

Exploration and Practice of Multi-level Teaching Reform of Electronic Technology Curriculum Design

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Abstract

Under the background of new engineering construction, it is of great practical significance to improve students' professional ability and comprehensive quality through the teaching reform of electronic information specialty courses. In this paper, the Multi-level teaching design and reform of "student-centered" is carried out for the comprehensive design experiment project of "Electronic Technology Curriculum Design", The system trains students' ability of circuit design, system debugging, circuit assembly and team cooperation, and stimulates students' enthusiasm for learning and innovation.

Keywords

New Engineering; Comprehensive Design; Multi-level Teaching; Curriculum Design.

1. Introduction

For science and engineering students majoring in electronic information science and technology, theoretical knowledge and practical ability are equally important. However, most students only pay attention to the final exam results, and there are some phenomena such as poor experimental class and poor hands-on ability. Moreover, most previous experimental projects were mainly verification-based, lacking comprehensive design-based experiments. Students lack enthusiasm and interest in experiments. It is not conducive to the improvement of students' comprehensive ability, nor to the cultivation of diversified, practical and innovative outstanding engineering talents[1] that can support local economic development. It is not conducive to the construction and development of new engineering majors such as artificial intelligence and robotics[2].

The development of electronic technology plays an important role in promoting the development of electronic and information science and engineering majors[3]. In order to train students' comprehensive design ability and innovative ability[4], the teaching design and teaching reform of the teaching case of Electronic Technology Course Design were carried out. Electronic Technology Course Design[5] is offered at the end of the fourth semester after students have systematically studied professional basic courses such as Circuit Analysis, Analog Electronic Technology and Digital Electronic Technology.

2. Take "Design and Implementation of Digital Clock" as an Example to Carry out Multi-level Teaching Reform

2.1. Clear Teaching Objectives

- (1) Learn the design and comprehensive application of basic SR flip-flops, clock generators, counters, decoders and displays;
- (2) Mastering the realization of hour, minute and second counting circuit;
- (3) Learn the debugging method of digital clock;

(4) Learn Multisim (or Lichuang EDA) simulation, master the experimental circuit construction and welding and punching technology;

(5) Stimulate students' learning enthusiasm and cultivate students' comprehensive design ability and team cooperation ability.

2.2. Assign Project Design Tasks

It is required to design a digital clock with small and medium-sized digital integrated circuits with the following functions:

(1) display hours, minutes and seconds;

(2) Adopt a 24-hour system;

(3) It has the function of timing, which can calibrate the hours and minutes separately. When it is divided into schools, it stops carrying hours in different directions. The timing clock source can be manually input or borrowed from the clock in the circuit;

(4) It has the function of striking the hour, and the buzzer sounds or the indicator light flashes 1 second before the hour.

2.3. Multi-level Design Teaching Process

In order to give full play to students' subjective initiative and train students' autonomous learning ability from theory to practice, taking "the design and implementation of digital clock" as an example, the Multi-level teaching reform of "student-centered" was explored and practiced.

The first step, students are free to combine in groups of three, teachers explain the contents and requirements of curriculum design in a unified way, and the online teaching platform gives out the task of project design. Students independently search for information, complete the circuit design and draw the overall circuit diagram. Secondly, students go to the simulation training room for simulation verification according to their designed circuit diagram. Adjust the circuit design in time when problems are found. The simulation adopts Multisim software or Lichuang EDA platform, and after simulation verification, the board making can be completed through Lichuang EDA platform. The third step, students go to the electronic technology laboratory to complete the actual circuit construction on the experimental box, and the whole machine is successfully debugged. The fourth step, the students select the components required by the project design to assemble and weld the circuit on the circuit board. Make a finished product. Step 5, students write a course design report, which includes design ideas, overall design block diagram, working principles of unit circuits of various functions, problems and solutions in practice, design experience, etc., and attach hand-painted circuit diagrams, simulation circuits, pictures of works of welding or punching boards, etc. The sixth step, organize students to make PPT to complete the defense report of course design.

2.4. The Introduction of Ideological and Political Elements in the Teaching Process

In the training stage of curriculum design, tell students the story that Sun Hongmei, the heart engineer of Hawk, has gradually grown into a senior engineer from being a welder, so that students can feel the ordinary and great spirit of "great country craftsman". As science and engineering students, they should pay equal attention to both theory and technology, and gradually improve their professional level in practice. In the process of practical training, some teams can finish it quickly and smoothly. I will praise the students' spirit of unity, cooperation and Excellence. Successful completion also shows that the preparatory work has been done well. Some teams rework many times over and over again. I will encourage students to have problems, which is a good thing. They can learn a lot of knowledge and methods in the process of solving problems. At the same time, it emphasizes that the division of labor should be clear,

and do not rush for success; Some teams want to give up, and I will encourage students to reinvent the wheel. If they persist, the future will come to light. I will give different guidance to different teams, and I will not give up any team, and finally complete the task successfully. In the teaching process, I was often moved by the students' spirit of forgetting to eat and sleep. Infected by students' excited passion after solving their problems.

