REFORM AND RESEARCH OF THE COURSE "COMMUNICATION SURVEY AND DESIGN AND PRELIMINARY BUDGET" BASED ON THE INTEGRATION OF INDUSTRY AND EDUCATION AND THE BACKGROUND OF JOB COURSE COMPETITION AND CERTIFICATION

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Abstract: Under the guidance of high-quality development, courses should be able to achieve a successful combination of "industry education integration" and "job course competition certification" in talent cultivation and student employment. As a core course of modern mobile communication technology, "Communication Survey and Design and Preliminary Budget" is an important means to cultivate students' vocational abilities and employment directions, ditly involving multiple positions such as consulting design, construction project management, and settlement audit. Based on the integration of industry and education and the certification of job courses, the course design is guided by modular teaching and practical work processes. The teaching content is closely integrated with the actual production of enterprises, and the theory is guided by practicality and vocational skills. By adopting information-based teaching methods and integrating with the 1+X certification and vocational college skills competitions, we aim to strengthen the cultivation of practical abilities, develop students' professional knowledge and vocational skills, and enable them to initially possess the qualification standards for engineering service positions, thereby laying a solid foundation for their employment.

Keywords: Integration of industry and education; Post course competition certificate; Modular design; Practicality; Vocational skills

1 INTRODUCTION

Communication Survey and Design and Preliminary Budget "is a core course for modern mobile communication technology majors, aiming to cultivate students' skills in design drawing and preliminary budget preparation. It is an important knowledge and skill that must be mastered in the employment direction of communication engineering services. Based on the job requirements of multiple positions such as communication consulting design, construction project management, and settlement audit, and referring to the qualification standards of various positions in the engineering service industry chain, the curriculum design and teaching content will be reformed with a focus on modular teaching and actual communication engineering workflow. In collaboration with enterprise technical personnel, we design teaching content that closely integrates with the actual production of the enterprise. Theory is guided by "practicality" and "vocational skills", and information technology teaching methods are used to connect with 1+X certification and vocational college skill competitions. We strengthen the cultivation of practical abilities, construct high-quality course content, cultivate students' professional knowledge and vocational skills, and lay a solid foundation for their employment[1].

2 CURRENT STATUS OF CURRICULUM DEVELOPMENT AT HOME AND ABROAD

The vigorous development of 5G new infrastructure construction has brought about a significant increase in the demand for engineering and technical talents. To this end, various universities have launched similar courses, such as Shijiazhuang Information Engineering College and Changzhou Information Vocational and Technical College. The teaching content of similar courses is partly focused on the understanding of engineering drawing, basic knowledge of engineering drawing, benchmark measurement, and instrument measurement, while some are too broad, not detailed enough, and not in-depth enough[2]. Most courses combine topics such as circuits and pipelines into one course, resulting in content that is too broad but lacks depth. The most important thing is the failure to grasp the spirit of policy documents such as the "Action Plan for Improving the Quality and Quality of Vocational Education" (2020-2023) and the "Implementation Plan for National Vocational Education Reform" (20 articles on vocational education), and the lack of integration between industry and education. For example, most course content lacks practical cases from enterprises, and the budget allocation quota used lags behind too long. Failed to timely connect with the 1+X certification and skills competition, and achieved course updates by promoting teaching and improvement through competition.

Domestic equipment manufacturers responsible for foreign communication engineering generally outsource to domestic design institutes or self manage the entire network deployment, requiring personnel to have planning, design, and engineering cost control capabilities. Therefore, based on the comprehensive investigation and implementation of the

communication engineering industry chain and similar courses at home and abroad, combined with our school's modern mobile communication technology curriculum system, it is necessary and feasible to carry out the course design and teaching content reform of "Communication Survey and Design and Preliminary Budget" through information technology means.

3 RESEARCH ROUTE AND COURSE DESIGN

3.1 Research Routes and Methods

The curriculum reform first and foremost lies in accurately grasping the inherent logical relationship between the integration of industry and education and the comprehensive education model of on-the-job course competition and certification. Through various methods such as data collection, on-site research, and comparative analysis, we have accurately identified the inherent needs of talent cultivation and the dual nature of schools and enterprises, and depicted the technical roadmap for communication survey and design and preliminary budget reform as shown in Figure 1.



Figure 1 Technical Roadmap

Under the guidance of the technical line, the detailed methods and specific contents adopted for each stage are as follows:

(1) Data collection

Refer to online materials, focus on analyzing the current research status at home and abroad, and the implementation of similar projects in other universities, determine research objectives, content, and key technologies, and lay the foundation for high-quality project development.

(2) On site research method

Visit enterprises, gather needs and obtain enterprise resources, send project members out for learning and training, and deepen "industry education cooperation". Through in-depth research and analysis, the relationship, direction, and focus of the integration of industry and education, as well as the competition and certification of on-the-job courses, with this course.

