

## Realization of Engineering Practice Education Based on CDIO for Electronic Information Engineering Major

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**Keywords:** CDIO, Electronic Information Engineering, Practical teaching system, Innovation

**Abstract.** Based on the CDIO Engineering Education the training plan to the major of electronic information engineering is formulated which is divided into several stages for implementation and practical teaching reform. With The learning content of relevant courses is organized around projects, the corresponding teaching system is setting up about the curriculum group project and jointly building the laboratories. It is proposed from the aspects of the demand analysis, design, implementation and operation, and takes the period from product development to product operation as the carrier. The curriculum system is actively implemented to realize three levels. The CDIO Engineering Education can improve students' ability of solving system problems and team cooperation, and finally achieve the goal of innovatively completing the project.

### Introduction

With the development of social diversification, the various disciplines and technical fields are constantly showing the situation of cross-cutting, infiltration and integration. The trend of comprehensive development is particularly prominent in the field of engineering discipline the research and engineering practice, which makes the engineering problems no longer a simple single problem but the complex problems of economic, social, humanistic, moral, theoretical and other elements. This undoubtedly puts forward higher requirements for the quality of advanced engineering talents. The higher engineering education in our country should adapt to the development of engineering field and cultivate engineering talents with all-round development of quality and ability that meet the needs of industry. The electronic information industry puts forward the higher requirements for applied talents. The curriculum system of electronic information specialty in the colleges or universities should be adjusted properly to solve the problem of the disconnection between teaching and practical engineering in the Colleges and Universities under the new situation, and to provide innovative applied talents to the society.

The CDIO education model is an important way to solve this problem. The model of the CDIO engineering education is the result of international education reform in recent years, which provides an effective way for the higher engineering education and innovative talents education. Based on the concept of the CDIO engineering education, this paper puts forward some methods to optimize the practical teaching system. The content of practice requires students to design and complete independently, so as to realize the active design and innovative implementation. The practice teaching reform based on CDIO is implemented formulating training plan for CDIO specialty, setting up the curriculum group projects and jointly building laboratories.

### CDIO Engineering Practice Education Model

CDIO is a form of shorthand. When we work on the process of Conceive (C) - Design (D) - implementation (I) - operation (O) , which are not isolated[1]. Under the guidance of the CDIO engineering education of every link of conception, design, implementation and operation, we have carefully designed the curriculum system of electronic information engineering specialty and decomposed and distributed the project in the corresponding curriculum. Project-centered, divided into several stages for implementation, the relevant curriculum learning content around the

project organization, to develop the students' knowledge, ability and quality in an all-round way. Respect the principle of combining theoretical teaching with practical teaching. Taking project cases as driving force and learning by doing as slogan, we can stimulate the interesting of students in learning and improve students' learning initiative, innovation ability and team communication and cooperation ability.

As an indispensable part of higher education, the position and role of practical teaching in personnel training is unshakable. To a certain extent, the quality of practical teaching methods determines the success or failure of training innovative talents. Faced with the lack of innovative practical ability of college students nowadays, how to transform professional knowledge and skills into innovative ability is the foundation and the only way to cultivate innovative ability. Therefore, cultivating comprehensive talents with innovative ability can enable them to have a strong multi-disciplinary and large-scale system control ability and better teamwork. Spirit is an urgent problem facing universities of science and technology at present[2].

### **Construction of Practical Course System for Electronic Information Engineering Major Based on CDIO**

#### **A. Formulation of talent training plan under CDIO mode**

In the process of formulating the training plan, we always take the CDIO engineering education thought as the guidance, and focus on the comprehensive training of conception, design, implementation and operation ability. We decompose the training goal into the teaching plan, and construct a multi-level practical teaching system which integrates curriculum design, practical courses, practical training and graduation design. The principle of curriculum study, which takes into account both depth and breadth, quality and skills, ensures the integrity of knowledge system to the students.

Under the background of close cooperation between engineering education and industry, we determine the requirements of employing units in industry by visiting enterprises with international standards, holding professional steering committees and industry experts' seminars, and analyzing feedback information from graduated students' surveys. At the same time, we introduce CDIO concept to clarify the objectives of personnel training and cultivate qualified personnel. An engineer who meets international standards and meets the needs of modern engineering[3].

