Construction and Practice of Ability-Oriented Curriculum System for Optoelectronic Information Science and Engineering Under the Background of Large-Classification Training

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Abstract. Large-classification training has the advantages of being conducive to the cultivation of wide-caliber talents, improving the structure of disciplines and tapping the inherent potential of students, which is widely used in colleges and universities. In this paper, in view of the problems existing in major training of Electronic Engineering in Chongqing University of Posts and Telecommunications, such as the difficulty of specialty diversion, the weakening of specialty generalization, and the weak ability of specialty engineering and innovation, the construction of the ability-oriented curriculum system and the specialty curriculum group of Optoelectronic Information Science and Engineering under the background of the large-classification training are explored. In addition, solid teaching practices are carried out in order to solve those problems.

1. Introduction

Large-classification training refers to the integration of the same or similar disciplines, usually the professional merger in a same academic department, and students will be enrolled according to one large-classification. After one to two years of basic training, students are divided into different majors according to the principle of interest and two-way choice. Compared with professional enrollment, large-classification enrollment is a reform of “General Education” in colleges and universities [1]. A 2+2 training mode for the major of electronic engineering is adopted in Chongqing University of Posts and Telecommunications (CQUPT). The major of Optoelectronic Information Science and engineering is one part of the mode, which is “The Three Special” specialty in Chongqing, The characteristic specialty in Chongqing and The first batch of school-level brand specialty in CQUPT. The enthusiasm and enthusiasm of students and teachers in learning and teaching are better stimulated through the large-classification training.

However, there are still some problems in practice, such as blindness and conformity of specialty diversion, weakening of specialty generalization, even the weak ability of specialty engineering and innovation. Therefore, it is necessary to explore the ability-oriented curriculum system construction and specialty curriculum group construction of Optoelectronic Information Science and engineering under the background of large-classification training.

2. Constructing a Competency Oriented Three Node Professional Curriculum System Under the Background of Large-Classification [2]

In this paper, aiming at the change of the demand for professional talents in the fast-developing global competitive environment, especially the demand for professional engineering and technical personnel adapted to the development of industry and local economy and society, a three node professional curriculum system for Optoelectronic Information Science and Engineering major under the background of large scale training is constructed, which is illustrated in Figure. 1. In the three important training nodes of entrance, specialty diversion and graduation, student’ engineering ability and innovative concept are strengthened through different forms and courses.
The initial point of the three node structure is at the beginning of new students’ enrollment. Through a series of freshmen entrance guidance and basic practice links, the engineering objectives concept of large-classification is established. The central point of the three-node structure exists in the second half of sophomore year and the first half of junior year. In the second half of sophomore year, a subject called Introduction to Discipline is set up. At the end of the second grade, the nodes of the specialty diversion jointly complete the guidance of the specialty project through the specialty diversion propaganda, strengthen the engineering concept of students, and accomplish a guarantee for the individualized development needs of the students when the diversion is completed. The first half of junior year is in the professional training stage.

![Figure 1. Three Node Large-Classification Training Professional Curriculum System.](image)

Through the advanced technology course in the field of Optics and Electronics, the guidance of the engineering research in this field is further established. After completing this course, professional diversion propaganda and professional laboratory exchange visit will be arranged. Major diversion is carried out, which strengthens the guarantee of students’ individualized development needs. The third node of the three-node structure is in the fourth grade. The main contents are graduation practice and graduation design. Through the training of relevant courses and experimental projects, students are required to make use of the knowledge they have learned to design, implement and apply a certain difficult professional subject completely, so that students can learn and apply professional knowledge from the perspective of solving engineering problems, and preliminarily master engineering thinking methods.

During the period of large-classification training, it is mainly the courses of mathematics, physics and electronics, and there are some related experimental links, which can solve the basic problems of mathematics, electronics and the preliminary application of tools for students. To the professional curriculum link, through a series of professional basic courses, professional direction courses and comprehensive innovative projects. By using of mathematics, electronics and other basic tools, the engineering and innovation abilities are achieved for students. The practice module of professional basic class and direction are constructed, and the comprehensive practice links involving many courses are set up, which can effectively strengthen students’ ability of solving engineering problems and innovative practice.


In this paper, the relationship between the construction of specialties and the development of industry even disciplines are studied. An innovative personnel training mode which is oriented to industrial development and driven by strong disciplines is put forward. The College has two first-class disciplines, and Electronic Science and technology and optical engineering is one of them,
which is the key discipline in Chongqing during the 12th Five-Year Plan period and the new round of doctoral declaration in CQUP.

Curriculum group is the integration of various disciplines and the structure is formed by competition and cooperation among the elements in the university curriculum system. Based on the four level curriculum system with the order of human culture as the main body and the relationship of large-classification-profession-professional direction, the discipline and specialty characteristics are emphasized. The four level curriculum system is constituted by general curriculum group of Arts and Science, general education curriculum group, professional basic curriculum group and professional curriculum group.

Through the accurate positioning of the “nearest development area”, a curriculum group with “vertical stratification and capacity advancement” has been formed, which can highlight the general knowledge of disciplines, professional basis and the vertical links between the professional courses as well as the progressive relationship between the level of competence. As shown in Figure 2. The core courses of the electronic engineering category correspond to the three levels of general knowledge in public foundation, professional foundation and curriculums. The cultivation of the three abilities are emphasized respectively. On the general knowledge level, the basic ability of mathematics and physics, electronic circuit analysis and application of electronic tools are emphasized through the combination of curriculums and competitions. On the level of basic specialty, students’ ability to apply basic knowledge of specialty is promoted by means of experiment and practice.