2.5. Carry out Diversified Assessment and Evaluation with the Help of Online Platform

Reform the assessment mechanism, complete students' mutual evaluation and self-evaluation scoring with the help of online platform, and teachers' comprehensive evaluation and scoring, paying attention to the process assessment and evaluation. The average score is 40%, including the whole process of circuit design, simulation verification, experimental circuit construction, circuit welding, etc. The exhibition of works is 40%, the writing of curriculum design report is 10%, and the report and defense is 10%.

Through the teaching platform such as Learning Communication and Wisdom Tree[6], the whole process of students' project implementation can be recorded in an all-round way. Students need to submit their hand-painted circuit diagrams within a limited time. During the simulation process, videos and pictures of the recording process are submitted. During the welding and punching process, photos and work display videos are also submitted through the platform. Make a final defense report through an open platform, During the evaluation process, mutual evaluation between teams and self-evaluation of students were carried out. Then, according to the performance and completion of each team in the whole course design process, the teacher gives the comprehensive evaluation of each team, and the scores are divided into excellent, good, fair, passing and failing. Finally, according to the specific performance of each student, the comprehensive scores of each student are given. Diversified evaluation mechanism can effectively arouse students' enthusiasm and avoid the problem of unfair performance evaluation.

2.6. Effectively Assist the Innovation Competition

With the continuous reform and innovation in the teaching process, many different projects are set up in the curriculum design, so that students can freely choose the projects they are interested in, and students can independently design challenging projects. At the same time, sensors, Internet of Things technology and photoelectric technology can be introduced into the project design, which makes it more difficult and challenging. First, a competition mechanism is formed in the college, To lay a solid foundation for the follow-up electronic competitions of all levels and types, and select good items to recommend to higher-level competitions, thus forming a virtuous circle of promoting competition by teaching and teaching by competition.

3. The Purpose and Effect of Teaching Reform

Setting up comprehensive design experiments in Electronic Technology Curriculum Design can effectively improve students' comprehensive abilities of circuit design, simulation, circuit construction and welding, which is a test of students' comprehensive application of theoretical knowledge, as well as a comprehensive test of students' circuit design and hands-on ability. Students can exercise their awareness of engineering practice by designing circuits and hand-painted circuit diagrams. Students can find problems by simulation and adjust circuit design in time, which can make students master various design methods flexibly and save time and circuit production cost. By completing the circuit construction and debugging of the whole machine on the experimental box, the students' care and patience are exercised. Enable students to learn division of labor and cooperation, form a sense of competition, feel the importance of teamwork and the sense of accomplishment of overcoming difficulties and

achieving success[7]. By selecting components independently to complete the circuit assembly and welding, students can have a good understanding of the "artisan spirit" of rigorous and meticulous, rational layout and accuracy. By writing the curriculum design report and the defense report of curriculum design, Effectively improve students' ability to express and summarize.

With the deepening and popularization of Multi-level teaching reform," Electronic Technology Course Design" now offers the design and implementation of digital clock, frequency meter, eight-way quiz responder, circuit design of traffic control lamp, design and implementation of waveform generator, active filter, tug-of-war game machine, DC digital voltmeter, electronic music doorbell, etc. Design-oriented experimental project. Through curriculum design, students' enthusiasm for learning and innovation is stimulated, good teams and projects are discovered, and a large number of college students' innovative and entrepreneurial projects, such as electric car charger, smart radio, large publicity electronic screen, intelligent tracking car, intelligent agricultural monitoring system and intelligent water quality monitoring system, are carried out by the Innovation and Entrepreneurship Studio of the College. It has formed a teaching mode of promoting competition by teaching and teaching by competition.

4. Concluding Remarks

Through the exploration and practice of Multi-level teaching reform in recent three years, the students' comprehensive circuit design ability, system debugging ability, circuit assembly ability and team cooperation ability have been effectively improved, and a mature teaching evaluation mechanism has been formed, which has effectively helped all kinds of college students' competitions at all levels. It is beneficial to the cultivation of applied talents and the construction and development of new engineering majors. This course is set in the last two weeks of the fourth semester, which can be a good test of students' mastery of basic courses for electronic majors. Hierarchical instructional design method has been popularized and applied in the teaching of electronic and communication related professional courses, and the effect is remarkable. It can also be used for reference in the teaching of science and engineering courses in similar universities.

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