Teaching Reform and Practice of Electrical Engineering Profession Based on CDIO

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Abstract: This paper analyzed the personnel training situation of electrical engineering application profession of the applied colleges, and explored the CDIO engineering education reform of electrical engineering profession, and put forward a set of scheme of curriculum education system based on CDIO education philosophy, and has gradually improved the training mode of personnel training and the students’ abilities of engineering application, and elaborated the training program and the profession curriculum system and practice tache in detail to cultivate students’ abilities of innovation and practice and improve their market competitiveness and employment rate.

Keywords: CDIO, Training mode, Practice ability, Curriculum system

1 Introduction

Electrical engineering profession aims to training the students’ aspect knowledge with electro technology and power electronic technology and control technology and computer technology and power supply and distribution, they can be engaged in product development and electrical technology application to meet the application personnel needs of electrical engineering. Although the training model constantly innovates and develops, but also it can’t meet the current market demand. The teaching and assessment attaches importance to theory, and ignores practice, and can’t improve the students’ abilities of reasoning and practice, the students often automatically operates and have strong personality and lack team work experiences, the ability of social adaptation is weak. The current training programs and curriculum system can’t adapt completely the society rapid development requirements of students’ knowledge and practice ability and innovation ability, these application engineering personnel can’t meet the enterprises needs, employment situation is very grim. Application colleges should innovate the training mode of electrical engineering according to the needs of society and economic development to promote the sustainable development and foster personnel with international vision and practice ability and comprehensive quality. CDIO denotes (Conceive) and design (Design) and (Implement) and operation (Operate), CDIO education idea adopts lifecycle from product development to product operation as the carrier, and makes the students study engineering by the way of the actively and practice and course connection, and proposes the training scheme of engineering basic knowledge and personal ability and teamwork ability and engineering ability[1].

2 The Dynamic Teaching Model of CDIO Engineering Education

The training model of CDIO engineering education based on ability target proposes the organical combination of society services and curriculum learning to meet the consumer requirements and promote the growth of students’ knowledge and skills through the planning service activities and the structured reflection process, and achieves the common development of students’ knowledge and ability and quality by applying the project or problem from enterprise and scientific research as the carrier, and helps students clear learning contents location in subject knowledge by adopting heuristic teaching to find the direction and the way improving personal knowledge frame, and systematically combines the curriculum system through training project design. In the process of project development, the students aim at the development of discipline and engineering phenomenon to propose the scientific or technical problems under elicitation of tutor and enterprise engineers, these problems associates with the key
concept of science or engineering knowledge, and can stimulate the students' desire and interest for exploring knowledge. In this process, the students not only grasp the knowledge, but also cultivate the abilities of acquiring knowledge and research and innovation and engineering practice. The training mode of adaptive engineering is constructed according to the advanced concept of CDIO engineering education, its core curriculum possesses high integration and academic and universality and self-adjustment ability. Profession training mode of adaptive engineering enables the students to possess profound profession knowledge and strong logical thinking ability and have the comprehensive profession practice ability. The dynamic teaching model of CDIO engineering education is shown in figure 1.

![Figure 1: The CDIO teaching model of electrical engineering specialty](image)

Figure 1 can achieve the dynamic teaching model of CDIO profession cultivating mode with feedback adjustment function, it is open system facing to the industry and society, the evaluation system based on the quantitative analysis of society and enterprise determines the training effect of comprehensive ability. this system is based on the teaching goal and the course system, teaching practice is a self improvement and self perfect process, it needs enterprise project or task and the updated profession knowledge, it associates with the enterprise to foster personnel and serves the enterprises, the process information of the enterprise training personnel can promote the school to develop the course system and teaching mode more adapting to the enterprises demands. The mode of enterprises participating in training makes the students achieve the organism combination of theory study and practice; this will achieve the goal of personnel training and serving society and constantly improve the curriculum system and training links. The whole process cultivates the students' comprehensive ability, the CDIO mode relying on the cooperation of produce and research and the modern training mode form the relation of school and industry, training plan is developed by employing department and school, they participate in the formulation of new course system and the common construction of teaching content. Schools and enterprises jointly develop the teaching plan and course system and build laboratories and practice bases, they reformulate duly the plans and teaching content according to the development needs of electrical engineering industry and new changes, this is the beneficial attempt exploring CDIO teaching mode and teaching idea. With the practice development and the experience accumulation and training mode self adjustment and improvement, electrical engineering education can cultivate the composite high technology personnel according with the requirements of modern enterprises.
3 Establish the Course System Reform and Improve the Teaching Method

