

Discussion on the Cooperative Education Curriculum System of Undergraduate and Vocational Colleges of Electrical Engineering in Guangdong Province

Wang Runtao^{a,*}, Li Ming, Fei Juan, Wu Hongyan, Liu Yao

School of Electronic and Electrical Engineering, Lingnan Normal University, Zhanjiang, Guangdong, China

^a85189425@qq.com

**Corresponding author*

Keywords: Electrical engineering specialty, collaborative education, practice teaching mode, practice teaching ideological and political

Abstract: Taking the development of the project of collaborative education between Higher Vocational and undergraduate education in Guangdong Province as the background, combined with the current situation of the development of high-cost collaborative education in electrical engineering specialty, the enrollment situation and course system of three-two-stage specialization and four-year undergraduate collaborative education were analyzed. In view of the problems of "faults" in the course system, "cohesion" in the theoretical course and "overlapping" in the experimental course, the solutions for the construction of the three-dimensional course system with high-quality and complementary-deficiency were put forward. It provided new ideas for optimizing the high-cost cooperative education course system of electrical engineering specialty.

1. Introduction

In order to deepen the reform of Applied Talents Training Mode in undergraduate colleges and universities, further expand the connection between higher vocational education and undergraduate education, and set up a resource platform for the integration of higher education and vocational education, Guangdong Province actively carried out various educational reform projects at all levels. In the Implementing Suggestions of the People's Government of Guangdong Province on Deepening the Comprehensive Reform in the Field of Education, it was clearly pointed out that "Accelerating the construction of a modern vocational education system, vigorously developing vocational education at the undergraduate level, optimizing the general vocational ratio of higher education, and realizing the convergence of education at different stages".

2. Professional development trend, promote improvement as needed

The major of electrical engineering is one of the key majors in the construction of "new engineering" in China, which aims to cultivate "national electricians". Graduates have a wide range of employment, including motor and electrical design, manufacturing, control, testing, operation

and maintenance, research and development, production management, or the operation of power system and electrical equipment, power supply system, and electrical design and operation and maintenance of high-rise buildings^[1]. At present, there are about 600 institutions of higher learning and vocational colleges offering electrical engineering and automation majors, which have always been among the best in the employment rate of science and engineering graduates. With the rapid development of China's economy and the continuous improvement of science and technology, the demand for "pyramid" shaped talents in electrical engineering has become increasingly significant.

In order to meet the needs of the professional talent market, it is of great significance to effectively link up higher education and vocational education. The key point of this high connection is not only the connection of the management of the two universities, but also the overall planning of the curriculum system. The continuity and coordination of the curriculum system is the basic guarantee for the collaborative training of the corresponding universities of the University. Therefore, it is the primary task to carry out the curriculum system reform in the collaborative education model of the university^[2].

3. The current situation of collaborative education between undergraduate and higher vocational education in Guangdong Province

In recent years, in order to open up the promotion channels of vocational education and provide more students with learning and promotion opportunities, Guangdong Province had built two types of collaborative education pilot projects. One was the "four-year undergraduate collaborative education" project for undergraduate enrollment, and the other was the "three two staged undergraduate collaborative education" project^[3].

3.1 Three two staged undergraduate collaborative education

The "three two" training mode of upgrading from junior college to undergraduate is adopted by higher vocational colleges. Students need to go through three years of higher vocational study, and higher vocational schools will organize students to apply for the corresponding undergraduate majors of the corresponding undergraduate colleges. The enrollment rate of this model is significantly higher than that of the ordinary plug-in, but it can not independently choose schools and majors. The "three two" segmentation model has great difficulties in the connection of courses, especially for engineering majors whose theory is "difficult to learn".

The courses learned in higher vocational colleges are mainly general education courses, professional basic courses and professional practice courses. After entering the undergraduate university, students in the same major courses as those in the third year of undergraduate study. Some core courses, such as power system integrated design and embedded design of electrical engineering, require a certain foundation in mathematics and programming, but generally no corresponding courses are set in higher vocational colleges. In this case, the college upgraded students will find it difficult to understand the course content, can't keep up with the pace of the classroom, and are difficult to adapt to the undergraduate courses. The effective way to ensure the quality of talent training is to actively carry out the curriculum reform under the "three two" staged collaborative training mode and to do a good job in the connection between specialized and undergraduate courses.

3.2 Four year undergraduate cooperative education

Four year undergraduate collaborative education includes "4+0" and "2+2" pilot projects. The "4+0" mode is adopted by undergraduate colleges for enrollment, and pilot training is carried out in

cooperative higher vocational colleges. During the training process, higher vocational colleges and undergraduate colleges jointly develop talent training programs, which organically combine the advantages of undergraduate theoretical knowledge education with the advantages of vocational colleges' skill knowledge education. In order to meet the requirements of undergraduate education, the breadth and depth of theoretical courses must meet certain standards in terms of curriculum. However, teachers in higher vocational colleges are difficult to guarantee the opening of courses, so teachers need to be deployed from undergraduate colleges. This kind of teacher sharing is limited by the distance between cities, so under the "4+0" training mode, the construction of online courses is particularly important.

3.3 Analysis of enrollment status

In the pilot enrollment plan for collaborative education of undergraduate and undergraduate students in Guangdong Province in 2021, there were only five majors for electrical engineering and automation, including two "three two segmentation", one "4+0", and two "2+2". This situation formed a huge contrast with the urgent demand for electrical talents in Guangdong Province. Guangdong Province encourages existing pilot schools to actively explore the popularization scheme of collaborative education, and encourages various teaching reforms, curriculum reforms, and management mode reforms.

