Teaching Mode Design for Mechanical Manufacturing Technology

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Abstract. Only the teaching methods and means, which conform to the course characteristic and students' actual requirements, are applied, the teaching quality can be improved. In this paper according to the characteristics of strong practicality of the course Mechanical Manufacturing Technology, oriented to the training requirements of the outstanding engineers training plan, a series of measures of teaching reform are put forward for the course Mechanical Manufacturing Technology. So the students' engineering practice ability, engineering design and engineering innovation ability are improved.

Introduction

In order to promote the university education reform in our country, the Ministry of Education decided to implement the 'outstanding engineers training plan'. Through this plan a large number of innovative ability, to adapt to the economic and social development needs of various types of high quality engineering and technical personnel can be trained [1-2]. This is an innovation of China's university education reform, and which can promote the university education to face to the society needs. The training plan has very important demonstration and guidance role in cultivating students and improving engineering education talent training quality. According to different specialized subjects, the teaching content is further studied, and the characteristic teaching modes that conform to the goal of cultivating the outstanding engineers is further created, and which has important practical significance for the full implementation of the outstanding engineers.

1. The Characteristics and Problems Existing in the Course Teaching

The Mechanical Manufacturing Technology is a professional basic course that the mechanical engineering students must master, which has the extremely important status in the mechanical engineering teaching system. The teaching content mainly includes the analysis of the processing quality, parts machining process and assembly process design and so on. This course has some characteristics, such as the practical curriculum, involving broad scope, the teaching content organization having very strong pertinence and practicability. In the teaching process the teachers need to pay more attention to the cultivation of students' ability to solve practical problems and strengthen the students' engineering consciousness.

As the mechanical engineering specialized fundamental course, the Mechanical Manufacturing Technology plays an important role in the cultivation of the mechanical outstanding engineers. For a long time, many universities are limited by the teaching and experimental conditions and the influence of the traditional teaching concept, such as paying more attention to the theory teaching content, paying much less attention to the practice teaching content and obsolete teaching content, updating teaching content slowly, and the students cultivated disconnecting with social needs [3-5]. There are a series of problems in the teaching of Machinery manufacturing technology: (1) the lack of a reasonable teaching mode, the teaching method still is given with one-way infusion. And lack of discussion, which leads to the students' learning interest reducing; (2) in the evaluation system the theoretical study and their test scores are treated as the only criterions for the evaluation of
students' ability, and in the exam the memory and choice questions replace the analytical problems; (3) lack of practice, the assessment of the application and practice ability is inadequate.

Backward way of teaching system seriously hinders the improvement of personnel quality, and the in-depth reform must be carried out. The advanced teaching methods and means should be adopted to mobilize students’ learning enthusiasm, promote the students’ positive thinking, stimulate students’ learning potential, and which can meet the needs of the implementation of the “outstanding engineers plan”.

2. Reform Measures

2.1 Reforming of Teaching Content, and Adapting to the Industry Characteristic

At present the quantity of teaching materials of "Mechanical Manufacturing Technology" is about more than 50, but the contents of them are basically the same. The graduate employment field usually exists certain differences in different colleges and universities. As a result, the universities should not adopt the unified teaching mode and teaching content. And the different teaching content of Mechanical Manufacturing Technology should be carried out according to the different employment fields and the different employment characteristics.

Our department has the distinctive engineering features, and over the years we have cultivated a large number of graduates for all levels of agricultural machinery enterprises and research institutes. In order to make our graduates familiar with the process characteristics of products, and reduce the gap between university and enterprise actual situation, the reform of the course of Mechanical Manufacturing Technology is carried on, and the teaching content is selected to highlight the characteristics of agricultural machinery.

In order to extract the manufacture processing of common parts, the decomposition of all kinds of agricultural machinery structure should be done, and the parts are classified, such as axial parts, plate parts, body parts, welding parts, etc. Then for each type of parts, the manufacture process is analyzed, all those content are applied to the teaching. So on the one hand, through the course teaching, the students' interest of agricultural machinery products are cultivated. On the other hand, in the future working the students can be familiar with the part manufacture processing as soon as possible.

