application of CDIO in Specialty Framework

Specialty is the link and bridge between talent cultivation and social needs in Colleges and universities, and plays an extremely important role in talent cultivation. Specialty construction is the key link for colleges and universities to meet the needs of society and the core of the construction of colleges and universities [3]. Specialty construction should be based on the objectives of production, construction, management and service, highlight the needs of social posts, so that teaching can meet the needs of regional economic development, industrial restructuring and high-tech development, and train talents according to the actual needs of industries and enterprises. Specialty construction is also a system engineering involving many contents, long implementation cycle and complexity [4]. The system engineering of specialty construction includes many aspects, such as the exact orientation of training objectives and specifications of specialists, the deepening of curriculum system and teaching content, the strengthening of practical teaching links, the establishment of training ways of production, teaching and research talents, and the reform of educational ideas and teaching methods.

How to carry out Specialty construction in an orderly way? Firstly, CDIO is used as the guidance at the planning level. As mentioned earlier, CDIO describes the life cycle of a product from development to operation. At this level, we can assume that the product is 'Specialty'. Specialized construction projects can be divided into specialty conception, specialty design, specialty implementation and specialty operation stages, as shown in Table 1. As the CDIO engineering education mode has been gradually developed in the field of higher education in recent years, most of the major of CDIO teaching reform in China is in the stage of conception and design, and a few are in the stage of implementation and operation. The problems encountered in the process of implementation and operation need to be further explored.

'Engineering Products'

Table 1 Specific application of CDIO in specialty construction

| Stage | Product | Conceive | Design | Implement | Operate |
|-------------------------|--|--|--|--|---|
| Specialty Framework | Specialty | According to the planning of university specialty setting, determine the specialty setting | Establishment of Specialty Talents Training Program | According to the implementation plan to train specialty students, the general implementation cycle is four years (take undergraduate students as an example) | solve the problems encountered; at the end of the implementation cycle, improve and optimize the implementation plan and enter the next implementation cycle. |
| Specialty Teaching Plan | Engineering products that students can master after specialty training | Course Setting for Developing the Ability of Conceiving 'Engineering Products' | Course Setting for Developing the Ability to Design 'Engineering Products' | Course Setting for Training and Implementing the Ability of 'Engineering Products' | Course Setting for Training the Ability to Operate Engineering Products |
| Course Construction | Ability System of Course Training | Conceiving Teaching Content of Course with 'Ability System of Course Training' as the Core | Design Teaching Resources with 'Teaching Content' as the Core | Comprehensive utilization of various teaching resources to accomplish teaching tasks | According to the effect of implementation, we should modify and adjust teaching resources and optimize the content of curriculum onstruction. |

Application of CDIO in Specialty Teaching Plan

Specialty teaching plan is a specific plan to guide students to study and develop towards a certain professional goal. Teaching plan is an important document to ensure the teaching quality and personnel training specifications of colleges and universities. It is also the basic basis for organizing teaching process, arranging teaching tasks and determining teaching preparation [5].

At the management level, products are assumed to be ‘engineering products that can be mastered by students after specialty training’ (e.g. products of information management and information system specialty are ‘management information systems’), so the formulation of specialty teaching plan should take the conception of management information system, the design of management information system, the implementation of management information system and the operation of management information system as the main line to design the theoretical knowledge system and the practical ability system. as shown in table.

The core idea of CDIO is to let students learn by doing, to organize the whole learning process with ‘project’ or ‘project case’ as the carrier, and to arrange the teaching content and methods driven by the knowledge needs of different stages in the process[6]. Simply in the school environment or in software enterprises to achieve CDIO teaching mode and purpose will be subject to different constraints, which requires the close integration of enterprises and schools, but not limited to the traditional operation of enterprises or schools.

Breaking the limitation of traditional teaching content and curriculum setting in Specialized teaching plan, combining theory with engineering practice closely, and promoting theoretical learning through practice content. The specific ideas are as follows:

To incorporate the latest achievements of industry and academia into the teaching contents of courses in time, especially the teaching contents of specialized courses, it is necessary to fully reflect the latest achievements of the industry. For example, the College is further developing courses such as Enterprise Resource Planning, SAP Application Course, Information System Analysis and Design. Make full use of the good cooperative relationship established with NEUSOFT, SAP and other well-known enterprises, and use more latest software theory, software tools and new technology to reform existing courses or open new courses.

According to the teaching mode and method of CDIO, The project promotes the perfection of the subject setting and syllabus content of the core curriculum of the specialty. It is not only required that all core specialty courses should be equipped with experimental courses and curriculum project, but also that the project practice content for enhancing the ability and understanding of the course should be continued after the courses of ‘Database Principles and Applications’, ‘Accounting’, ‘Information System Analysis and Design’, ‘Enterprise Resource Planning’. A group of well-designed project cases promote the interest of curriculum learning and the cultivation of practical ability.

Major specialty courses in the third stage, such as information system analysis and design, project management, etc., are organized and taught entirely by linking up specific projects or project cases. Senior engineers of enterprises and teachers of schools cooperate to complete course teaching process. The content of each course is arranged according to the progress of the project, Students can be divided into different research groups according to project case, It not only realizes the knowledge of ‘learning by doing’, but also trains and exercises the students' ability of innovation and teamwork. In terms of teaching arrangement, the teaching of specialty courses is combined with students' practice, thus resolves the situation that the past teaching and practice process is always in the ‘two skins’.

