

Innovation and practice of computer network course teaching mode based on CDIO concept

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Abstract: In order to cope with the shortcomings of computer network course teaching in independent colleges and universities, the CDIO education concept is introduced into the reform practice of computer network teaching, and the educational concept of cultivating virtues and talents under the background of new engineering is implemented. The computer network teaching model based on the CDIO concept is constructed, aiming at three different teaching stages: before class, during class and after class. Based on different teaching platforms, it completes the structural transformation from the adaptive unidirectional professional theory to the generation of network engineering literacy. The practice shows that the computer network teaching based on the CDIO educational concept has formed a virtuous circle of promoting learning and teaching by competition, and realized an efficient classroom with students as the main body. It not only improves the teaching effect significantly, but also cultivates the students' independent learning ability, engineering practice accomplishment and innovation consciousness.

Key words: CDIO; Computer network; Pattern innovation

0 Introduction

The core concept of engineering education based on CDIO (Ideation-Design-Implement-operation) is to let students take the initiative to learn, and pay attention to students' practical ability and engineering and technical ability. At present, it has been widely applied in the global engineering education reform. The existing researches mainly focus on the new engineering curriculum reform of higher education based on the CDIO concept and the research on personnel training mode. Combined with our university's application-oriented talent training program, to achieve the goal of improving students' vocational ability through classroom teaching, it is necessary to study how to integrate CDIO concept into practical teaching of computer network courses, so as to improve the teaching status quo of computer network courses emphasizing theory over practice and constantly improve teaching quality, which is of great significance.

1. The necessity of integrating CDIO teaching concept into computer network courses

Computer Network is a course that attaches equal importance to both theory and practice, which requires students to have strong logical thinking, practice and innovation ability. Because the knowledge points of the course are abstract, involving a wide range and miscellaneous, the classroom teaching is relatively boring. At the same time, the experiment class is tense.

In the face of new engineering construction requirements and increasingly complex engineering construction experiment environment, it is necessary to improve students' comprehensive ability and professional quality in limited class hours. The teaching process takes real enterprise projects as an example, fully apply theoretical knowledge to practical teaching, master the key points of engineering technology from the projects, and improve the comprehensive ability to solve practical problems. To achieve the training goals of design innovation ability and practical engineering ability, lay a solid foundation for students to engage in engineering technology in the future, and realize the teaching concept of learning by doing and learning by doing in a real sense. Based on this, in the process of teaching reform, the content of this course is decomposed, summarized and reconstructed, the CDIO concept and ideological and political elements are integrated, the interdisciplinary integration is emphasized, the coupling construction of the curriculum is strengthened, the classroom teaching is reformed, the teaching mode is optimized, the teaching evaluation method is improved, and the teaching effect is improved, so as to achieve the training goal of application-oriented talents in the new engineering background of the school.

2. Teaching design of computer network courses based on the CDIO concept

2.1 Construction of innovative teaching mode based on engineering practice teaching

At present, the theory of computer network courses is out of line with practice, and the theory part is mainly taught by blackboard PPT. At the same time, computer network courses involve a large amount of communication knowledge, the content is abstract, the understanding is difficult, and the teaching method is single, resulting in low class participation of students and poor teaching effect. To carry out the concept of educating students by virtue and cultivating talents under the background of new engineering, re-integrate the course content and explore teaching resources. According to the CDIO concept, the teaching process is divided into three stages: before class, during class and after class, and different teaching resources are provided to students based on the three platforms to meet the needs of students' cultivation of basic knowledge ability, engineering practice ability and innovation ability. The teaching mode of computer network course based on the CDIO concept is proposed, as shown in Figure 1.

Before class, excellent MOOC resources are introduced as auxiliary support for pre-class theoretical learning, which requires students to achieve basic knowledge ability. In class, CDIO project experiments are carried out with the help of Cisco Packet Tracer relying on physical equipment to deepen theoretical knowledge, and emphasis is placed on the cultivation of students' engineering practical ability, thus promoting the transformation of the course teaching system from the adaptive unidirectional professional theory to the structure of network

engineering literacy . After class, subject competition, grade examination and industry certification are introduced into the teaching system through the self-built integrated platform of “teaching competition and training”. As an extension and supplement of classroom teaching, it consolidates classroom knowledge, drives students’ learning motivation and broadens their learning scope. With network competition as the starting point, improve students’ ability to use network technology to solve practical problems, increase students’ sense of achievement in learning, and cultivate students’ practical and innovative ability.

