

Exploration and Practice of Modular Teaching of “Communication Engineering Project Management and Supervision” Course based on Post Ability

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Abstract: “Communication Engineering Project Management and Supervision,” as the core course of the communication major in higher vocational colleges, plays an important role in the teaching process and work practice. This paper aims at the challenges of this course under the traditional teaching model and points out the existing problems in teaching content, use of teaching materials, teaching methods and evaluation. The article emphasizes the advantages of modular teaching in adapting to the actual needs of students, all-round assessment and practicability, introduces the specific path of the implementation of modular teaching reform in detail, expounds how to implement modular teaching, provides a new reference perspective for the implementation of professional curriculum teaching reform in higher vocational colleges, and then supports the training of all-round communication supervision talents.

Keywords: Modular teaching; Post ability; Task-driven; Curriculum thinking and politics; Supervision

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1. Introduction

Today in the information age, the demand for communication facilities in all walks of life is increasing, especially with the rise of emerging technologies such as 5G and the Internet of Things, which puts forward higher requirements for the construction of communication engineering. The scale of communication engineering construction continues to expand, the types of projects are constantly changing, the level and technology of construction units are uneven, and the construction methods and standards are not uniform. In order to avoid the situation that there is no special person to supervise and coordinate during the construction process, which will lead to frequent engineering failures and quality hazards, chaotic equipment installation and wiring, difficulties in commissioning and project quality cannot be guaranteed. Communication engineering project management and supervision positions emerge at the historic moment and the market is

broad. Based on this, many vocational colleges in China have set up “Communication Engineering Project Management and Supervision” courses.

The major in communication in higher vocational colleges is an application-oriented major with a high degree of integration with social needs. The course of communication engineering project management and supervision is conducive to cultivating students’ practical spirit and innovation ability and provides the basic guarantee for cultivating excellent engineers. It plays an important role in supporting the transformation of old and new kinetic energy, industrial transformation and upgrading, training talents leading future technology and industrial development, and cultivating new quality productivity ^[1,2]. The course is characterized by a wide range of knowledge and a close combination of theory and practice, but the traditional personnel training model has been unable to adapt to the development and needs of the new era.

In May 2019, the Ministry of Education officially promulgated the National Vocational College Teacher Teaching Innovation Team Building Plan, which prospectively introduced modular teaching as the core strategy of team cooperation innovation, aiming to promote the innovation of the education model. Subsequently, in order to further strengthen the construction of the innovation team, the General Office of the Ministry of Education issued a “Notice on Further Strengthening the Construction of National Vocational College Teachers’ Teaching Innovation Team” in September 2022, clearly requiring that the construction of innovation team must go beyond the boundaries of traditional disciplines, take modular teaching as important content, and encourage the exploration of project-based, scenario-based and other diversified teaching methods to highlight the modular teaching model of innovation team ^[3]. In order to meet these reform requirements, the research group explored modular teaching reform of the communication engineering supervision practice course, which was oriented by post ability, and reformed the course from four aspects: teaching content, use of teaching materials, teaching methods and assessment.

2. The drawbacks of the traditional teaching mode of “Communication Engineering Project Management and Supervision”

Through the investigation, it is found that some schools still use the traditional teaching mode to teach, but the traditional teaching mode in the course content, the use of textbooks, teaching methods and teaching evaluation there are some urgent difficulties to be solved ^[4,5].

(1) The content is detached from the job requirements of enterprises

The school has not arranged for enterprise tutors to participate in the formulation, of course, teaching content and the implementation of course teaching, and most professional teachers have not been deeply involved in enterprise learning and practice ^[6]. As a result, the teaching content cannot keep up with the latest technology and standard development, and the knowledge and skill level of students after graduation lag behind the development needs of the industry.

