Research on Practice Teaching Optimization of Professional Courses for full-time Master of Engineering-Computer Control Technique

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Abstract. In the process of training for full-time Master of Engineering in computer technology, practice is paid less attention than theory in teaching. According to the training targets of full-time Master of Engineering in computer technology, combined with the characteristics of full-time Master of Engineering, professional course “computer control technique” is taken as an example to carry out teaching reform. Several pieces of advice is put forward, such as optimize teaching mode to make study serve the practice, update teaching content to keep up with the times, strengthen practice teaching link to improve practical ability of full-time master in computer control technique.

Introduction

With the arrival of knowledge economy, countries gradually pay attention to the cultivation of top talents, so that graduate education is particularly important. However, with the transformation of national industrial structure, the demand for the applied top-talented technical management personnel increases gradually, and the existing academic graduate students is not very good to satisfy this requirement. In order to produce applied high-level personnel which meet the demand of economic development, Department of Higher Education in all countries all over the world reforms accordingly to adapt to the transformation of change. In 2009, Chinese Ministry of Education has begun to implement training for full-time Master of Engineering across the country. The education of Engineering Postgraduates, which aims to cultivate applied top-talented engineering personnel, who master certain professional basic theory and wide professional knowledge, strong ability to solve practical problems, ability to undertake professional or managerial work independently, good professional quality, is associated with professional degree graduate education who relates with engineering qualifications [1, 2].

According to the above guidelines, training target of full-time Master of Engineering in computer technology can be that postgraduates should master the basic theory, advanced technology, method and means in computer technology, and be engaged in engineering design, and implementation, research, development, management of project in a certain direction. Among them, the key is the practical-ability training [3-6].

However, with insufficient implementation time and experience, the problems gradually emerge: practice is paid less attention than theory in teaching. For full-time Master of Engineering in computer technology field, there is no particular teaching content but drawing lessons from Master of Academic, who lay particular stress on knowledge and theory ,and ignore the application and practice of computer technology in engineering.

According to above problems and training targets of full-time Master of Engineering in computer technology, combined with the characteristics of full-time Master of Engineering, professional course
“computer control technique” is taken as an example to carry out teaching reform to strengthen and optimize the practical ability training level of full-time Master of Engineering. "Computer control technique" is a basic professional course integrating theory closely with practice. It involves a wide range of basic theory and knowledge, including circuit, electronic, computer, automatic control theory, testing instruments, and occupies an important position in the same courses. In addition, Computer control technique, with many curriculum teaching contents and large amount of information, has high requirements of fundamentality and advancement. Therefore, in the teaching process of Computer control technique for full-time Master of Engineering, it is necessary to establish a scientific and effective system of curriculum teaching combined theory teaching with practice teaching. Here, several pieces of advice is put forward, such as optimize teaching mode to make study serve the practice, update teaching content to keep up with the times, strengthen practice teaching link to adjust measures to local conditions, and other measures.

Curriculum Teaching Reform on Computer Control Technique

Optimize Teaching Mode to Make Study Serve Practice

On the basis of the training targets of full-time Master of Engineering, and curriculum teaching requirements of Computer control technique, it is essential to optimize the traditional teaching mode to make study serve practice.

Hence, basic concepts and rules should be emphasized in the process of teaching. for example, the purpose of calculation method teaching is that, calculation results are expected to help students understand and grasp basic concepts and rules, rather than cultivate students' ability of calculation. On one hand classroom teaching aims to make students master theoretical knowledge, on the other hand allows students to learn methods of analyzing problems and solving problems and further to enhance their independent ability and creativity. Therefore, it is methods and thoughts to solve problems that should be taught in classroom teaching.

The teacher should design the whole teaching process, optimize the teaching plan, and realize the outward-bound training for students. In the teaching, abandon the traditional "knowledge of a virtual exercise one experiment" approach, instead of using the project teaching method, to "reverse", firstly, the actual project background, anatomical modules of the project, to find out the links between modules in the module, determine the knowledge points, then use the "order" the way of the knowledge into a system. Different from the traditional teaching methods, the project driven teaching method, immediately after the project was raised, aroused the interest of the students, and launched a heated discussion. Inspired by the teacher's proper guidance, the solution was finally formed. Through the study of this project, the students not only have a comprehensive understanding of the composition of the simple weighing system, but also have a profound understanding of the abstract theoretical content. By solving practical problems in engineering, let students have a new understanding of the meaning of learning this course, from "I want to learn" to "I want to learn", so that passive learning into active learning. In short, the main application of project driven teaching method makes students become the teaching activities, the formation of autonomous learning, cooperative learning and exploratory learning atmosphere and improve students' ability to analyze and solve problems, so as to the future work to lay the foundation for a certain.

Update Teaching Contents to Keep Up with the Times

Computer control technique change rapidly. Practicableness of teaching must be strengthened following development of technology and keep with the times. Therefore, teaching content must be updated timely.