2.2 Build an efficient classroom with students as the main body

The teaching goal of computer network courses under the new engineering background should not only focus on cultivating students’ professional skills, innovation consciousness, problem-solving ability and engineering technical ability, but also pay more attention to the ideological and political education of engineering ethics and professional ethics . This teaching reform takes classroom teaching as the starting point, integrates classroom ideological and political ideas, reconstructs teaching content, optimizes curriculum Settings, improves teaching design, innovates teaching evaluation methods, strengthens problem-oriented, adheres to teaching innovation, realizes the effective combination of knowledge imparts and value guidance, and thus achieves the goal of cultivating innovative engineering talents under the background of new engineering . The teaching process is shown in FIG. 2.

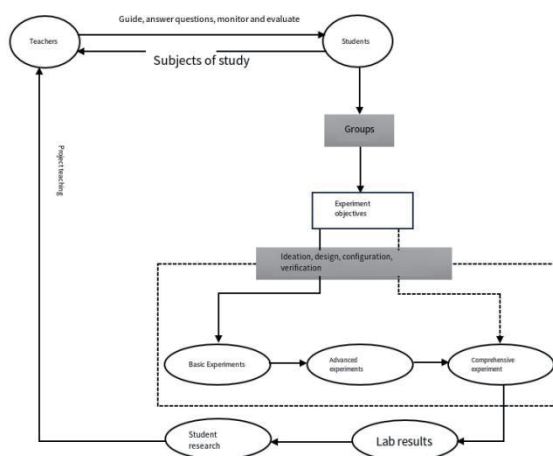
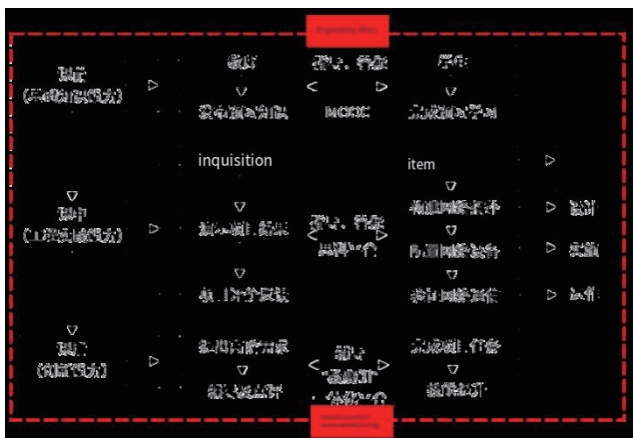


FIG. 1 Computer network teaching mode based on CDIO concept FIG. 2 Classroom teaching practice process based on CDIO concept

This project relies on the network physical equipment, with the help of simulation software Cisco Packet Tracer, and integrates the CDIO (Ideation-Design-Implement-Operation) engineering education concept to carry out the project comprehensive experiment. In the classroom teaching process, the real project of the enterprise is introduced. First, the teacher demonstrates the final effect of the project and puts forward the needs of the enterprise users. Secondly, with the result as the orientation, the requirements are refined, the project is divided by this backward logic, the task is clear, the specific requirements are put forward, and the project is completed in four stages: ideation-design-configuration-verification. The progressive project cases according to the requirements of design ability include three levels: basic experiment, advanced experiment and comprehensive experiment, so as to adapt to the “basic-advanced-comprehensive-application” step teaching process . At the same time, as an optional part of classroom teaching, the comprehensive experiment in the experimental project makes up for the problem of “one-size-fits-all” in traditional teaching, meets the needs of students’ personalized development, and establishes the education concept of people-oriented and moral cultivation. Throughout the implementation of the project, the experiment results are oriented, the competition content is taken as the classroom teaching experiment project, and students are guided to participate in discipline competitions and industry certification, forming a virtuous circle of promoting learning and teaching by competition, and realizing an efficient classroom with students as the main body and teachers as the main body.

2.3 With discipline competition and industry certification as the starting point, the teaching strategy of promoting learning and teaching by competition is constructed

Under the background of new engineering, the curriculum reform based on the CDIO concept pays attention to the improvement of students’ comprehensive ability of both theory and practice, while industry certification and discipline competition are important ways to test the effectiveness of course teaching and improve students’ comprehensive quality . After class, students conduct special training based on the self-built integrated platform of “teaching competition and training”, which feeds back the classroom teaching content, organically integrates theory and practice, and improves the classroom teaching effect. At the same time, more capable students are encouraged to participate in Huawei or Cisco certification and discipline competitions, which realizes the flip from classroom knowledge to real enterprise project practice, and further improves students’ innovation and engineering practice ability.