(2) The role of teaching materials cannot be fully utilized

Traditional paper textbooks are slow to update, lack interaction and personalization, neglect practice and application, and are difficult to adapt to the digital age ^[7]. On the other hand, they lack practical application links corresponding to knowledge, and the content is boring, resulting in low interest in learning and a lack of methodological ability and social ability of students. They still need to spend a certain amount of time training before going to work. It cannot meet the training requirements of specialized skilled talents in higher vocational colleges.

(3) Teaching evaluation is too simple

The traditional assessment method is to obtain the total score of students by combining the final examination with the usual score, which is easy to causes students to focus only on memorization and understanding of knowledge, but neglect the cultivation and detection of practical ability, which cannot reflect the real level and potential of students, and affect their enthusiasm for learning. It is not conducive to cultivating students' professional qualities of dedication, fairness and integrity, as well as good communication skills and coordination skills, and cannot provide accurate references for employers.

3. Communication engineering project management and supervision course modular teaching reform implementation path

According to the position and skill requirements of communication engineering construction and supervision enterprises, the course content of "Communication Engineering Project Management and Supervision" is reorganized, and the course is studied and practiced in modular teaching reform to form a reform plan and implementation path for cultivating high-quality composite talents in communication majors.

3.1. Meet the post requirements and institutionalize the course content

On the basis of the deep integration of schools and enterprises, the "five-step working mechanism" of "industry enterprises → typical positions → work tasks → knowledge points combing → building modules → course system" has been formed. Together with enterprise engineers, seven project stage work modules and seven post-skill modules have been jointly developed according to the project stage work content and the core post skills of project management and supervisors respectively (**Table 1** and **Table 2**). Each module sets corresponding tasks, and students can obtain several knowledge points or skill points after learning one module. Students can complete the management and supervision of typical projects of communication engineering by completing modules such as communication pipeline engineering projects, communication optical cable engineering projects, data and switching equipment installation projects and wireless base station engineering projects, and have stronger adaptability after working in enterprises ^[8].

Table 1. Work modules in the project phase

Module 1	Module 2	Module 3	Module 4	Module 5	Module 6	Module 7
Pre-construction	Design review	Preparation for construction	Construction	Engineering acceptance	Design review	Trial run and warranty

Table 2. Post-skill module

Module 1	Module 2	Module 3	Module 4	Module 5	Module 6	Module 7
Investment Control	Quality control	Schedule control	Information Management	Contract management	Security Management	Risk management

3.2. Develop new forms of integrated teaching materials and realize the modular content of teaching materials

In order to conform to the trend of curriculum modular teaching reform, teachers need to divide the content

of textbooks into modules and further refine the content of each module into specific learning tasks. On this basis, a rich and diverse digital teaching resource library should be constructed to meet the needs of students with different learning styles and needs, to comprehensively improve the teaching quality and learning experience. The key to the implementation of the modular curriculum system is the “dual” cooperation between schools and enterprises to develop new teaching materials ^[9]. In-depth cooperation between schools and enterprises to develop a new form of textbooks integrating digital resources, the latest communication engineering project management and supervision implementation mode and core post skills, ideological and political elements, typical cases and vocational skill level examination question bank, especially loose-page or workbook textbooks. At the same time, the textbooks are integrated into the curriculum with ideological and political elements to help students establish correct values and career views. Cultivate good professional ethics and professional spirit.

3.3. Teaching team division of labor and cooperation, the implementation of “progressive ability improvement” modular teaching

- (1) Set up a modular course teaching team, teachers work together to complete modular teaching

Set up a teaching team with a reasonable structure and a combination of school and enterprise ^[10,11]. In terms of the division of teaching content and teaching modules, the team members’ respective advantages are combined to determine the content division. Based on the characteristics of the course modules, the teachers on campus and the enterprise mentors are matched to determine the teachers, teaching time and teaching place of each module, and finally complete the teaching tasks of 76 class hours on campus and the actual project site. In order to ensure that the teaching content can be close to the needs of enterprises, before the implementation of modular teaching, school teachers are assigned to the enterprises to learn, cultivate skills, and “progressive” improve professional literacy.

