

Teaching Reform on Digital Circuit and Logic Design Course

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ABSTRACT

Owning strong theoretical and practical performance, the “digital circuit and logic design” course plays a vital role in the electronic information speciality. Although the digital circuit and logic design course emphasizes the practical characteristics, there still ignores the linking with other courses in teaching process. In this paper, the teaching reform program is put forward by the project-driven methods to embody the course characteristics of the engineering application, then the course teaching reform indicates that it can better stimulate the students’ learning interest, train the students’ creative thinking and improve the students’ entrepreneurial ability, then train the excellent electronic information talents.

Keywords: *Electronic information, Teaching reform, Practical ability.*

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1. INTRODUCTION

The Premier Li Keqiang mentioned the “innovation and entrepreneurship” three times in a week and put forward the public entrepreneurship and innovation in July 2015 (Wang, 2016). In essence, the innovative entrepreneurship education (Liu *et al.*, 2016) is a kind of practical education. In order to respond to the government call and improve the teaching quality, the teaching reform program is put forward, including the cross-course knowledge teaching, project-driven teaching, virtual simulation technology teaching (Wang, 2016; Zhu and Wang, 2016). Firstly, the students can avoid the isolation knowledge learning, understand the MCU, EDA and DSP technology through the effective cross-course knowledge teaching and enhance the understanding and design ability of digital circuit system. Secondly, the project driven teaching method can realize the transformation from teaching to guiding. Then, the teaching process fully stimulates the students’ learning interest and develops the ability of project design and engineering practice.

In this paper, we adopt the computer simulation demonstration, which enhances the intuitive and authenticity of the experiment. Combining the virtual experiment and real experiment, the experiment content are expanded, the means of design experiment and comprehensive experiment are enriched. What’ more, by establishing an effective evaluation mechanism, the teachers can grasp the students’ learning dynamic in time, and the students can put forward their difficulties and doubts promptly.

2. THE TEACHING REFORM NECESSITY

The traditional teaching mode adopts the form of blackboard board and PowerPoint. In this mode, the students are in a passive learning state and are lack of learning interest, then the course teaching effect is very bad. The specific problems in the teaching process are represented as follows (Hou *et al.*, 2016; Liu, 2016; Liu and Deng, 2017)

2.1. Ignore the Knowledge Connection with Other Courses

The electronic information speciality teachers often attach importance to the key chapters and ignore the linking with other courses. As the digital circuit and logic design is the core of the speciality course system, it plays the role of connecting the preceding and the following.

2.2. Weaken the Engineering Practice

The traditional classroom teaching mode lacks the effective cooperation between the theoretical knowledge and the project practice, so the students can not experience practice power for promoting theoretical learning. Gradually, the students will lose their interests of the electronic course.

2.3. Lack the Virtual Simulation Technology

Due to the old experimental instruments and limited number of experimental instruments, the expansions of experimental content are limited, but the vivid virtual simulation technology plays a very important role in the teaching effect and knowledge application.

Therefore, for the problems of “digital circuit and logic design” course, this project intends to put forward the teaching reform on the project driven teaching and virtual simulation teaching.

3. CONTENTS OF “DIGITAL CIRCUIT AND LOGIC DESIGN” COURSE REFORM

3.1. Teaching Content

3.1.1. Strengthen The Coupling with Other Course Knowledge

1) The design of MCU, the peripheral circuit and interface circuit of microcomputer can not do without the deep understanding of the digital circuit. At present, the teaching of MCU and DSP application technology focuses on the program design, and the microcomputer interface focuses on the chip function, we should pay attention to the connection of MCU, DSP and digital circuit units. And also we should pay attention to cultivate the integrated design capabilities of combinational logic circuit and sequential logic circuit.

2) Although the PLD, EDA and other advanced technologies play an increasingly important role in the digital system, the basic knowledge and design ability of digital circuit and logic design is essential. In addition, the core control software, peripheral driven circuits and interface circuits are also parts of digital system. Therefore, the students should be urged to learn the digital circuit and logic design course.

3.1.2. Implement The Project-Driven Instance

The “digital circuit and logic design” is a course with strong application, which is widely used in the electronic design competition, intelligent car competition and other practical engineering instances. According to the course content, it is divided as follows: the combinational logic circuit design, timing logic circuit design, 555 timer application and comprehensive project design. Through introducing the design of engineering instances into the teaching process, the students can understand and complete the real project designs.

3.1.3. Introduce the Virtual Simulation Technology

A virtual electronic workbench with advanced testing equipment is established by the simulation platform, which provides the Multisim, Altium Designer or Quartus II to simulate the virtual circuits, and uses virtual test equipment to carry out the circuit experiments and analysis.

