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Research on the Training Mode and Curriculum Group Establishment of Electronic Information Specialty

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Abstract: In order to better meet the needs of the society for the talents of electronic information major, according to the characteristics of applied electronic technology major, this paper puts forward the construction of training course groups in different directions to clarify the training objectives of the major and optimize the training effect of talents. This paper is based on the public courses of electronic technology major, focusing on the development and application of embedded system and single chip microcomputer, supplemented by the design and application of integrated circuit. The orientation of the major training is "intelligent electronic technology" and "integrated circuit design and manufacturing", in order to achieve personalized training. The goal-oriented training model can not only meet the diversified needs of professional development, but also take into account students' individual learning interests. This reform has effectively improved students' learning purpose and professional skills, and the proportion of awards won in various discipline competitions has increased by nearly three times. It provides a new idea for the training of applied talents in electronic information majors, which can effectively improve the quality of talent training.

1. Introduction

In recent years, with the popularization of higher education, the teaching process appears to stress theory over practice, which leads to the difficult employment of college students. In recent years, with the popularization of higher education, the teaching process appears to stress theory over practice, which leads to the difficult employment of college students. Studies have shown that only by combining the teaching of theoretical knowledge with the training of practical ability can talents with basic engineering synthesis and design ability be cultivated in higher education [1]. It shows the rapid development of engineering education in our country, but there is still a gap with the goal of training engineering talents. In February 2019, The State Council issued the "20 Guidelines" for vocational education, which clearly defined the restructuring of vocational education standards based on industrial employment needs. Vocational education aims at improving the quality and vocational skills of laborers, promoting employment, promoting the economic development of

enterprises and the whole society, and cultivating practical talents and skilled laborers. At present, the teaching reform of colleges and universities in education teaching methods, teaching concepts and other theoretical research is more in-depth [1-3]. However, the teaching reform theory of electronic information specialty is less, and the specific research on training mode and curriculum group construction of electronic information related specialty is also less [4,5].How to introduce and establish a talent training and teaching model suitable for electronic information majors is of great significance to the healthy and sustainable development of electronic information majors in higher education. Based on the actual construction of electronic information engineering related major -- applied electronic technology major, this paper deeply analyzes the key core issues of sub-direction training mode and curriculum construction in the teaching practice and promotion, carries out practical research on the teaching reform of electronic information major in higher vocational colleges, and provides new ideas and practical guidance for the local talent training strategy.

2. Analysis of the Current Situation of Personnel Training for Electronic Information Majors

At present, electronic information majors usually adopt the "general" talent training mode. Most undergraduate talents training can only guarantee the breadth of professional fields but hardly guarantee the depth of professional learning. It is difficult to take into account both aspects, which may cause the disconnect between education and practice, and seriously affect the quality of electronic information application-oriented undergraduate talents training. The main problems in the training of electronic information talents in higher vocational colleges in China are as follows: first, the training objectives are not clear, showing two extremes, which are manifested in two aspects: one is the same as the training objectives of undergraduate schools, and the particularity of vocational education is not fully considered; the other is the training objectives are consistent with the objectives of short-term employment training institutions, which excessively meet the needs of enterprises, the personnel training objectives are changed frequently. Second, the professional setting is outdated, talent training methods can not keep up with the development of The Times; Third, the professional curriculum system is chaotic and unscientific, and the depth of the curriculum system is unreasonable; Finally, due to almost no difference with the training mode of undergraduate colleges, it leads to poor employment quality and weak employment competitiveness. Thus, it is urgent to reform the training mode of applied electronic technology in higher vocational colleges.In China, Shenzhen Vocational and Technical College, according to local conditions, divides the training direction of its electronic information major into "intelligent manufacturing" and "integrated circuit design and manufacturing". In the training program of Computer Science and Technology Major of Tianjin University, the program is divided into three major directions. Several years' practice shows that the program plays an important role in the training of computer professionals. In order to solve the problem of unclear professional training objectives, Nanning Vocational and Technical College divides the applied electronic technology major into two general directions: electronic products and electrical equipment maintenance and intelligent product development. By setting up modular courses in different directions, Zhejiang A&F University has solved the problem that the major of electronic information engineering has too much content and too few class hours, and the practical application level of graduates is difficult to adapt to the needs of the rapidly developing electronic information industry, which reflects the reform idea of the nonlinear training mode of practical and innovative ability;.Hangzhou Vocational and Technical College takes applied electronic technology major as an example, considering the characteristics of higher vocational students, such as large differences in basic abilities and qualities, outstanding personality and so on, from the perspective of respecting the development of students' individual talents, combined with the direction of professional ability learning, put forward the personalized

