



Research on the Innovative Education Practical Teaching Mode of Electronic Information for Outstanding Engineer

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Abstract. In order to meet the requirement of “the Plan for Educating and Training Outstanding Engineers” and to continuously improve the practical ability and comprehensive innovation ability of undergraduates, we should continue to deepen the education reform. This article puts forward a new system of innovative education practical teaching: the reform of teaching methods and teaching ideas at the same time. The teaching method adopts progressive teaching; the teaching philosophy adopts interactive teaching and competitive learning. Through the combination of the two, we will construct a virtuous interactive teaching system of “classroom teaching + curriculum design + electronic competition”.

Keywords: Excellence plan · Innovative education · Practical teaching
Education reform

1 Introduction

Electronic information industry belongs to technology-intensive industries. In recent years, some breakthroughs have been made in interdisciplinary fields such as Internet of Things. The electronics industry poses new challenges to the knowledge reserve and professional abilities of practitioners. In accordance with the traditional electronic professional training methods, students must not adapt to this new development situation [1].

In order to cultivate talents with practical ability and innovative ability to meet the needs of economic and social development and to serve the country in taking a new road of industrialization development, the Ministry of Education launched the “the Plan for Educating and Training Outstanding Engineers” (“Excellence Program”). The cultivation of students’ engineering practice ability and innovation ability is the core and key of “Excellence Program”. This is a weak link in our practice teaching system over the years and also a deficiency of our college students’ ability. The cultivation of engineering college students lies in practice, and the cultivation of practical ability relies on the practical teaching system. However, there are many problems in the existing practice teaching system, which restricts the cultivation of practical ability of engineering college students. The top priority is that colleges and universities should actively promote the reform of practice teaching system [2].

On December 20, 2013, the Ministry of Education and the Chinese Academy of Engineering issued a circular titled “General Standard for Education and Training Program of Excellent Engineers” to optimize the training programs for pilot professionals, to promote the reform of the personnel training mode and to enhance the level of personnel training. Under this premise, the school training standards of participating colleges and universities should basically meet the requirements of the three principles [3]: to be based on industry standards under the guidance of common standards; to position the school personnel training to highlight the school personnel training features; the school standard must be a viable, achievable, evaluable standard.

Practical teaching is an important component of college personnel training, which is an important teaching link in cultivating students’ creative thinking and innovative ability [4]. It plays an irreplaceable role in cultivating students’ practical ability of combining theory with practice and overall improvement of comprehensive quality. Based on the common standards and school standards, this paper further proposes the innovative education practical teaching plan for the excellent engineer of electronic information, that is, constructing a new system of practical teaching: the reform of teaching methods and teaching ideas at the same time. The teaching method adopts progressive teaching; the teaching philosophy adopts interactive teaching and competitive learning.

2 Progressive Teaching Methods

Progressive teaching refers to the use of a method from shallow to deep to gradually improve students’ practical ability and innovative ability: taking experimental class as the basic content of practical teaching to cultivate students’ basic ability; taking curriculum design as the core content of practical teaching to train students’ comprehensive ability; taking electronic design competition for the extension of practical teaching to develop students’ research and development capabilities.

2.1 Emphasis Experimental Class, Improve Basic Ability

In view of the lack of experimental teaching at the present stage, the contents and methods of experimental teaching also need to be reformed. In the current experimental class, although many courses have their own experimental class, many experiments in the experimental class are used to prove the correctness of the experimental principle. And the experiment often has the independent experimental instruction book, many students just follow the procedure according to the guideline in the line connection, finally draw the result, verify the result whether accords with the experimental principle. In this process, many students do not seriously think about how to use the hardware, what is the principle of connecting lines. So that the experimental equipment used, many students can’t really use after.