The CDIO education mode of electrical engineering is to cultivate students' innovation ability and practice ability and society demand as the main goal and the curriculum system and teaching reform as the core, and takes the subject development as foundation, and achieves the combination of teaching and research, and sets up scientific and effective classroom and laboratory and practice base to ensure the effective implementation of training plan and train students' abilities of engineering practice and actualizes "zero distance" of school and enterprise and continuously improves the teaching quality and the graduates employment rate. Facing the demand of enterprise and industry, the basic framework of profession knowledge and ability of electrical engineering is developed, the training mode determines the profession direction and plan curriculum system and course group to implement the school enterprise joint design of teaching syllabus and curriculum planning and build curriculum and choose knowledge points in teaching subjects according to the application needs. The reform takes the students individuation development as the core and the future occupation demand as the guidance, and regards "application system and function module and the basic unit" as the main line, and radicates 5 design projects as the leading direction, and carries out the course teaching through the design project leading profession course construction and theory contacting practice, the combination of engineering practice and discipline leads the students initiative. Design project cultivates their team spirit and team communication and coordination ability in group cooperation way, the reform adopts inquiry teaching methods to set scientific questions and stimulate student's interest in learning and guide students thinking. The curriculum system focuses on the coalescent of electronic engineering and computer technology, and includes electrocircuit and power electronics and computer software and embedded research projects, and sets up the scientific curriculum system according to application personal training and profession characteristics requirements to form own distinct features, the core curriculum should ensure the necessary profession theory so that students have sustainable learning basic and realize the evolution from end education to lifelong education, curriculum system of electrical engineering based on CDIO is established as the following Figure 2. Teaching method implements education training mode according to education idea of electrical engineering CDIO, and adopts imparting knowledge and heuristic teaching, and leads into the teaching method of project and case. The correlation of theory knowledge and enterprise projects stimulate students' interest in learning, the task is assigned to students in the form of project, students elaborate research achievements in the classroom, the teachers comment on and appraise the student achievements and teach course content. The teaching realizes the cooperation between schools and enterprises, the project cooperation of school and enterprises enhances the interaction among teachers and industry and society, and optimizes the teachers' practice ability, and lays good foundation of application personnel training model of engineering professional. The students change into the classroom teaching leading, students' classroom participation and feedback and teachers imparting knowledge system and knowledge updating are regarded as profession knowledge learning standards, they include students’ engineering reasoning and solving problem ability and experiment observation and data analysis and knowledge discovery ability and comprehensive thinking ability [4][5].
4 The Experimental Curriculum System Based on CDIO

The experiment tache unites the life cycle of product development including concept and design and implementation and operation closely together according to CDIO engineering education concept, and designs CDIO experiment course system of electrical engineering, experimental course system can be divided into 4 levels: basic experiment and designing experiment and comprehensive experiment and profession innovation experiment. Each level adopts the whole project as case to penetrate the main content of the experiment together and make the experiment content into an organic whole, this will improve the students' practice interest and experiment effects. The cases project is decomposed into modules distributed to throughout experiment, project modules are closely related, the preceding experiment is the base of next experiment, the teaching mode of open research innovative fosters students' innovation awareness and entrepreneurship and creativity, and enhances the ability of engineering practice and comprehensive quality, and achieves the changeover from knowledge to ability and professional to quality and adapting to creative and passive to active employment entrepreneurship, and makes students adapt to the rapid development of electrical engineering requirements, and improves training quality. At the same time, the related course experiments are connected into the independent experiment courses, the series module of experiment course are set into 20 independent experiments according to the requirements of electrical engineering profession, 30 innovative experiment project are raised, these make project number of the integrated design and innovative experiment improve greatly. single course experiment is integrated into different category experiment class and increases hours experiment, confirmatory experiments are compressed, the experiment mode increases the teaching content of comprehensive and designing and optimizes the teaching content system of whole experiment and trains the abilities of analyzing problems and solving problems and practice and exploration initiative spirit. To encourage the personality development is conducive to the realization of cultivating practice personnel [6].

Figure 2 Structure diagram of the core profession curriculum system
5 Conclusion

Teaching reform of CDIO engineering education trains students' creativity and thinking ability and practice ability and team cooperation spirit, and gradually improves the training mode of practice personnel, and cultivates students' abilities of practice and organization and coordination and innovation and employment rate of graduates. The teaching process adopts curriculum system based on CDIO education concept and reasonable curriculum schedule as a carrier of ability training, the curriculum reform and teaching process pay attention to optimizing the teaching content, the segmentation and striping training mode of theory knowledge of the traditional partitioning will gradually transform into education training model of imparting knowledge and fostering ability to cultivate students' ability of innovation and system engineering, the end education evolves into lifelong education. The teaching reform is able to train technical personnel adapting to the requirements of modern enterprise engineering through unremitting efforts and hard exploration and practice, and heightens teaching efficiency, and stimulates learning enthusiasm, and cultivates the student’s creativity, and expands the students’ knowledge. With the deepening of teaching reform, teaching reform of electrical engineering will have new features.

References