(3) Comparative analysis method

Comparative analysis of students' classroom performance, understanding of professional knowledge, mastery of professional skills, and course evaluation results before and after the implementation of curriculum reform and resource development

(4) Experimental verification method

Verify the achievements of the reform through the work performance of interns and graduates, evaluations from employers, content and results of vocational skills competitions;

(5) Summary and Amendment Method

Based on course evaluation and practical results, improve and revise project research methods to ensure the scientific and reliable nature of research results. Through project research, achieve the successful integration of curriculum with "industry education integration" and "on-the-job course competition certification".

3.2 Course Teaching Design

The course of "Communication Survey and Design and Preliminary Budget" is designed based on job knowledge and overall ability requirements. Scientific design includes 7 projects: basic knowledge of engineering projects, communication base station survey, communication base station design, engineering cost and preliminary budget, preparation of preliminary budget examples, publication, review and disclosure, and certification integration, as shown in Figure 2.



Figure 2 Course Design

According to the course module shown in Figure 2, the teaching plan for the "Communication Base Station Design" module is designed as shown in Table 1. A total of 6 lectures and 12 class hours were arranged, including on-site teaching and practical internships for tower and mast design, power supply matching design, and main equipment design, which were then reflected through drawings. Finally, design practical teaching for the comprehensive training of newly built stations and co located stations, demonstrating the combined effect of theory and practice[3].

Teaching arrangement	Chapter and Content Summary –	Time Allocation		
		lecture	experiment and practice	on-the-spot teaching
1	Design of tower and mast machine room		1	1
2	Power supply matching design		1	1
3	Design of base station main equipment		1	1
4	Design a diagram	1	1	
5	New Station Comprehensive Training		2	
6	Comprehensive Training of Co located Stations		2	

 Table 1 Teaching Plan for Communication Base Station Design Module

The course introduces industry standards, job responsibilities, enterprise plans, and construction documents to construct project carriers, as shown in Figure 2. Driven by tasks, the integrated design content of "teaching, learning, and doing" fully and clearly reflects the full service process of designers in the construction of communication base station projects, encouraging students to bravely shoulder multiple responsibilities and master necessary skills and certificates. Simultaneously emphasizing the closed-loop assessment of enterprise inspection and competition certification integration, in order to better enhance students' professional abilities, see Figure 3.



Figure 3 Case Study of Enterprise Positions

Each project sets different task quantities based on the production needs of the enterprise and the teaching difficulties, and the content is equipped with text, pictures, videos, engineering cases, or practical training tasks to highlight practical skills. Teaching emphasizes gradual and closed-loop assessment, and improves students' comprehensive abilities through enterprise testing and competition certification integration.

The above course projects have established online courses for Xueyin and are open to students and society for free. The course design includes teacher-student interaction and course evaluation, which helps to understand students' needs and answer their questions in a timely manner. The course website is: https://www.xueyinonline.com/detail/244644252

4 THE EFFECT OF CURRICULUM REFORM

4.1 Integration of Industry and Education

Since the implementation of the reform research on the course of "Communication Survey and Design and Preliminary Budget", the school and enterprise have closely cooperated and deeply cultivated the field of communication engineering design. Based on the external practice base jointly established by our school's Modern Mobile Communication Technology major and Zhongtongfu Consulting Design and Research Institute Co., Ltd.[4], we have hired senior technical talents from enterprises as guest professors to jointly develop courses and publish textbooks, as shown in Figure 4. By promoting efficient innovation in the education and industry chains, we aim to achieve deep cooperation in the integration of industry and education[5].



Figure 4 Achievements of Industry Education Integration

4.2 Post Course Competition Certificate

Through teaching reform research, simulation training content of 1+X certification and skills competitions is integrated into the curriculum, encouraging students to obtain relevant industry certificates and actively participate in skills competitions in school[6,7], enhancing their professional competence and improving their employability. Since the curriculum reform, the pass rate of+X certification has increased from 76% to 94%, and the participation base has become larger and wider. The results of the skills competition have also significantly improved, breaking through the BRICS Vocational Skills Competition and winning the second prize in the international finals, as shown in Figure 5. The award-winning contestants and students who have obtained relevant certificates have significantly improved their skills, and the company has provided feedback that these students have strong practical abilities and high professional ethics.



Figure 5 Gold Brick Competition Award Certificate

5 CONCLUSION

Based on the job requirements of the communication industry chain at home and abroad, the development of relevant courses at home and abroad, and the current situation of the mobile communication major in our university, this article conducts research on the reform of "Communication Survey, Design and Preliminary Budget". Through comprehensive and in-depth analysis, propose reform measures based on the integration of industry and education and the certification of job courses. Practice has proven that under this approach, educational reform has achieved the expected goals and improved students' comprehensive qualities. Next, we will incorporate the career trajectory of graduates as a key research focus[8], in order to obtain more valuable long-term benefits and improvement methods.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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