

Research on the Integrated Construction of Electronic Technology Courses for the Cultivation of Applied Talents in Higher Vocational Colleges

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Abstract—Under the new situation, higher vocational and technical education should highlight the characteristics of vocational education and innovate curriculum and teaching models in terms of cultivating high-quality applied and skilled talents. This paper takes the construction of electronic technology courses compulsory for higher vocational communication and electronics majors as the main research object, comprehensively analyzes the current situation of course teaching, focusing on reshaping the course system, optimizing course content, innovation in teaching organization forms, environmental resources and teacher construction, etc., and deeply discusses the integrated construction strategy of electronic technology courses in higher vocational colleges, and put forward the curriculum reform methods suitable for the characteristics of higher vocational student. This method can provide useful reference for the cultivation of applied talents in higher vocational colleges.

Keywords—higher vocational and technical education; applied talents; electronic technology; curriculum construction

I. INTRODUCTION

The cultivation of applied and skilled talents is the core task of Higher Vocational and technical education. With the rapid development of national comprehensive national strength and scientific and technological level, new and higher standards are put forward for the ability and quality of talents. Higher vocational colleges should closely follow the development of industry and technology, explore the characteristics and laws of vocational education, fully consider the characteristics and interests of students, further position the core of education in professional competence, focus on the promotion of modern talent ability, and promote the innovative development of higher vocational education[1][2].

Taking the course construction of electronic technology basic as an example, it is compulsory course for electronic information specialty in Higher Vocational Colleges. Focusing on the training goal of "application-oriented and skill oriented", this paper combines with the current scientific and Technological Development and the new ideas and concepts of interdisciplinary integration, breaks through the traditional teaching mode, explores the curriculum reform plan to meet the needs of professional talents in the new era from the aspects of curriculum system, teaching content reform, teaching methods

and means innovation. This practice is of great significance and value to improve the level of professional basic curriculum construction and enhance the professional learning ability and professional competitiveness of students in higher vocational colleges.

II. ANALYSIS OF THE CURRENT SITUATION OF COURSE TEACHING

Electronic technology course is a series of compulsory professional basic courses for communication and electronic majors. It covers a wide range of subjects and has many knowledge points, and pays equal attention to theory and practice[3][4]. The previous curriculum teaching is mainly carried out along the traditional content framework system, namely the progressive route of "fundamentals of electric circuits - Analog Electronic Circuit - Digital Electronic Circuit". Under the new situation, in order to meet the training requirements of application-oriented talents, we can carry out reform and practice from multiple dimensions of the curriculum, and solve some problems in the original curriculum teaching.

1) The traditional curriculum system of electronic technology is "Circuit Foundation - Analog Circuit - Digital Circuit". Each course has its own system, and the logical main line between them is not coherent[5]. For the students in higher vocational colleges, the proportion of basic theory is relatively large, but there are some problems in the connection between knowledge context and the practical application of modern electronic system.

2) The current course content belongs to the style of classical theory school and pays attention to the integrity of knowledge system, but it is not closely connected with practical application and professional field, and the application of teaching example engineering is not enough.

3) In practice, most of the students are afraid of difficulties in theoretical study, but they are more receptive to practice[6]. Therefore, in the form of teaching organization, we need to further strengthen the integration of theory and practice design, and explore the teaching mode guided by engineering application and practice traction.

III. STRATEGY OF INTEGRATED CONSTRUCTION OF ELECTRONIC TECHNOLOGY COURSE

A. Reconstruction of curriculum system

According to the learning ability and characteristics of higher vocational college students, If we can strengthen the logical relevance between courses, let students clarify the context of knowledge, improve the macro grasp of the course from the perspective of engineering or system, clarify the position and role of each knowledge point in the whole system, and strengthen the connection between content and practical application, it will play an obvious role in promoting the quality of talent training and the effectiveness of curriculum teaching[7].

Based on the above considerations, we can break through the constraints of traditional curriculum system and reconstruct the new system of electronic technology curriculum with the whole workflow of typical electronic system from signal acquisition / input, signal processing / processing, signal control / execution to signal driving / output, and form the architecture of "basic module + application module + training expansion module". Among them, the basic module selects the basic concepts, principles and components in the courses of electrical engineering, fundamentals of electric circuits, analog circuit and digital circuit. The goal is to enable students to establish the basic understanding and basic concepts of electronic technology from scratch to have from the perspective of understanding the basic components, getting familiar with the basic electrical parameters, and mastering the basic methods of circuit analysis. The application module refers to the whole workflow of typical electronic system and extracts the corresponding electronic technology knowledge points and skills points according to the principle and application of each functional unit in the electronic system, carries out optimization and integration, and forms a modular and step-by-step content grouping. The goal is that through the study of this module, students can establish a comprehensive and systematic cognition of the functional principle, working mode and circuit structure of typical electronic system, and generate the application ability of electronic technology, so as to lay a good foundation for professional study and competent post practice. The training and expansion module focuses on the design, assembly, debugging and maintenance of electronic products, and designs training contents based on project-based and engineering practice teaching. It expands and increases frontier knowledge topics, online resources of MOOC/Micro lecture, activities of electronic workshop innovation and training of electronic design competition, etc. The goal is to enhance the students' autonomous learning ability, the ability to solve practical problems, and to cultivate scientific thinking mode, positive learning attitude and sense of teamwork. To provide assistance for professional ability improvement and career development. The new architecture of electronic technology curriculum is shown in Figure 1.