2.4 Build a diversified evaluation system based on process evaluation

The traditional course assessment of teaching takes the final evaluation as the main reference basis, which has a certain one-sidedness and can not reflect the real learning effect of students. Under the background of new engineering, the course assessment should pay more attention to the assessment of students’ learning process and engineering practical ability. In this project, based on the assessment of final

results, the process assessment such as class attendance, project development, experiment report completion, class discussion and additional points (subject competition and industry certification) should also be included. To form an all-round and diversified evaluation system.

3. Implementation effect of computer network course teaching based on CDIO concept

Taking the national training of applied talents in colleges and universities as an opportunity, combined with the CDIO concept, the computer network teaching system has been reconstructed, and in-depth reform research and implementation have been carried out to cultivate students' teamwork ability, engineering practice ability and innovation ability, and remarkable results have been achieved.

3.1 Reconstruct the experimental system to improve the teaching effect

In the process of experimental teaching reform, the experimental system was optimized, and with the help of the simulation virtual platform Cisco Packet Tracer, the whole teaching process was designed to design advanced experiments and complete the comprehensive tasks in group cooperation on the basis of ensuring that each student completed the basic verification experiments independently. The course follows the step teaching process of "basic - advanced - comprehensive - application", and comprehensively examines the students' comprehensive ability of physical network connection, topology design, equipment configuration and verification. The whole experiment was gradually broken down from easy to difficult, from simple to complex, which greatly improved the students' participation in class, hands-on ability and courage to explore the spirit, and efficiently completed all the projects. After class, based on the integrated platform of "teaching competition training", the comprehensive application challenge training was completed, and the cutting-edge technical knowledge of related experimental content was explored through the Internet, and the goal of teaching and research conformal development was practiced. After two rounds of research on the reform of computer network, the teaching effect has been significantly improved.

3.2 Based on the integrated platform of "teaching, competition and training", the innovation ability is improved

After class, expand classroom teaching content based on the integrated platform of "teaching competition and training", including grade exams, discipline competitions and industry certifications. Students can freely choose and conduct corresponding special training, further understand more abundant network knowledge, witness the landing and germination of network applications, increase the sense of achievement and gain in learning, and improve innovation ability.

Since the reform of the computer network curriculum, the number of students who pass the Computer network Level 3 examination has doubled, and the number of students who participate in and pass the computer technology and software professional technical qualification (level) examination has increased. At the same time, we have won honors in Huawei ICT Competition for Chinese College Students, and some students have obtained HCNP and HCIP industry certificates. These achievements are undoubtedly the best proof of the obvious improvement of students' discipline competition and innovation ability, and also a full affirmation of the exploration effect of computer network curriculum reform.

3.3 Build three-dimensional teaching resources around the development of computer network experiment case base

Follow the CDIO education concept and focus on students' engineering application ability of computer network theory. Closely around the development of computer network experiment project, the formation of computer network project test case database. Establish a three-level question bank of Computer rank examination divided according to the subject, and help the number of students to participate in and pass the computer technology and software professional technical qualification (level) examination to increase. With the help of self-built "teaching competition training" integrated platform, personalized learning has been strongly guaranteed, and the number of industry certification has also increased year by year, cultivating students' project practice ability, independent thinking ability and innovation ability, forming a three-dimensional teaching resource integrating case base, courseware and learning manual.

4 Epilogue

The reform and practice of computer network curriculum under the guidance of CDIO concept focuses on the talent training objectives under the new engineering background, reconstructs the teaching content with key knowledge points as the main line, constructs the CDIO innovation model for engineering application, and optimizes the course content chain. Based on the real projects of enterprises, the case-driven experimental teaching, closely surrounding the CDIO concept, and adhering to the four stages of ideation-design-implementation to complete the primary and extended experiments in an orderly manner, arouses the students' learning interest and enthusiasm. By practicing the practical teaching system reform of CDIO concept, the computer network course strengthens the students' grasp of the basic knowledge of network theory, cultivates their engineering practice ability, realizes the parallel of theory and practice, and improves the teaching effect.

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