talent training model for higher vocational students, and achieved good teaching effect. As a high-tech industry, integrated circuit is the core of today's electronic equipment. Some people believe that the feasibility of such an industry entering vocational colleges is extremely low. In particular, large and valuable equipment and ultra-clean working environment cannot be replicated in vocational colleges and ordinary application-oriented undergraduates, and students lack the sense of reality of being in enterprises. However, with the increase of industry gap and technology development, these problems have been solved. In terms of education policy, the new 《Edition of the Professional Directory of Vocational Education (2021)》 issued by the Ministry of Education has added the major of integrated circuit technology. In terms of the development of science and technology, students can realize zero distance with enterprises through simulation. In addition, this problem can be solved through school-enterprise cooperation in running schools and enterprise personnel teaching in schools, so as to complete hands-on training of this major and acquire hands-on ability of this major. Therefore, this paper takes the applied electronic technology major as an example to explore the sub-orientation training mode and course group construction, and positions the training direction of the applied electronic technology major as "intelligent electronic technology" and "integrated circuit design", so as to realize personalized training and provide reference for the promotion of the sub-orientation training mode of the electronic information major in vocational education.

3. Basic Thoughts of the Reform of Application-Oriented Talents Training Mode

According to the actual situation of the major, aiming at the training of application-oriented talents, the major courses are scientifically divided into two directions: "intelligent electronic technology" and "integrated circuit design".The students of higher vocational schools come from two ways: general higher vocational education independent examination enrollment and general college entrance examination enrollment. Considering the difference in basic ability and quality of freshmen when they enter the college, they can choose specialized courses selectively based on the cognition degree of professional knowledge and future development direction after completing professional public basic courses, so as to realize personalized training. It not only meets the diversified needs of professional development, but also takes into account the individual learning interests of students. Taking this opportunity, we will create a platform to promote classroom teaching reform through discipline skills competition, realize the optimal allocation of teachers, enhance students' interest in learning, and thus improve the quality of talent training.

3.1. Cultivation Objectives

3.1.1. Training Objectives of Intelligent Electronic Technology

The talents trained in the direction of intelligent electronic technology are mainly for intelligent hardware developers and product testers in the electronic information industry. They are trained to have the theoretical basis of modern electronic information, the operation skills of advanced instruments and equipment, the comprehensive application ability of hardware and software of intelligent electronic information system, and the ability to analyze and solve complex engineering problems. The trained talents can be engaged in intelligent control equipment, high-end new electronic information technology, space information technology, traffic control system, home appliance control system, intelligent toys, automotive electronics, industrial automatic control, medical instruments, environmental monitoring and other aspects of the controller technology development, production management and sales of products in electronic information enterprises and institutions. Moreover, they are innovative and high-quality technical and skilled personnel

with certain humanistic quality, scientific quality, innovation consciousness and craftsman spirit.

3.1.2. Training Objectives of Integrated Circuit Design and Manufacturing

Integrated circuit design and manufacturing training aims at specific fields such as integrated circuit design, EDA tool use, testing and integrated circuit manufacturing. Students can master a series of high-level technical skills such as integrated circuit process technology, layout design, testing and application, and engage in related work in semiconductor and integrated circuit industries. To cultivate complex, innovative and high-quality technical and skilled personnel with a sense of innovation, spirit of craftsmanship, strong ability of employment and entrepreneurship, sustainable development and international vision.

3.2. Construction of Course Groups

Table 1: The contents of course group construction in different directions of applied electronic technology major

The type of course	Intelligent electronic technology direction	Integrated circuit design and manufacturing direction
professional basic course	Basis of Circuit Analysis, Analog electronics technique, Digital electronic technique, C language programming	
specialized elective courses	Electronic circuit board design, Electronic circuit board design, SCM application technology, Sensor technology, Embedded system application, RFID principle technology, PLC technology and application, Embedded operating system, Machine vision , and so on.	Semiconductor integrated circuit, analog integrated circuit design, Digital design FPGA application, Integrated circuit layout design, Integrated circuit testing and verification, and so on.
practical curriculum	Electronic system design	electronic system design

Considering the characteristics of students' limited learning time in school and lack of theoretical knowledge, on the basis of "thick" basic courses for public majors, supported by course group construction and guided by application-oriented talent training, courses with distinctive characteristics are set up to make the learning of professional courses both "broad" and "specialized".That is to say, after learning the basic courses of public majors, students voluntarily choose the major they are interested in to complete the elective courses, and focus on discipline competitions in related directions to achieve the purpose of "promoting learning through competition". By grasping the depth and breadth of the theory and the degree of specialization, the implementation of separate direction teaching is conducive to the optimal allocation of teachers.Table 1 shows the specific curriculum Settings of course group construction in different directions for applied electronic technology major.