In order to avoid the emergence of the above phenomenon, so the current experimental class should pay more attention to hardware and software proficiency. Through the experimental class, students should be able to master the use of hardware and software, so as to truly achieve the purpose of classroom teaching and basic experiments, so that students not only know some theoretical knowledge, but also have some

hands-on ability. Only in this way can students lay a solid foundation for the future of integrated curriculum design. In the experimental class, we should master the basic hardware skills and basic software skills. For one thing, students should master the commonly used experimental equipment and device line connection and use. Such as multimeter, oscilloscope, development board and signal source. Only in this way can students take full advantage of these devices in the future practice. For another thing, students should master the installation of required software, the establishment of the project, the compilation of program and how to copy the program into the chip, laying a solid foundation for the future use of the software. The software involved Multisim, Quatus and so on. At the same time, the virtual simulation software breaks the space-time limitation of the routine laboratory site and equipment. Students can conduct autonomous experiments and exploration research through software to improve their practical ability and innovative ability [5].

2.2 Based on Innovative Design, Improve Comprehensive Ability

After mastering the basic skills, students began to participate in comprehensive innovative design. In order to meet the industry standards, the comprehensive innovative design combines the SCM knowledge and the National Undergraduate Electronic Contest Design. The National Undergraduate Electronic Design Contest is a subject competition hosted by the Ministry of Education. The contest content not only reflects the application and development trend of modern electronic technology, but also is a comprehensive test of students' scientific and technological knowledge and practical skills [6]. This event is fully in line with industry standards. Therefore, the comprehensive innovative design based on the National Undergraduate Electronic Design Competition can also meet the industry standards.

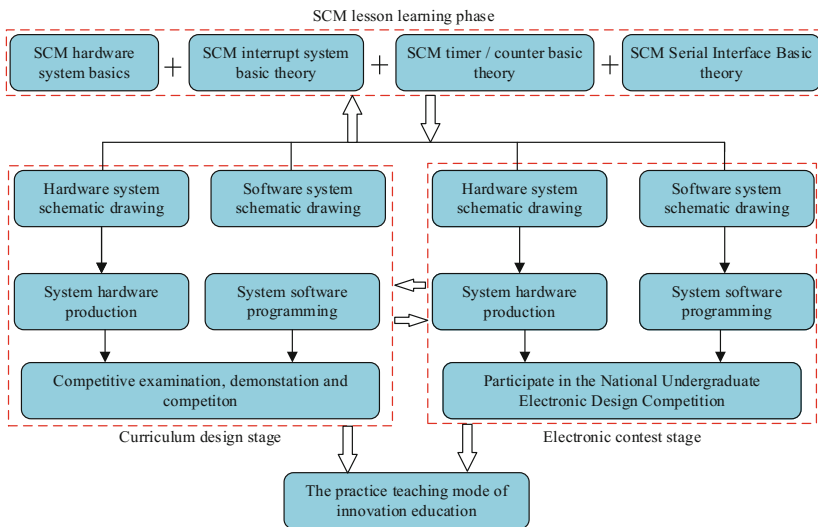


Fig. 1. The practice teaching mode of innovative education

Comprehensive curriculum design requires students to independently design a smart car with obstacle avoidance function, including car motor drive module design, infrared tracking module design, ultrasonic barrier module design, Bluetooth control module design, LCD display module design. The way of acceptance: smart car needs to complete a given job tasks, such as body movement, intelligent tracking, intelligent obstacle avoidance, information display and other functions. The way of the competition: four or five students in each group, each group needs to complete the design, production and commissioning of the entire set of smart car, to draw the circuit schematics, and to write the project design report. In the process of comprehensive design, students closely related the knowledge of the relevant courses with the actual production so as to deepen the students' understanding of the classroom knowledge. The project space is reserved for the students in the project planning. Therefore, students can develop innovative ability through the development of hardware and software; in the process of the project, the students can also effectively improve the practical ability throughout the operation of their own. In order to lay the foundation for participating in the National Undergraduate Electronic Design Contest, we build a benign interactive teaching system of "classroom teaching + curriculum design + electronic competition", and form an innovative education practice teaching mode [7]. The practice teaching mode of innovative education as shown in Fig. 1.

2.3 Based on Electronic Competitions, Train Elite Talent

Comprehensive Innovative Design is based on the National Undergraduate Electronic Design Competition designed by the Ministry of Education sponsored by the enterprise. Most subject competitions at the present stage are sponsored by enterprises. Therefore, the purpose and content of the competition are closely integrated with the electronic information industry, and the actual exchange platform between school and enterprise is automatically established. It also greatly promotes the reform and innovation in the training mode of electronic information students. Discipline competition not only cultivates students' practical ability and innovative consciousness, but also enables students to truly understand the importance of integrating theory with practice and teamwork. It realizes the overall improvement of ability and qualities of electronic information outstanding engineers and creates the conditions for outstanding talents to stand out [8].

