

Reform and Application in Mechanical Engineering Classroom of CDIO

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Abstract. This paper first introduces the concept of CDIO engineering education, aiming at the shortcomings of the traditional mechanical courses in the teaching, the CDIO engineering education concept applied to the mechanical professional classroom teaching, and put forward the corresponding reform measures, so as to increase the students' learning initiative, achieve a multiplier effect of learning.

Keywords: CDIO; engineering education ideas; mechanical design; comprehensive ability.

1. Overview of CDIO theory

In recent years, with the deepening of education reform, CDIO engineering education model has been introduced to the teaching process. CDIO is a multinational team of research teaching philosophy four universities composed of Massachusetts Institute of Technology, after many years of research and practice of building up. CDIO is a concept, design, implementation and operation of. The CDIO concept is based on product development to run, mobilize the enthusiasm and initiative of the students in this process, the curriculum content between organically, put in the traditional discipline based curriculum system, into a modular teaching system with ability as the goal, so as to cultivate the engineering basic knowledge, personal ability, interpersonal team ability and ability of students of Engineering system. The construction machinery manufacturing module content through the CDIO concept, and guide the practice of teaching module, module teaching reform made a useful exploration, so as to solve the existing problems in the teaching of mechanical specialty class.

2. The purpose of cultivating students' consciousness of Engineering

Talents training target determines the selection of teaching mode, according to the engineering technical requirements of today's society, colleges and universities should cultivate applied talents. CDIO outline to conception, design, implementation, operation as the main line, synthetically considering the professional basic knowledge, personal and professional skills, team work and communication interpersonal skills and mechanical professional teaching model of basic requirement. To create real and product and system operation, the students must understand in the enterprise and the social background of conception, design, implementation and system operation. On the need of social development, formulate the CDIO syllabus. CDIO includes technical knowledge and reasoning skills, occupation, personal skills and interpersonal skills in three aspects.

3. By improving the teaching level to promote the student to the connotation of technology and skills

3.1 To strengthen the construction of teachers team

CDIO put forward higher requirements for teachers, if do not have the resources, teachers will not be able to learn new skills to improve their own competitiveness. Teachers must take part in a high level of scientific research and teaching practice, must pass through, "learning by doing" in multidimensional, three-dimensional, theory and practice, classroom combined with mechanical industry development environment of growth, strengthen the foreign academic exchanges and expand the team vision, training of teachers' knowledge renewal and broaden, promote teachers' teaching research and team building, promote the overall teaching quality.

3.2 Change the teaching method, to the novel

Teachers should be familiar with the teaching idea of CDIO, CDIO function and position in the process of course teaching, so that the students in the class have a clear understanding to professional knowledge. In the process of teaching should make arrangement design and experiment content, improve students' practical skills, let the student fully integrated into the education process, and participate in the teaching practice. The whole process of teaching is not only the knowledge of the learning process is also beginning ability training process.

3.3 The modern teaching ideas and technologies into teaching means Site

Making use of modern teaching technology and the multimedia courseware of teaching courses, virtual implement case, etc., through the media presentation stimulate students' learning enthusiasm and innovative ability. Establish a QQ group, facilitate WeChat group, between teachers and students, communication and exchange between students. At the same time can online homework, corrects students' papers, motivate students, on the basis of the organic combination of the network and learning can make full and reasonable arrangement study time,

3.4 The CDIO engineering education concept and combining with production practices

CDIO philosophy to the project-oriented teaching content and methods should be synchronized with the production and development, to train qualified personnel for the development of production goals. The theory requires trained personnel, along with the product conception, design, implementation and operation of four aspects of talent. Allow students to learn the theory of knowledge and the real product development can be combined.

Courses machinery of very practical, teachers in the teaching process should be integrated as much as possible the actual production of teaching. In the process of teaching practice, teachers should lead students to really dig the plant, in the face of different CNC machine tools for detailed explanations and demonstrations, and enable students to hands-on, the students will really understand the machine's performance, operating procedures, etc., and will have a profound impact. The scene teaching method, students in the production practice, in order to truly achieve the combination of theory and practice.

3.5 Pay attention to cultivating students' comprehensive ability

CDIO emphasizes the idea of engineering education is the comprehensive ability of students, including knowledge and practical ability, cooperation ability, problem solving ability, self learning ability. In the process of cultivating comprehensive ability, should create more opportunities for the cultivation of comprehensive ability of students, curriculum design can be arranged for students to exercise comprehensive ability, it is helpful to their graduation thesis and go to work after graduation after work.

4. Shortcomings of the traditional mechanical specialty in classroom teaching

4.1 Design Method older

Mechanical principle operations and curriculum design first used machinery - Manual selection model, and then be checked using hand calculations. This used to be the main method of mechanical design, initially played a very important role. But the traditional design method is too boring, slow, cannot meet the needs of rapid development.

