

Reforming and Practicing of Experimental Teaching in Electronic Technique Fundament

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Abstract - Based on the analyzation of the importance as well as existing problems of experimental teaching in the electronic technique fundament, reform and practice concerning the connection of the theories with the experiment teaching, experimental projects, experimental projects and evaluation system has been enforced. Through the implementations for the nearly three years, the teaching model has been well received by students, good reputation from employer has been gained and more and more awards in electronic design competition has been won.

Index Terms - electronic technology fundamental experiment, circuit analysis, analogous circuits, digital circuit

1. Introduction

With the further development of teaching reform, colleges and universities pay more attention to cultivate applied talents and experiment course plays an important role in it [1-3]. Electronic technology fundamental experiment is a technical based course. In this course, experimental teaching is supported by theory course, making the theory teaching deeper as well as practical. It is the beginning for students to get experimental methods as well as experimental trainings systematically and cultivate their abilities of science experiments. Through experimental courses, students not only learn some knowledge of electronic components, master certain electronic circuits, gain the skill to use common instruments, acquire basic measurement technique and debug methods of electronic technique, but also get the ability of independent thought and independent analysis. "Electronic technology fundamental experiment" is a practical course, which teaches students' experimental research methods of basic electronic circuit. With the abilities of practicing and combining theory with practice in electronic technology developed, students' capacity to analyze and solve problems is raised.

Nowadays, some abuse such as the lack of close connection between experimental courses and theory courses, the absence of comprehensive design experiments, the simpleness of teaching methods, the single form of evaluations and so on still exists in experimental teaching of electronic technique fundament, which makes students not good at practical innovation, not satisfy need of practical and innovative talents in today's society[4]. For many colleges and universities, The sharply increase in the number of students is not coupled with development of laboratory, along with the shortage of experiment teacher makes it difficult to schedule experimental teaching according to theory courses. Sometimes experiment is scheduled long after related theory course,

which would result in the difficulty for students to deepen their understanding of the theory and do validation or research through experiments[5-7]. In this case, students can only do experiments to review theory courses. Even worse, sometimes experimental teaching is arranged before relative theory courses, which spoils the effect seriously.

2. Contents of Reform

A. *Experiment courses and theory courses supplement each other*

Experiment courses and theory courses of electronic technology fundament supplement each other. If experimental teaching could not synchronize with theory teaching, theory teaching would not guide experimental teaching well and experimental teaching also would not serve theoretical course teaching well. So it is of great significance to make overall management in experiment courses and theory courses of electronic technology fundament.

a. Before schedule courses, experiment teachers shall fully communicate with theory teachers and determine the best time for experiment. Then report the right time to the relative course arrangement person to maximize the time that experiment teaching and theory teaching are synchronized.

b. In view of the increase of students and the shortage of laboratories as well as teachers, we could schedule experiment teaching at night or on the weekends to fit with theory teaching. And if it is possible, allowances for teachers should be given and deferred days off should be enjoyed accordingly.

c. To make the experiment teaching go well, students ought to review fundamental concepts, fundamental theories, experimental procedures, experimental methods, performance of apparatus and parameters. So through the experiments, not only the knowledge of components, theories of basic circuit unit can be acquired but also students can take advantage of familiar theories to explain a wide variety of phenomena.

B. *Optimize experimental project*

Experimental project namely the base content of experiment teaching. It is reasonable content of experimental project that can help students gain more knowledge, especially innovative practical knowledge. Currently, most experiment is verification experiment, which can be helpful to train students' handling abilities as well as deepen the understanding of knowledge. While the content of verification is so obsolete and the operation steps are so full detailed in the guide books that it limits the development of practical ability and innovative

thinking for students. To solve the problem, schools should offer more designed-comprehensively experiments and increase the proportion of it to train the comprehensive abilities and good characters of students. Through designed-comprehensively experiments, abilities of analyzing and solving problems by using learned knowledge synthetically should be cultivated, training in scientific research should be given. Designed-comprehensively experiments involve numerous knowledge points, and the scale of circuits needing to be designed and tested is large. Designed-comprehensively experiments is difficult but popular with students. It can turn students from coping with experiments to active participating, which develops students' practice abilities and increases students' subjective sense of motivation as well as creativity [8].

C. Reform teaching model

Students learn passively and have low efficiency in traditional cramming method of teaching, which lead to poor initiative in learning and worse operation in practice. According to the characters of the course, the following teaching methods are recommended[9].

a. Heuristic method of teaching, which can arouse the enthusiasm of the students for independent in learning;

b. Communicative language teaching, which not only intensifies the positivity of students during learning but also makes teachers have a general understanding of their students and tailor the teaching approach accordingly;

c. Encouraging method of teaching, which encourages students to pore over documents and enhances the confidence of the students;

d. Trusting method of teaching, which trusts students' conscious learning ability and leads them to set up the idea that they could learn well with their willing. While teaching, teaching methods should vary with each level of students. Combined with modern education means, CAD and EDA can be applied to experimental teaching in the electronic technique fundament. With the abundance of teaching content and methods, the deficiency of traditional methodology is made up and the teaching effect is improved.