We will continue to strengthen the construction of existing courses such as English communication and IT vocational English, and combine them with the teaching contents and syllabus of specialized courses. We will carry out reforms in the aspects of project planning and process management, increase the requirement of presentation, and make the cultivation of students' communication and expression ability, English practical ability (internationalization) and team cooperation ability. These abilities are an important part of the training of comprehensive abilities.

Application of CDIO in Course Building

Course is the core and soul of specialty teaching plan, and curriculum construction is an important work of specialty construction [7]. At the execution level, the product is assumed to be ‘the ability system of curriculum development’ (e.g., the product of enterprise resource planning course is ‘the ability of basic application of ERP platform’), then the course building should take the concept, design,

implementation and operation of ‘the ability system of course development’ as the core to carry out the related resource construction [8], as shown in Table 1.

Under the guidance of CDIO concept, the course of Enterprise Resource Planning focuses on the integration of basic theory and project practice [9], as shown in Figure 1. It unifies the project background of ‘XX SME Business Process’. The project runs through the theory and practice design of ERP course. At the same time, ERP course takes the business processes related to the operation of small and medium-sized enterprises as the main line, uses practical case-based approach, uses theoretical knowledge to solve practical problems, and cultivates students' creative thinking ability.

In the first stage, teachers explain the content of the project and demonstrate the process of the project, and students carry out project practice under the guidance of teachers. This is from theory to practice, reflecting the idea of ‘learning to do’ ; In the second stage, students independently complete the project practice and summarize the basic theory used in the project, which is from practice to theory, reflecting the idea of ‘learning by doing’ . These two stages of learning are not simple repetition, but the precipitation of knowledge and the sublimation of theory. At the same time, the teaching activity of enterprise resource planning is a gradual and progressive teaching system with hierarchical, parallel theory and practice, from simple to complex. In the teaching process, according to the characteristics and rules of students' learning, the whole course system of enterprise resource planning is divided into theoretical learning, four-level project (single practice), three-level project (multi-module collaborative practice) and so on. The course arrangement is set up according to the process of students' understanding of objective things, so that students can gradually master the core management ideas of ERP and the in-depth understanding and application of ERP platform.

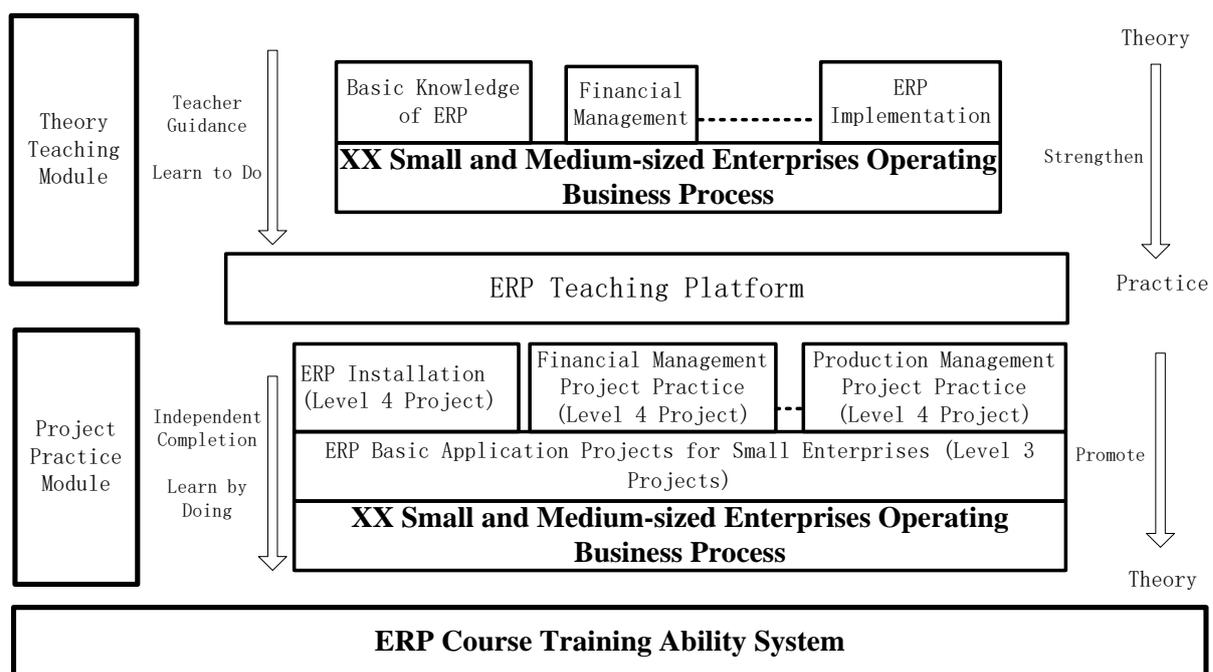


Figure. 1 Design of ERP course

Conclusion and discussion

At present, some colleges and universities are actively carrying out CDIO engineering education model research and practice of education and teaching reform. The application of CDIO enables colleges and universities to reorient and sort out the objectives of professional training, teachers' educational concepts and curriculum design ideas. These changes will be directly reflected in the personnel training mode of various majors, thus making thousands of students benefit. CDIO education mode emphasizes the importance of students' principal position and active learning in the process of teaching and curriculum implementation. At the same time, OBE education mode is also widely used. OBE is a ‘result-oriented, Reverse-Design teaching system’ education model, which

originated from the basic education reform in the United States and Australia in the 1980s [10]. OBE educational model emphasizes that students' learning output is more important than their learning process. The objective of OBE education model is to design appropriate educational structure and curriculum system for students' expected learning outcomes. How to combine OBE and CDIO education modes so that the talent training of colleges and universities can truly meet the needs of society is the future research direction.

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