3.2. Improve the Teaching Mode

According to the course teaching requirements, we can not merely apply the traditional teaching methods but should use the following methods: lecture method, which is based on the basic principles; example method, which is given to illustrate the theorem application. The two methods have a significant effect on improving teaching effectiveness and improve the students' practical abilities.

3.3. Assess the Teaching Quality

The teaching quality assessment should be a comprehensive, integrated and dynamic process, which not only reflect how much knowledge the students memorize, but also verify the student's analytical abilities, problem-solving skills and project creativities. So, the course adapts the sections of the lecture, answer, homework, electronic production and examination to comprehensively evaluate the curriculum performance.

3.4. Solve the Learning Difficulties

We need to develop practical and effective measurements to help and urge the students with learning difficulties to improve their learning interest, get rid of the bad learning habits and improve the learning quality. Its measures are as follows.

1) Organize the regular seminars to improve the course quality for helping the students deepen their understanding capabilities.

2) Achieve the multi-level cooperation. Firstly, the outstanding students and the students with learning difficulties are chosen to help each other. Secondly, the several learning groups are set to aid the students with learning difficulties to make progress in the learning community. Thirdly, we establish the regular contact system between the difficult students and teachers, then the teachers can tutor them after school.

However, in order to realize the above objectives, we should pay attention to three key points as follows.

The first key point is to design the driven projects carefully. On the one hand, the students should be guided to be interested in learning and get a sense of achievement from the project design; on the other hand, it is necessary to depend on the teaching content with the engineering practice to cultivate the students' practical abilities.

The second key point is to build the course website and enrich the teaching resources. Through the digital circuit and logic design course website, the students can upload the project simulation design and answer the students' questions online.

The third key point is to construct the reasonable teaching evaluation standard. The student-centered teaching concept requires every student to participate in the teaching process, then it is necessary to establish an effective evaluation mechanism. In order to help the students master the knowledge and cultivate their abilities of independent thinking and practice innovation, the teaching evaluation system should not only pay attention to the inculcation of theoretical knowledge, but also cultivate other skills.

4. CONCLUSION

The teaching objectives of the digital circuit and logic design course are mainly embodied in the cultivation of knowledge and ability so that the students can master the core content and the core practice capability of the course.

Using the project driven teaching method, simulation software aided teaching method and course website aided teaching method, the teachers help the students implement the digital system product. Therefore, through the study of digital circuit and logic design courses, the students have the following core competencies. Firstly, the reading ability of the integrated chip function table. Secondly, the ability of selecting the integrated chip flexibly and correctly. Thirdly, the logic circuit design, debugging and analysis ability. Fourthly, the operating ability of the instruments and equipment.

For the students, it is conducive to cultivating their collaborative abilities and knowledge application abilities. For the teachers, it is conducive to improving their teaching levels, scientific research abilities and engineering practice abilities. For the colleges, it is beneficial to integrate the teaching methods and resources to realize the comprehensive and coordinated development of the course and speciality. For the enterprises, it is beneficial to meet the needs of the innovative engineering talents and improve the enterprise competitiveness.

In short, according to the analyses of the teaching content, teaching method and teaching quality evaluation in the digital circuit and logic design course in this paper, the students' engineering practice innovation abilities should be strengthened.

REFERENCES

Hou, G., Z.Z. Chi and J. Wang, 2016. Reform of teaching method for analog and digital circuits course. *Journal of Electrical & Electronic Education*, 38(4): 92-95.

- Liu, W., 2016. The application of software aided teaching in the teaching of digital circuit design. Education Teaching Forum, 2016(38): 33-34.
- Liu, Z. and C.J. Deng, 2017. Design of digital logic circuit educational software. Research & Exploration in Laboratory, 36(1): 140-143.
- Liu, Z.K., F. Zhao and Z.W. Zhang, 2016. The exploration about the training mode for innovation and entrepreneurial talents for electronic information major students in local universities: Current situation, problems and prospects. Higher Education Forum, 2016(1): 30-35.
- Wang, J., 2016. Analysis and exploration on digital circuit' course teaching reform of the vocational colleges. International Conference on Management Science, Education Technology, Arts, Social Science and Economics, pp: 33-36.
- Wang, Z., 2016. Research on the disciplinary features and development orientation of innovative entrepreneurship education in Chinese Universities. Educational Research, 2016(3): 56-63.
- Zhu, M. and S. Wang, 2016. Research on the teaching of digital circuit and logic design course in independent institute. Journal of Electrical & Electronic Education, 38(5): 36-37.

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