In order to give full play to the role of electronic information subject competitions in enhancing students' ability of practice and innovation, the outstanding talent selected by the comprehensive innovative design will participate in the National Undergraduate Electronic Design Competition, the National Undergraduate Intelligent Automobile Competition and the China Robot Competition. By teaching students according to their aptitudes, we should focus on cultivating students with high comprehensive quality, innovative ability and practical hands-on ability. This will not only enhance the school's reputation in implementing the "Excellence Program", but also inspire more students to devote themselves to learning knowledge and skills. In order to cope with the implementation of the School Excellence Program, elite education is implemented [9].

3 Interactive Teaching and Competitive Learning Philosophy

Interactive teaching is a teaching method for teachers and students to communicate and discuss with each other. In the teaching process, teachers should give students adequate guidance and students should actively consult the teacher when there is a problem on the basis of equality, acceptance and honesty with each other. Through the entire guidance, the teacher will give full play to the guiding role. Specific performance: the steering group of all teachers complete and issue the design task book and the design guide book, and plan the competition form before comprehensive design.

The instructors are responsible for certain work of the comprehensive design in accordance with their respect specialty expertise and ensure the entire guidance. The teacher provides the necessary reference materials and demonstrate the program with the students to help students determine the final design proposal. On the other hand, students actively ask the teacher questions and solve the problems in the design process. In this way, the teacher can know the student’s question and enhance the teaching effect effectively. Competitive learning refers to students’ learning in competition. This will also be fully reflected in the comprehensive innovative design. Firstly, integrated innovation design takes the form of group competitions. Secondly, the members of the team work together and each member plays their own advantages to form a complementary advantage in this process. Finally, the group formed a competitive relationship with each other.

In the teacher’s active guidance, Students can form a healthy concept of competition. Competition can promote human growth and social development. While we cultivate students’ cooperation, we should also focus on cultivating the students’ sense of competition and correct the students’ attitudes to further improve the overall quality of students. We should focus on cultivating students with high comprehensive quality, innovative ability and practical hands-on ability. We hope that students can lay a solid foundation for work through in-depth study of undergraduate expertise. Figure 2 shows the new mentor-student interaction and the benign student-student competition model.

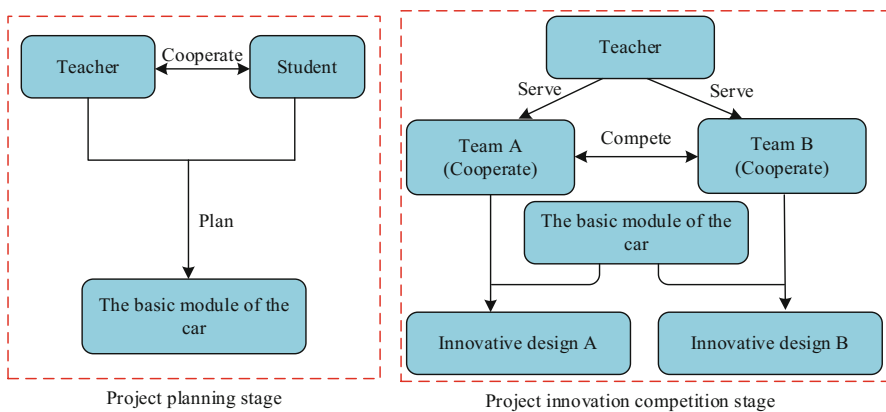


Fig. 2. New mentor-student interaction and benign student-student competition model

4 Conclusion

The “the Plan for Educating and Training Outstanding Engineers” requires universities to change their teaching philosophy and cultivate talents. This paper proposes a new system of innovative education and practical teaching. Through the combination of teaching method and teaching concept reform, students’ basic ability, comprehensive ability and scientific research ability are effectively improved so as to train applied talents to meet the social requirements. In the process of deepening education reform, schools should be gradually overcome the shortcomings of the traditional education model and construct a new system of innovative education practice teaching.

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