- (2) According to the module tasks, set up a student study group

Each group is made up of 5 to 6 students, through role-playing, simulated post, and engineering site side by other teaching methods, so that students can work together to complete the task. Each project group includes the project manager of the construction unit, the person in charge of the design unit, the project manager of the construction unit, the chief supervision engineer, the professional supervision engineer and the supervisor. The detailed module task content is shown in **Figure 1**.

- (3) In the teaching process of each module, the teaching methods such as inquiry, discussion and participation are adopted, and the “progressive” teaching methods such as action-oriented, project teaching, situational teaching and case teaching are flexibly adopted ^[12]

Part of the time in the classroom teaching, part of the time in the school training base teaching, in addition, timely organizing students to visit the project site, the characteristics of this stage of teaching is that the teacher leads the students to learn to do the project management and supervisor work in the project, that is, “learning to do.” The third stage is a complete course project teaching, the course project is the real project task of the enterprise, the students under the leadership of the enterprise tutor, the implementation of the project management and supervision workflow, complete the project management and supervision work tasks, that is, “do learning.”

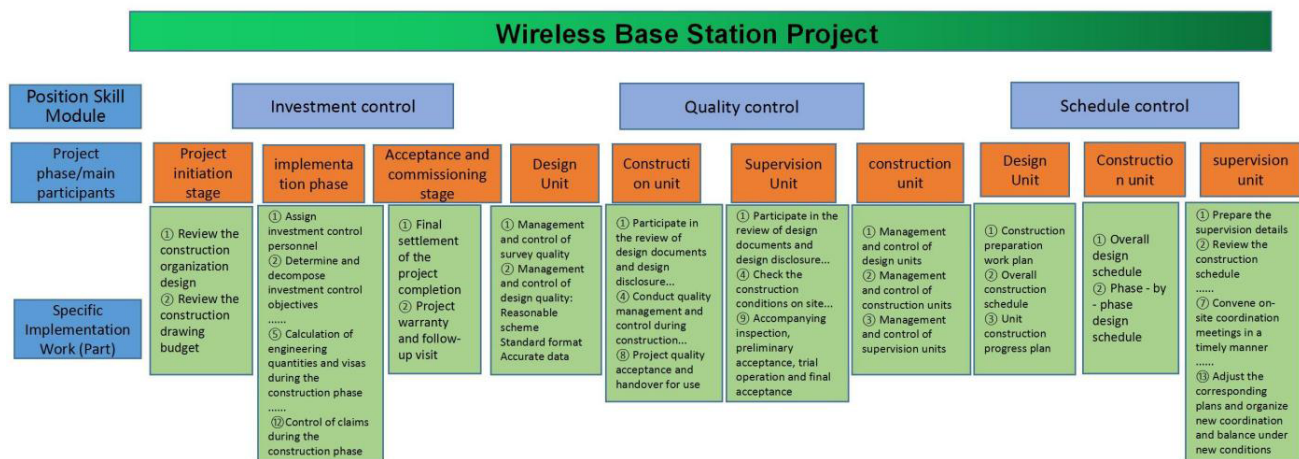


Figure 1. Details the content of module tasks.

3.4. Establish multiple evaluation mechanisms and implement the whole life cycle management and monitoring of the teaching process

To build a modular teaching and learning management system integrating self-learning and academic level diagnosis, the school teachers and enterprise tutors jointly develop a comprehensive and perfect assessment system and assessment indicators, which are applied to student's class attendance, class performance evaluation, course work completion evaluation, practical training operation evaluation and the process examination system combining theory and practice, etc. To comprehensively test the learning effect of students' knowledge, skills, and literacy in each module. Through the positive feedback of assessment, diagnosis and improvement, the students' learning situation is analyzed and their academic level is diagnosed [13]. Combined with information platforms such as Superstar Learning Channel, classroom party and Tencent Conference, it integrates multiple evaluations and assessments such as student self-evaluation, group mutual evaluation, teacher evaluation, teacher and student mutual evaluation, platform evaluation, enterprise tutor evaluation, value-added evaluation, etc. It uses big data and artificial intelligence to implement teaching process management and monitoring, create multiple evaluations, and truly achieve the whole life cycle evaluation and management [14].