4.2 Design a single subject, not new

With yearly increase in the number of college students, the interests of students vary greatly varying degrees of knowledge in the traditional teaching unified teaching, practice assignments, curriculum design are unified curriculum design topics even the whole school year is the same, resulting in student psychological inertia, I did not want to pass their own learning, thinking to finish the job, and copying each other, perfunctory.

4.3 Emphasize theoretical study, ignoring the practical operation

Currently, some universities still use old, outdated textbooks,, less than a high school student from a book of real life machinery products, difficult to have perceptual knowledge, a lack of overall design theory, not be able to effectively organize a new agency different agencies.

Mechanical teaching emphasized that the heavy use, flexible and divergent thinking, but because of the above-mentioned deficiencies, resulting in heavy teaching the theory and practice of light,

teaching boring, goals are not clear, low student interest, decreased quality of teaching is not suitable for engineering needs the application of the training objectives. This requires changing the mechanical principles of teaching methods, the CDIO engineering concepts into mechanical engineering teaching becomes necessary.

5. The CDIO concepts into classroom teaching mechanical engineering purposes

In the framework of CDIO teaching philosophy, and actively explore the rational mode of teaching basic mechanical engineering curriculum, teaching methods based on CDIO Reform concept of CDIO Teaching Mode cultivate a distinctive building in line with the concept of CDIO Syllabus and experimental instructions , based on "research project" type of teaching methods, curriculum assessment methods to explore the idea under full control, the establishment of curriculum teaching mode, the final form of teaching mode mechanical professional courses in line with CDIO educational philosophy.

6. CDIO concept in the mechanical engineering curriculum reform ideas

6.1 CDIO concept study Teaching Model

By studying and absorbing foreign CDIO education model practical results, which collect large amounts of data, in-depth study CDIO teaching connotation, the basic theories and concepts integrated personnel training features, inherited discipline, complementary to absorb new theory and knowledge, so that learning and teaching content close to the teaching practice, the establishment of the teaching reform mode of educational philosophy.

6.2 Develop curricula and experimental guidance based on the concept of CDIO education

CDIO teaching philosophy based on engineering, the development of new curricula and courses of mechanical experimental instructions are an important part of teaching content reform, we should be an integrated approach to the university, summarized the practice of teaching experience, specialized teachers and students to extensively solicit opinions and suggestions not from the "mechanical principle" mainline textbooks, curricula and develop more suitable experimental instructions. The original syllabus and experimental instructions were revised and improved to make it more applicable to the training program of new talent.

6.3 Using teaching methods of combining a variety of ways

Teachers select the appropriate research programs for different students, so that students in "learning by doing", so that students master the basic knowledge relevant curriculum and ability, and further the ability of students to use knowledge to design complex integrated products and systems through projects traction. The actual research project as a case study, students creative thinking and innovation. Students will learn the concept, design skills into practice, to stimulate the students' interest and enthusiasm in secondary schools so that students can learn with.

The current mechanical courses teaching, teaching multimedia courseware is mainly used by the courseware demonstrate the dynamic and static icon, written expression and teachers on together, the abstract teaching content becomes illustrations, increases the vitality of classroom teaching, promoting the interaction between teachers and students, students of teachers teaching content impressed, relatively easy to grasp, to enhance the students' learning initiative.

Classroom Teaching Symposium also often used as a teaching method, teachers and students to discuss a close and teaching content, while students and more interested in the subject of discussion, give students some time to prepare, to enable students to gather information in the class, The data were then organize, analyze, summarize, summarize, complete a short essay, and then use the time in class, the students report their first paper, after mutual discussions between the students, the teacher finally give the appropriate papers and discussion comments. Through symposia, exercise Students 'Ability to acquire knowledge, to enrich the students' knowledge, and enhance students 'sense of accomplishment and self-confidence, develop the students' interest in learning.

6.4 Study on curriculum evaluation mode

At present, the curriculum evaluation is the main way to take the final exam form, mainly rely on the results to decide. After the CDIO engineering education mode into teaching, explore the students in the learning process of the performance of all included within the scope of assessment. Pay attention to the comprehensive ability of establishing evaluation mechanism, focusing on assessment of students in the learning process, for work, seminars, project internship project completion, a certain proportion of the total score of the final exam, cannot be used as the assessment of all.

6.5 Research on teaching model of course design

CDIO course design mode, give full play to the initiative and creativity of students. In the process of curriculum design, teachers play a leading role; the students finish the project conception, design, manufacture and operation of the whole process, comprehensive cultivation of students' comprehensive ability. According to the characteristics of teachers of each student, for the students to customize topics, each student is required to complete their curriculum design topics. This mode of teaching, to provide students with learning and thinking enough space, cultivate students' ability of independent thinking.

Acknowledgements

This paper is supported by National machinery/foundation course teaching steering committee of Engineering training teaching steering committee/Education scientific research project (JJ-GX-jy201422) and the scientific research fund project of Inner Mongolia University for the Nationalities (MDYB2013044).

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