Figure 2. Organization of Core Courses.

And on the level of specialty curriculum, students’ engineering ability is promoted by means of comprehensive and innovative experiments and practice modules, as well as graduating projects such as graduating internship or design. With the combination of industry-teaching-research and science-education, students’ ability of engineering and innovation are formed and further promoted. The organic integration of those three abilities effectively strengthens the connection between vertical courses, which can also take into account of the interaction, correlation and radiation between core courses and other courses.

4. Constructing a Three-Synchronization Mechanism of “Direction-Platform-Team” to Promote Professional Development with Strong Key Disciplines

In this paper, the relationship between the construction of specialties and the development of industry even disciplines are studied. An innovative personnel training mode which is oriented to industrial development and driven by strong disciplines is put forward. The College has two first-class disciplines, and Electronic Science and technology and optical engineering is one of them, which is the key discipline in Chongqing during the 12th Five-Year Plan period and the new round
of doctoral declaration in CQUP. Based on a series of investigations, discussions, expert consultations and the guiding ideology of adjustment and construction of school teaching institutions, it is determined that the major of Optoelectronic Information Science and engineering should focus on supporting the secondary discipline development of optical engineering and physical electronics in Electronic Science and technology.

In the support direction of the school’s overall discipline planning, optoelectronic technology and its application directions should be strongly supported, as well as the direction of optical communication, optoelectronic sensing systems, micro-nano devices and systems, and optoelectronic detection technology in optical engineering. Therefore, the core construction direction of Optoelectronic Information Science and engineering specialty is determined as a modular curriculum group in 3 directions including optoelectronic technology, optoelectronic information technology, display and lighting technology, which is defined in the corresponding curriculum module of the training program. Through the construction of scientific research platform of optoelectronic devices and systems, Electronic Science and technology and other disciplines, the level of professional innovative experiments and trainings have been rapidly upgraded. Key teachers are not only the person in charge of the core curriculums, but also the organizer of textbook construction, or the key of some related disciplines, who have already formed a strong teaching and research team.

5. Focusing on the Improvement of Training Objectives-Teaching Process-Quality and the Construction of Full Coverage Teaching Resources for the Core Courses

5.1 Through the Co-Construction of the Central and Local Governments, Experimental Platforms, Scientific Research Platforms, Ability Promotion Platforms and Subject Platforms of Optoelectronic Specialty are Constructed. And a Professional Innovation Practice Environment with Balanced Professional Orientation is Constructed [4]

On the basis of the existing optoelectronic professional laboratories, four R&D platforms for optoelectronic devices and systems, key disciplines of Electronics Science and technology, Optoelectronic Information Science and engineering, and optoelectronic new sensors and systems have been successively obtained, which have been successively supported by central and local joint projects. A solid foundation has been laid with the foundation of those four platforms for improving students’ ability in the area of Optoelectronic information science and Engineering, as shown in Figure 3. On the basis of platform construction, new experimental and scientific research training projects are actively developed.

At the same time, through the cooperation of industry, universities and researches, the construction of off-campus experimental practice base, a systematic and complete innovation practice platform is constructed with the integrating of the subject resources.

Figure 3. The Platform Supports for Professional Characteristic Orientation Modules.
5.2 Construction of Teaching Materials and Resources Actively Covered by Core Course [5]

In terms of professional foundation and professional curriculum construction, teaching materials and resources are built around core courses, in order to achieve the full coverage of the publication and use of core curriculum textbooks, and the construction of key curriculum website resources. Thus a soft learning environment for students has been built. The core courses of this specialty including Information of Optics, Optoelectronic Technology and Optical Transmission Technology. All the textbooks have been published by the National High-level Publishing Houses and have been applied in teaching practice.

Information of Optics, Optoelectronic Technology, Optical Transmission Technology and Integrated Optics have been constructed as key courses at school level, which have been completed the construction of network resources etc. Teachers are all have excellent performance in teaching evaluation.

5.3 Construction of Professional Teachers Team with Three Combinations

In the talents introduction of teaching team, in recent years, doctorate are actively introduced in order to strengthen team strength. Through the combination of three constructions (curriculum construction, textbook construction, subject construction), key teachers are not only the person in charge of the core curriculums, but also the organizers of textbook construction. Teaching researches are carried out by them regularly, which have brought out excellent teaching and research results. Through team cohesion and common development, the sustainable development of curriculum construction and teaching reform are ensured.

6. Conclusion

Through reform and practice, good results have been achieved in the construction of photoelectric information science and engineering specialty. The specialty has been approved as “The Three Special” specialty in Chongqing, which has also been incorporated into the construction of “Three Special” specialty group of Electronics Science and technology in Chongqing. The specialty ability has been upgraded and the advantage of optoelectronic talent training cluster has been formed. In terms of personnel training, the abilities of students in engineering application and innovative practice have been significantly improved.

Recent years, students of this major have made outstanding achievements in the competitions such as “Internet +”, “Challenge Cup”, “The National Electronic Design Competition”, “The National Undergraduate Photoelectric Design Competition”, “The National Mathematical Modeling”, and “The Mathematical Contest in Modeling”. Employment rate and contract rate have been in the forefront of Chongqing’s colleges and universities. The quality of employment is high. Students graduated are widely recognized by employers. The influence of this major is effectively expanded in China.

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