D. Optimize evaluation system

Examination leads the way of teaching. Reform examining system and focus on the achievement of ordinary time, exam results, practical abilities and theory check. Through this checking way, an all-embracing evaluation system with multiple forms is established. To do this, grades to experiments should have two parts, half operating grades half final exam. Operating grades=20%attendance+ 40% experiment operation+40%lab report; final exam=50%operation+50%paper test. The score of these parts are counted with related proportions and objective grades are given. This inspection releases students' initiative in studies and solves the problem of coping lab report. It strengthens students' capacities of practice, cultivates their abilities to analyze and solve problems.

3. Implementation Method

Experimental Teaching in Electronic Technique Fundament consists of three parts: Circuit analysis experiments, analogous circuits experiments and digital circuit experiments. Concrete implementing means are as follows.

A. Implementation methods of circuit analysis experiments

Circuit analysis experiment is one of the earliest experiments offered by electronic speciality. Teaching is implemented in the following areas.

a. Experiments are closely coordinated with theory courses. With experiments, students can deepen the theory study, verify theory and do research;

b. Fostering the students' interests. Laboratory teaching should be centered on students instead of teachers to keep up with the requirement of social development;

c. Students refer information before class. Before experiments, the pre-class task would be previewing the text, teachers teach the utilization of instruments and the experimental matters needing attention, leaving most of the time to students;

d. Grades to experiments should have two parts, half operating grades half final exam. Operating grades=20%attendance+ 40%experiment operation+40%lab report; final exam=50%operation+50%paper test.

B. Implementation method of analogous circuits experiments

a. Experiments are closely coordinated with theory courses. With experiments, students can deepen the theory study, verify theory and do research;

b. Half designing experiments half verification experiments in experiment courses, train students' operating abilities and initiative spirit;

c. As designing experiments, students should be required to do circuit design and simulation in simulation software before the experiments. Then solder corresponding parts onto a device and debug;

d. For designing experiments, content should be popular with students. Some useful small electricals such as wireless remote control car, direct current source could be adopted.

C. Implementation method of digital circuit experiments

a. Experiments are closely coordinated with theory courses. With experiments, students can deepen the theory study, verify theory and do research;

b. Given demands of experiments only, students are required to simulate and validate functionality requires. It can improve students' independent learning abilities and problem solving skills;

c. Require students design circuit with small scale or medium scale integrated circuit chips according to their simulation results;

d. Given experimental projects should be helpful in real life and interesting students as well.

4. Conclusion

The local place badly needs technology applied talents of electronic information engineering due to the regional industrial development limits. The cultivation of technology applied talents mainly pays attention to the training of practical teaching and innovation ability. This article found the cultivation mode of the practical teaching of electronic technology talents in electronic and information engineering through the reform and explore of the practical teaching of electronic technology in the applied undergraduate colleges. Through the investigation for a few years, it found that the students not only can quickly adapt to the company after entering the enterprise without the enterprise training but also can achieve better results. At the same time, through the reform of practical teaching, in nearly 3 years, the students won the National Undergraduate Innovative Experiment Project Plan once, the Challenge Cup project twice and Chongqing College Students Innovation Experiment Project Plan 7 times. What's more, the students also won the second place in Chongqing area of the National Undergraduate Electronic Design Contest 5 times, the third place 8 times. In addition, they also won the third place in the Challenge Cup National University of student extracurricular academic works. They performed well in all kinds of Chongqing Electronic Design Competition with the first place 5 times, the second place 10 times and several third place. However, in the process of reform, also encountered many problems, for example, its shortage of the professional practical teachers. Therefore, it is important to encourage teachers to work in enterprises in order to cultivate the electronic and information engineering talents better.

By the reform students can deepen the understanding of theory, broaden thinking, use several approaches to solve real problems. Students' experiment interests is cultivated and developed, making their interests be ambitious and conscientious. With the reform, problems such as the shortage of class hours, focusing on verification experiment only, stiff teaching methods, absence of innovation in classroom teaching can be solved. The reformed experiment teaching meets

tangible needs of project application, cultivates students' consciousness of engineering, trains students' engineering practice abilities, improves students' learning interests and efficiency, exploits students' capacity to innovate, elevates students' comprehensive quality. It makes a great contribution for students to meet the needs of social development when they go to work.

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