It is important to exert importance on the evaluation of students' quality and incorporate safety awareness, labor attitude, craftsman spirit and professional accomplishment into the evaluation indicators in combination with the actual situation. With the help of the learning management system, students' learning behavior is recorded, the "value-added" generated by each student's academic progress is tracked and counted, the individual differences of students are respected, the efforts and progress of students are affirmed, and personalized learning reports are generated to implement the "life case."

4. Communication engineering supervision practice course modularization teaching reform effect

4.1. It has effectively promoted the implementation of the "Three Education Reform"

(1) The improvement of the teacher level

To promote teachers to constantly update their teaching concepts and teaching methods, the teaching

team is composed of teachers in the school and enterprise mentors to cooperate and deepen school-enterprise cooperation. Teachers in the school study in enterprises, constantly improve their professional quality and teaching ability, help teachers transform scientific research results into teaching resources, improve teaching quality and effect, and help increase the ratio of dual teachers^[15].

(2) The optimization of teaching materials

It has promoted the updating and integration of teaching materials, promoted the construction of three-dimensional teaching materials, and provided students with more abundant and diverse learning materials. The reform emphasizes the combination of teaching materials and practice so that students can better combine theoretical knowledge with practice and improve their ability to solve practical problems.

(3) Innovation at the teaching method level

Teachers can adopt diversified teaching methods according to different teaching modules and students' characteristics to stimulate students' learning interest and enthusiasm. Strengthen practical teaching, so that students can learn and master the knowledge and skills of communication engineering supervision practice in practice, improve practical ability and problem-solving ability. The application of information teaching means can realize the sharing and interaction of teaching resources, and improve the teaching effect and students' learning experience.

4.2. It effectively improves students' practical ability

Through case analysis, simulation exercises, practice training and other ways, let students learn and master the knowledge and skills of communication engineering supervision in practice. This teaching method is helpful to improve students' practical ability and problem-solving ability. In the enterprise practice, students can have access to the real communication engineering supervision projects, understand the latest trends of the industry and technology development trends, so as to better combine theoretical knowledge with practice.

4.3. Students' enthusiasm for learning has been significantly improved, and their professional recognition has been significantly enhanced

The teaching team adopts the teaching modes of "classroom teaching - teaching to learn," "project reproduction - learning to do" and "real project - learning to do," and adopts the teaching methods of inquiry, discussion and participation, and flexibly adopts the teaching methods of action-oriented, project teaching, situational teaching and case teaching. The teaching site is the engineering site, and the teaching focus is the key points of post-skills. In the process, the ideological and political infiltration of the course is strengthened, which stimulates the motivation of students' learning and the direction of efforts, and improves the students' professional cognition. Students from the "fear of learning" to "can learn happy learning." From the modular teaching and learning management system, it can be seen that students' learning objectives have been effectively achieved, and their professional quality and comprehensive ability have been significantly improved.

5. Conclusion

Through the modular teaching reform of the course "Communication Engineering Supervision Practice," the classroom of "student-oriented, multi-collaborative modular teaching" has been realized, and the teaching

design has changed from “knowledge-based” to “ability-based.” Promote the cooperation between schools and enterprises to realize the deep integration of production and education. It is conducive to the iterative updating of course content, and students can grasp the latest professional technology in time. It is conducive to the personalized development of students and improves the quality of students’ employment. Modular curriculum teaching promotes teachers to carry out teaching reform, which is conducive to improving teachers’ professional quality and teaching ability. Modular curriculum learning makes students more motivated to learn, and students change from passive learning to active exploration learning. In addition, the teaching of this course can also cultivate students’ professionalism, impartiality and integrity, as well as good communication skills and coordination skills.

Disclosure statement

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