3.4 Problems in development

(1) The "fault" of the curriculum system. In the undergraduate stage, theory is more important than practice, while in the higher vocational stage, skills are more important than exploration. The connection of the two types of curriculum systems has caused a fault problem, resulting in a situation of "nothing learned, nothing used". It needs to explore the intersection of the undergraduate and senior courses, carry out curriculum interpenetration in the form of mutual penetration, and solve the fault problem.

(2) The problem of "cohesion" of theoretical courses. Within the training time limit of the two stages of higher vocational education and undergraduate education, it is impossible to cover all professional courses. The structure of theoretical courses is incomplete, resulting in narrow scope of knowledge and weak innovation ability of students, which affects the follow-up promotion study. It needs to build an online elective course platform to provide students with a network space for learning at all stages and solve the problem of curriculum convergence.

(3) The problem of "overlapping" in practical courses. The experimental courses in colleges and universities are mainly confirmatory and comprehensive experimental training, with a high degree of overlap. However, due to the limitation of hardware resources, it is difficult to make breakthroughs on campus. It needs to introduce enterprise collaborative education elements, expand resources, and progressive teaching can effectively solve the overlapping problem^[4].

4. Complementary advantages and disadvantages of undergraduate and higher vocational education, three-dimensional curriculum system construction

4.1 Integration of undergraduate and higher vocational resources

Statistically integrate the teacher allocation, experimental equipment and existing curriculum systems of undergraduate and vocational colleges. It takes the training direction of building electrical engineering as the object, adjusts the setting of basic courses of disciplines, improves the proportion of professional courses of relevant disciplines at the undergraduate stage, and reduces

the proportion of courses with relatively small relevance to the training direction. It increases the proportion of curriculum design and comprehensive practical training courses in higher vocational education, reduces the setting of discipline based courses, and constructs a three-dimensional curriculum system of theoretical practice, online and offline, and undergraduate higher vocational education.

4.2 Both undergraduate and higher vocational education

For the core curriculum of the discipline, the undergraduate stage sets up a four tier structure of theoretical courses, simulation experiments, basic experiments and curriculum design to achieve the penetration of "knowledge theory practice innovation". In the higher vocational stage, three forms of applied technology courses, skills training courses and comprehensive training courses are used to achieve the improvement of "skills technology design". The social practice in the undergraduate stage is arranged to be carried out in the corresponding vocational colleges in the form of centralized practice, as the intersection of the two tracks of the undergraduate and the college. It can improve the utilization rate of school-based resources and promote the smooth and effective connection between the two schools' curricula^[5].

4.3 Expansion of teaching mode and construction of online curriculum resources

Encourage excellent teachers of the college to actively carry out video course construction and expand online course resources in many ways. Online courses are open in the form of elective courses. Students can obtain corresponding credits only after they sign up for courses and pass online course assessment. Professional teachers assigned to each course are responsible for answering questions, correcting homework, and assessing the course. Students can communicate with teachers through the teacher-student interaction area. Gradually improve the curriculum system through dynamic optimization, so that students can gain real learning results, and ensure the stable implementation of high-quality talent training plan.

Acknowledgements

This work was supported by Guangdong Province Higher Vocational Education Reform Research and Practice Project "Construction of the Immersive" 2+2 "Collaborative Education Curriculum System for Electrical Engineering and Automation" (GDJG2021368), Ling Shi Jiao Wu [2021] No.165 Document No.34 "Lingnan Normal University - Beijing Sanqing Internet Technology Co., Ltd. Practical Teaching Base", Ling Shi Jiao Wu [2020] No.240 Document No.3 "Construction of curriculum and practice system for collaborative education between vocational colleges and application-oriented undergraduates" ,Ling Shi Jiao Wu [2020] No. 81 Document No. 31 "Lingnan Normal University - Guangdong Xinxing Cast Pipe Co., Ltd. Practical Teaching Base" and Guangdong Provincial Department of Education Yue Jiao Gao Han [2021] No. 29 Document No. 347 "Research and Practice of Mixed Teaching Mode Based on Multi information Technology".

References

- [1] Zhi Pengfei, Zhu Zhiyu, Qiu haiyang, Zhu Wanlu, Wang Hui. *Exploration on the Construction of Electrical Engineering and Automation Specialty in Colleges and Universities [J].Modern Vocational Education*, 2021(40):88-89.
- [2] Chen Danjiang, Fan Huili, Zheng Zihan, Yang Yali. *Demand analysis of applied talents in electrical engineering and automation[J].China Modern Educational Equipment*, 2019(15):66-68+76.
- [3] Wang Ming, Pan Dawei. *Research on the characteristic development path of electrical engineering and automation specialty in local application-oriented universities[J]. Journal of Shengli College China University of*

Petroleum ,2020,34(02):68-71.

[4] Yuan Xunfeng, Liu Jun, Liu Baoying. *Exploration on the mode of school enterprise cooperation in cultivating innovative engineering talents of electrical engineering*[J]. *University Education*, 2019(05):35-38.

[5] Shi Weiping, Lan Jinlin, Liu Xiaotian. *The dilemma and Outlet of Undergraduate Vocational Education Development under the Background of Typological Reform*[J]. *Modern Education Management*, 2021(02):99-104.