2.2 The “Denotative” Teaching Mode can be Conveniently Established based on Network Teaching Platform

After the implementation of the “outstanding engineers training plan”, the students' practice teaching time will increase, which will lead to a drop in theory teaching hours. Thus the teacher has to pay less time in course content explanation. And the multimedia network teaching, simulation teaching, the teaching resources platform based on campus network, which can rich the online teaching resources, and will be an effective method to solve the problem of the decreasing in the teaching hours.

2.3 Reference the Engineering Education Concept of CDIO, to Create the New Mechanism of Combining the University Teaching with Industry Enterprises

The engineering education concept of CDIO was first established by the Massachusetts Institute of Technology. It advocates that the engineering education should return from science to engineering. CDIO means Conceive, Design, Implement and Operate. It looks from the product research and development to the product's life cycle as the carrier, and lets the students to study in the way of actively, practice, courses organic connection.

The training target of outstanding engineers is put forward by the Ministry of Education with the engineering technology as the main line, with the actual project as the background, facing to the needs of the industry, the world and the future, to train a large number of strong innovation ability, the high quality of various types of engineering and technical personnel, which has the same
training concept with CDIO education model, and has certain reference significance for the implementation of the our country outstanding engineers plan. The key of the success of the CDIO engineering education reform is to apply the university-enterprise joint model for students and “learning by doing”, “teaching and learning based on project”. In the teaching process of the course Mechanical Manufacturing Technology, based on the successful experience of the CDIO engineering education, the university-enterprise united teaching mode used to cultivate the students' engineering practical ability will play a positive role in the training plan.

2.4 Build a Bilingual Teaching Platform for the Course Mechanical Manufacturing Technology

The Ministry of Education clearly puts forward that the 'outstanding engineers training plan' is geared to the needs of the industry, the world and the future to cultivate the excellent engineers. Those engineers should have international perspective, cross-cultural communication and international cooperation and competition ability. The universities participated should actively introduce foreign advanced engineering education resources and excellent teachers, and should actively organize students to participate in international exchanges, to participate in the overseas enterprise practice, to develop the students' international vision.

2.5 Change the Mode of Examination, Strengthen the Practice Module, and Guide Students to a Positive Attitude, in the Right Way to Study the Course

Test scores are directly related with the vital interests of students, and the way of examination is the baton of the student studying. Appropriate way of assessment is very important for the cultivation of the students. To reverse this situation, a written examination in the past can be replaced by a comprehensive assessment model through multiple modules throughout the course teaching process. Every student’s final course score should include four modules: assessments at ordinary times, practical assessments, curriculum design, and the final exam. And the proportion of assessments at ordinary times should be increased.

After finishing the teaching contents of each chapter for the course, according to the factory subject the teacher can assign homework for the students as ordinary times assessment. For example in the interpretation of the chapter "mechanical parts process regulations", the teacher gives each student a drawings of the parts, and then let the students to prepare the manufacturing process, then according to the technological process to manufacture parts, analyzing of the machining quality of parts after the manufacturing, lastly to find out the problems and put forward solutions to the problems. Through the assessment of the ability for solving practical problems, the students will pay more attention to the practical problems, and the ability will be enhanced that applying the theoretical knowledge to solve the practice problems.

Summary

According to the strong practicality characteristics of the course Mechanical Manufacturing Technology, taking full advantage of the opportunity of “outstanding plan”, drawing lessons from CDIO engineering education concept, looking the improving of the teaching quality of Mechanical Manufacturing Technology as the purpose, in order to enhance students’ ability to solve practical problems as the ultimate goal, the teaching mode of Mechanical Manufacturing Technology is designed. In this paper from five aspects the specific measures of teaching model reform for Mechanical Manufacturing Technology are expounded. The problem of the education disconnects between the university and enterprise is fundamentally solved. And an effective way is explored for practical teaching course reform.
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