Teaching material, the embodiment of the teaching content, is an important tool for students’ learning especially that of computer control. Rapid development of electronic technology, teaching material, who reflects the contemporary new technology of computer control, is the first choice. Practice has proved that, if the teaching material content falls behind the actual level of application of
social development, there is little effect on cultivating of innovative talents. However, new content of teaching material, can receive good results.

In addition, the most popular and latest technology should be introduced in teaching . and theory of Computer control technique shall be closely combined with the achievements and progress of contemporary science and technology to enhance teaching effect.

Strengthen Practical Teaching Link to Adjust Measures to Local Conditions

Practice is the only yardstick for truth. Practice teaching is an important way to improve students' creativity and ability.

In teaching content, on the basis of training goals of full-time Master's in Computer Control Technique, some measures should be taken as follows. Scientifically plan teaching content of professional courses, change teaching syllabus, and add experiments. In experimental methods, during classroom teaching, students can be divided into multiple teams, and at the same time apply course content into related projects in practice.

For full-time Master of Engineering in Computer Technology, according to its characteristics, two points need to be noticed when setting up experiment content: first, Master of Engineering can't spend much time into the practice of Computer Control Technique. Second, due to different research directions of engineering master and wide range of Computer Control Technique, little time is spent in this course. As a result, based on course syllabus, lecturers should select key content and set up concisely course experiment content, which should have a different class considering students with various learning ability.

![Figure 1. The Computer control technique of experiment device module structure.](image)

According to the requirements of practice, a set of experimental box for Computer Control Technique is developed, to verify students' ability of using computer to control and design system, and to improve students' ability of analyzing and resolving problems through design of experiments. The experimental box as shown in Figure 1 includes: 1, CP1H PLC host; 2, 7 segments of LED and matrix keyboard; 3, DC power supply; 4, PLC analog input/output module; 5, PLC switch input and output module; 6, DC motor and stepper motor module; 7, stepper motor driver module; 8, red and green traffic lights experiment module; 9: temperature PID control module.

In the experiment, one computer and one set of experiment boxes are guaranteed. As shown in Table 1, this experiment mainly adapts to characteristics of computer Engineering Master--short length of schooling and different research fields by setting the verification experiment rather than designing experiments or comprehensive experiments. Thus, student can deepen understanding of theory and grasp general structure and composition of computer control. For more capable students,
through comprehensive experiments, they can design simulate and debug computer control system by integrating comprehensive knowledge of this course.

Table 1. The experiments based on the Computer control technique of experiment device.

| Ordinal | Name of Project | Indicative Abstract | Main equipment | Type of Experiment | Credit Hours | Number of Members | Type of experimenter | Compulsory or Elective |
|---------|----------------|---------------------|----------------|-------------------|--------------|------------------|----------------------|------------------------|
| 1       | Familiar with experimental device | Familiar with experimental device | A PC and a experimental box | Verification experiment | 2            | 2–3              | Master of Engineering | Compulsory             |
| 2       | Traffic light control experiment | Traffic light control experiment | A PC and a experimental box | Verification experiment | 2            | 2–3              | Master of Engineering | Compulsory             |
| 3       | DC motor control experiment | DC motor control experiment | A PC and a experimental box | Verification experiment | 2            | 2–3              | Master of Engineering | Elective(2 From 3)     |
| 4       | Stepper motor control experiment | Stepper motor control experiment | A PC and a experimental box | Verification experiment | 2            | 2–3              | Master of Engineering |                       |
| 5       | Temperature control experiment | Temperature control experiment | A PC and a experimental box | Verification experiment | 2            | 2–3              | Master of Engineering |                       |

Emphasize the Teaching Conditions

In order to meet the needs of teaching, through various channels to collect the computer control of the industrial scene pictures, simulation and other materials, the production of multimedia teaching courseware, writing exercises set, experimental guide books and other teaching materials, the teaching resources organization emphasizes students' active participation in learning behavior, each experiment with several questions, and these questions the answer is not found directly in the textbooks, students need further thinking, rely on the results of experiment analysis or their programming to get.

In the course of two weeks before the scheduled practice, contact a number of enterprises to lead the students to visit and study, including TV production line, computer motherboard production line, communication equipment, automatic production line of water-saving irrigation equipment production line, so that the students of computer control each link, process and actual production environment have a perceptual knowledge, learn how to the advanced control technology application in industrial practice, so to arouse students' intrinsic motivation, enhance knowledge transfer, so that the students can apply their knowledge, but also help the students to understand the concept of many books on the abstract.

All the resources of this course have been online, and students can obtain course knowledge through the internet. The laboratory is equipped with a wireless network, students readily access to 100Mb high speed campus broadband network, support students to use the network environment self-learning. Teachers use the network for teaching discussion, communicate with students in time, and further improve the teaching syllabus, curriculum content, teaching courseware, exercises and other network resources.

Conclusions

According to the training targets of full-time Master of Engineering in computer technology, combined with the characteristics of full-time Master of Engineering, professional course “computer control technique” is taken as an example to carry out teaching reform. Several pieces of advice is put forward, such as optimize teaching mode to make study serve the practice, update teaching content to adjust measures to local conditions, strengthen practice teaching link to improve practical ability of full-time master in computer control technique.
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