#### **B. Establishing an Open Experimental Teaching Platform for Innovation**

The premise of innovative teaching reform of integrated practical courses is the rich resources and flexibility of the experimental environment. The construction of an open experimental teaching platform for innovation and entrepreneurship provides environmental support for the reform. The current experimental platform basically satisfies such training, that is, students start with a concept or idea, then proceed to the design of circuit schematic, programming code, debugging, PCB design, and finally form the whole product development process. The existing teaching experiments of various embedded systems still need to be improved in cultivating the ideal from the students of "from concept to product". The training that students get through traditional experimental means is one-sided and partial, and their understanding of product development process is not profound, which is also the fundamental reason why students can not use what they learn[4]. Although the existing laboratory construction has been completed, whether it is innovative entrepreneurship or CDIO, its practice process is relatively long-term, throughout the classroom to extracurricular.

### **Implementation of Practical Course under CDIO Mode**

#### **A.Implementation of Professional Practice Course**

In practical courses, teachers are encouraged to adopt diversified teaching modes, practical methods and means to ensure the implementation of CDIO concept: taking the student engineering innovation incentive mechanism based on tutorial system as a useful complement to the teaching system, organizing engineering research and development teams, encouraging students with more learning ability to carry out engineering innovation, in order to strengthen the implementation of CDIO concept. The cultivation of comprehensive abilities of the students in conception, design,

implementation and operation[5-8].

Based on the concept of CDIO, electronic information engineering specialty education actively cooperates with well-known enterprises at home and abroad, strengthens practical teaching, establishes practice teaching bases inside and outside the school, takes experiment and practical training as the breakthrough point, and constructs engineering specialty practice teaching with four levels of basic skills, comprehensive design, enterprise application and innovation practice. Learning system, the establishment of experimental teaching base in school, to cultivate students' basic engineering ability; through the establishment of off-campus engineering practice base, to cultivate students' ability to use curriculum knowledge to solve engineering problems and industrial quality. Through uninterrupted practice teaching, the gradual cultivation of comprehensive ability can be realized. The experimental system with the cultivation of electronic information engineering ability as its core has set up many levels of practical teaching links, such as course design, school year design, course group project design, enterprise training, enterprise practice and graduation design. At the same time, the students' open experiments, innovative experiments and schools closely related to the practical teaching system have been established. A series of practical activities, such as competitions, social practice and so on, are carried out by students both at home and abroad.

### **B. Integration into Practical Teaching System**

The integration project seamlessly integrates the success or failure of the reform of information engineering practice teaching system. Firstly, the integration project is divided into different levels and contents for different courses. Each sub-project is relatively independent and interrelated. It is repeated in theory teaching to achieve the purpose of integrating practice into theory and guiding practice by theory. This reflects the continuity of knowledge and practice, conforms to the law of human cognitive things, from easy to difficult, so that students can experience a sense of achievement in the process of learning knowledge and solving problems, and overcome the fear of difficulties.

In the direction of embedded system, the integrated experimental teaching design is planned and implemented step by step. Facing the project guidance of students, teachers complete module division and task assignment. With the help of network resources, students complete product innovation design and project realization through self-learning. Teachers can complete problem guidance in teacher-student interaction through forums, give specific guidance to learning behavior in the form of comments, and evaluate the learning effect in the form of assessment. Students complete the whole life cycle of "product market analysis innovative design product integrated development system testing product installation and implementation system operation" through role-playing experiential learning, team key-solving collaborative learning and practical training scenario learning. Finally, they give the stage practice report and system operation and maintenance report[9, 10].

### **C. Practice of CDIO Teaching Model**

This major is based on the design of verifiable courses to achieve the first level of technical competence training; the second level of personal and team competence training is realized by taking practical courses as the clue through the module of professional courses; the third level of conception (C), design (D) and implementation (I) is realized by taking practical training and graduation design as the carrier. And operation (O) comprehensive ability training, thus forming a set of curriculum design, practical courses, practical training and graduation design integration, multi-level practical teaching system.

At present, embedded technology is the new technology in the electronic information industry. For sophomores who study CSI single-chip microprocessor, they can first develop single-phase single-rate intelligent meters. For juniors who study ARM embedded system, they can develop three-phase multi-rate intelligent meters. For senior graduates, the development of multi-function meters is completed in the real environment of enterprises, which trains students' ability and innovation and entrepreneurship ability. Following the requirements of the mode of the CDIO engineering practice education, we study and summarize the four links of conception, design, implementation and operation.

### **Conclusions**

With the pilot project of electronic information, we formulate the training plan of CDIO specialty, optimize the

course group and establish an open course system platform. From the engineering practice of conception, design, realization and operation, we can cultivate students' ability of solving system problems and team cooperation, and finally achieve the goal of innovative CDIO engineering education.

### **Acknowledgements**

Thanks for the support of Projects of Teaching Science Research of Jiangxi Province (JXJG171716).

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