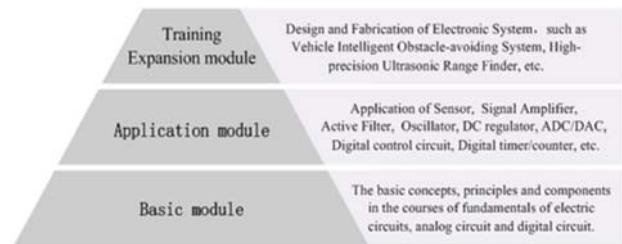


Figure 1. The New Architecture of Electronic Technology curriculum

B. Optimization of teaching content

In view of the reform of teaching content, we should balance the breadth, depth and foresight of the teaching content on the basis of fully considering the professional needs and professional development needs, focus on the application, close to the engineering and optimize the teaching content.

Students in higher vocational colleges are not good at learning theoretical content, but have good interest and acceptance of practical content[8]. In the past, most of the teaching content reform is to delete some complex theoretical calculation content and add some new technical knowledge, which is slightly insufficient in the overall design of the content, and the integration of theory and practice needs to be strengthened.

Based on the above considerations, in the optimization design of teaching content, we can follow the step-by-step path of knowledge "point" – application "line" - Engineering "surface", and carry out the integrated development and design of curriculum content. The detailed ideas are as follows: The first is to design some simple and practical application problems, introduce some intuitive experimental phenomena, etc., and build a bridge from the basic knowledge points and skills points to the practical circuit application, and form the basic layer content of the course through multi-point convergence, so as to support students' progress Entry into the field of electronic technology learning needs. The second is to take the working flow of typical electronic system as the logic main line, the corresponding circuit function cases are integrated and generated according to modular and thematic design ideas, such as 12V DC power supply, audio-optic anti-theft alarm, digital timing circuit, etc., in comparison with circuit function units such as "signal acquisition / extraction, signal conversion / processing, signal execution / control, power supply / monitoring", etc., and so on. We will organically embed the teaching content into the circuit function case to form the application layer content of the course, so that the classroom learning can effectively connect with the practical application of electronic technology, and enhance the pertinence and effectiveness of the content. The third is to draw lessons from the new engineering education concept, strengthen the engineering practice teaching, fully tap the depth and foresight of the course content, highlight the key and difficult points of the course and the development of new technology in the field, and design and form several engineering training projects with different difficulty coefficients according to the engineering idea. Its purpose is to support the development of project-based teaching related to electronic system design, maintenance and process manufacturing, to create opportunities for students'

engineering practice innovation, to encourage open thinking and team cooperation, and to lay a good foundation for strengthening professional basic ability and enhancing professional competence. From the macro perspective, the course content after the new design can effectively connect with the functional application of electronic system, the internal logic of content is coherence. From the micro perspective, the knowledge and skills within the course can be integrated organically and the pertinence of content is effective.

C. The design of teaching organization form

Appropriate teaching methods and teaching organization forms are the "booster" to improve the teaching quality and stimulate students' interest and curiosity. The combination of the characteristics of electronic technology course and the learning situation of higher vocational students determines that the teaching process should follow the organizational strategy of combining theory with practice and leading by practice. According to different teaching contents, different teaching organization methods should be designed. We should consolidate students' theoretical foundation in teaching resonance, temper students' practical ability, and cultivate innovative thinking and professional ability[9][10].

In the actual teaching process, adhering to the principle of "integration of theory and practice is the core", we organically combine theoretical learning with practical operation, and carry out teaching practice by classification. For example, for basic theory, basic components, we can flexibly adopt the teaching organization form of "practice before theory" or "theory before practice", carefully design the teaching link of "key preview before class-intensive learning and refining in class-consolidation and promotion after class", and timely cooperate with heuristic teaching methods, question inquiry teaching method, demonstration method, experimental method and other teaching methods, so as to skillfully realize the organic integration of theory and practice, help students connect the "closed loop" between theory and practice. According to the content of circuit function cases, the teaching organization form of practice traction and task driving can be adopted. As a guide, teachers can flexibly use discussion and heuristic methods to guide students to analyze circuits, sort out problems, study knowledge, and discuss solutions. Students form a task group, select the required equipment components, carry out circuit bonding and testing, and realize the circuit function. In order to stimulate students' subject consciousness and learning motivation, and further improve circuit application ability, teachers should timely carry out program evaluation, group mutual evaluation, experience sharing and other links in teaching. For the content of engineering training project, the idea of engineering management can be used for referred, the teaching organization form is shown in Figure 2. According to the difficulty of the project, students can set up a project team of appropriate scale independently and the teacher should play the role of engineering technical supervision. The teacher should evaluate and guide the project implementation scheme proposed by the students, and put forward a clear completion time limit and requirements. The project team independently completes the whole process of project design and implementation, and teachers provide necessary checks and guarantees. The process evaluation is the main way in teaching,