4. Ability Training of Engineering Applied Talents

4.1. Curriculum Setting and Teaching Mode Based on Practical Thinking

Electronic information discipline is a multidisciplinary integration subject with the characteristics of high integration, crossover and penetration, which puts forward higher

requirements for electronic information engineering applications. In terms of teaching, we put forward a Goal-oriented team practical teaching model [6], Figure 1 shows the goal-oriented team practical teaching model.

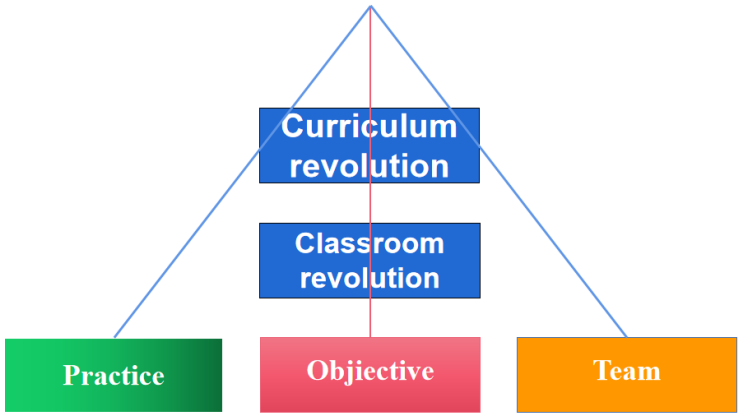

Figure 1: Goal-oriented team practice teaching model

Therefore, in addition to carefully setting up comprehensive practical training and practical courses in the curriculum setting, appropriately reducing the theoretical teaching hours and increasing the practical links in the non-practical curriculum setting, the teaching of "combining theory with practice" is also advocated. Table 2 shows the distribution of practice class hours and theory class hours of some major compulsory courses.

Table 2: The distribution of practice class hours and theory class hours of some major compulsory courses

The name of the course	Hours of theoretical learning	Hours of practical learning
Sensor technology	32	16
Semiconductor integrated circuit	44	20
RFID principle technology	40	16
Embedded system application	20	44
Digital design FPGA application	32	24
Embedded operating system	32	16

4.2. Improve the Training of Applied Talents in Multiple Ways

By dividing the training direction of the major scientifically and optimizing the curriculum system to emphasize the training of engineering consciousness and application ability, the goal of training applied talents for the major of applied electronic technology is gradually accomplished. Specifically, the following methods are used to improve students' practical application ability: (1) strengthen the school-enterprise cooperation construction, arrange enterprise tutors to enter the classroom regularly, or provide in-depth communication opportunities in the form of lectures, and combine classroom with engineering practice; (2) Encourage students from all directions to actively participate in discipline competitions, such as college students Electronic Design competition, Internet + competition, integrated circuit development and application and other related discipline competitions, which not only meet the diversified needs of professional development, but also increase the number of awards in discipline competitions by more than three times; (3) Establish and improve students' professional skills teaching and learning workshops through apprenticeship and other means to improve students' independent learning ability.

5. Conclusion

The orientation of the applied electronic technology major is defined as "intelligent electronic technology" and "integrated circuit design". The orientation and objectives of talent training are defined, and the learning objectives of students are clarified, so as to improve their learning and interest. By optimizing the course system and the construction of relevant course groups, appropriately increasing the proportion of practical class hours, enriching the content of practical training courses, effectively training students' professional skills and improving their innovation ability. One year after the implementation of the reform, it was obviously found that the number of subjects that could participate in the skills competition increased, and the number of relevant awards was about three times as much as before, which provided valuable practical experience for the training mode of applied electronic information talents. However, due to the limited training equipment, training venues, teachers and other factors, students' discipline skills and employment competitiveness are still insufficient. This teaching reform provides valuable practical experience for the training mode of applied electronic information talents.

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