and students are encouraged to make bold innovation in scheme improvement, performance improvement and function expansion. The organizational form of engineering project training can effectively cultivate students' application innovation ability, engineering practice quality and team cooperation consciousness, and improve the comprehensive ability of professional learning and career development.

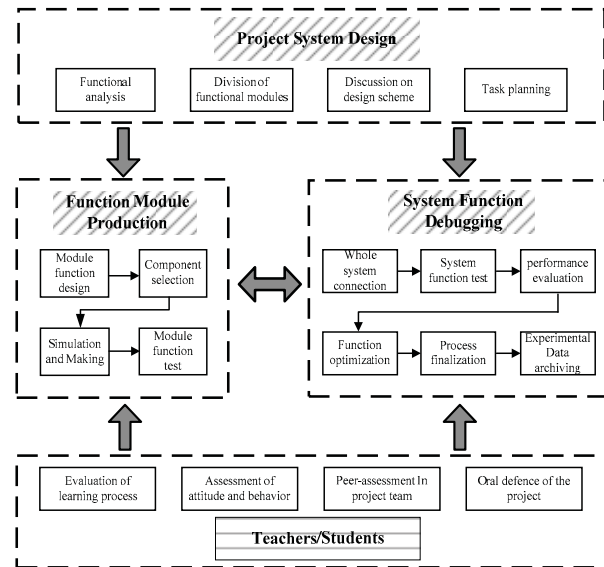


Figure 2. Teaching Organization Form of Engineering Training Project

D. Construction of teaching resources and teaching staff

In order to fully support the goal of curriculum integration construction, we need to make continuous efforts in the construction of teaching materials, teaching conditions, information resources and other curriculum supporting construction, and enrich the hardware and software configuration related to curriculum teaching. The construction task focuses on the design concept of curriculum system, teaching content and teaching organization form. The teaching materials follow the design principle of "close to application, focus on theory and strengthen practice", and optimize and integrate the content of teaching materials according to modular and task-based thinking. At the same time, we should give full play to the role of information network technology in promoting teaching, actively promote the construction and sharing of network resources, build course related websites, record micro lectures and MOOC videos, carry out online communication and discussion, test and answer questions and other teaching links, so as to provide rich resources for the online and offline Hybrid Teaching of the course.

To strengthen the construction of teaching conditions, on the basis of giving full play to the role of existing resources, it is suggested to vigorously carry out the construction of smart classrooms, smart laboratories and other environmental construction. Combined with the actual situation of the school, the mainstream teaching platform of the industry or self-developed teaching platform can be used to carry out the construction. At the same time, we should strengthen the timely tracking of new technologies and processes, introduce

advanced sensor, Internet of things, embedded system development and other related modules, configure Multisim, Protues and other virtual simulation environments, further enrich the hardware and software conditions of teaching, and provide support for improving students' professional learning ability and career employment ability.

In order to achieve good teaching effect, it is bound to put forward higher requirements for the comprehensive quality of teachers. Teachers should have solid theoretical foundation, strong electronic technology practice ability, and scientific classroom organization and management ability, which is also one of the key elements of talent training in colleges and universities. It is suggested that the construction of teaching staff should be promoted from the following three aspects: The first is to build a leading team composed of experts, professors and excellent teachers, strive to create a reasonable echelon level, create a scientific teaching and research atmosphere, and give full play to the role of demonstration and guidance. The second is to take young teachers as the main object, by means of teaching professional training and leading and helping by famous teachers, we hope that they can lay the solid foundation in teaching and cultivate good teachers' quality. The third is to help teachers to improve the practical ability, accumulate rich practical experience, and strengthen the overall quality of teachers by relying on scientific research, manufacturer training, academic exchange, vocational skills competition and etc, so as to make them become the core force of college education project.

IV. CONCLUSION

Facing the practical needs of improving the construction level of electronic information specialty and enhancing the professional competence of students in higher vocational colleges, it is of great significance for the cultivation of Applied Talents in Higher Vocational Colleges to fully excavate the characteristics of integration of theory and practice of electronic technology course and close to engineering, and carry out integrated construction around curriculum system, course content, teaching method mode, teaching resources and other aspects. According to the specific measures proposed in this paper, after the verification of teaching practice in recent years, the construction ideas and methods can effectively promote the benign interaction of teaching, improve the level of students' ability, and have a good guidance and reference role for the curriculum reform of related majors.

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