

# Research on the teaching reform of the "four in one" course of computer network security

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**Abstract.** This article combines the current characteristics of the "Computer Network Security" course in network engineering majors in universities, and continuously improves students' ability to apply theoretical knowledge through teaching them theoretical knowledge. Adopting a three-dimensional teaching method, gradually enhancing students' abilities through experiments, practice, internships, and practical training, so as to adapt to social needs and enhance their social competitiveness.

## 1 Research background

The course of Computer Network Security is a professional course that requires high practical skills. After graduation, students are required to engage in practical engineering planning and design or network security deployment design. Therefore, the cultivation of students should not only impart professional knowledge, but also cultivate their hands-on and innovative abilities. In teaching activities, students should learn and innovate independently to improve their comprehensive ability to adapt to society, emphasizing the joint cultivation of their ability to acquire knowledge and innovate. Autonomous learning ability is an essential basic quality for high-quality talents in modern society. Teaching students strategies for learning and acquiring knowledge is more important than teaching them specific knowledge. To deepen theoretical knowledge, stimulate learning enthusiasm, and strengthen the improvement of one's own qualities, students should be encouraged to practice. Innovation ability is developed on the basis of self-directed learning. Only by doing it yourself can corresponding problems be discovered. By solving this problem, one will further think of how to optimize the methods for solving the problem, and thus propose new ideas and means to achieve the goal of innovation. This article proposes to integrate the "four in one" into teaching activities, namely experiments, practice, internships, and practical training.

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## **2 The problems faced by the teaching of computer network security course**

For a long time, there has been a problem of emphasizing theory over practice in the teaching of computer network security courses, and insufficient attention has been paid to how to apply teaching content to practical work. For computer network security courses with a strong background in engineering applications, establishing a practical teaching mode and improving the effectiveness of practical teaching have a crucial impact on the entire teaching process. The current computer network security courses have many shortcomings in practical teaching, mainly manifested in the following aspects.

### **2.1 Insufficient emphasis on experimental teaching**

In experimental teaching, only confirmatory experiments are offered, lacking design experiments. There are no experiments on the deployment of large and medium-sized network security, which hinders the cultivation of students' practical abilities in analyzing and solving problems. Therefore, it cannot meet the requirements of computer network security in terms of knowledge, technology, and other aspects.

### **2.2 Many students excel in theoretical courses, but are unwilling to learn hands-on practical courses, which has become a prominent issue**

There are many reasons for this, but the main reason is that students cannot apply the theoretical knowledge they have learned to practical projects.

### **2.3 Theoretical knowledge is difficult to apply to practical projects.**

The knowledge of theoretical courses is scattered into each chapter, while actual projects are holistic and involve multiple aspects of knowledge. Students have not developed the ability to combine theory with final project development. As the course progresses, students will feel increasingly unable to keep up with the pace and lack confidence. This requires better arrangement of classroom content for practical courses, gradually improving students' learning abilities, so that they can ultimately stand out from numerous competitors.

## **3 The implementation procedure of the "four in one" teaching model**

The computer network security course aims to cultivate applied talents, so the "four in one" teaching method is very suitable. The "four" refer to experiments, practice, internships, and practical training. Integrate the "four" into one, adopt a time and level based approach, and carry out three-dimensional teaching according to the "four in one" model.

### **3.1 Experimental teaching**

This stage mainly involves conducting experiments to enable students to master corresponding theoretical knowledge and carry out some simple network security settings. By establishing self-directed learning, exercising the ability to analyze and solve problems, a foundation is laid for the practical process. This stage belongs to the design phase of basic knowledge of network security. As students have a preliminary understanding of network security knowledge, short and simple questions should be used as the design for arranging

experimental activities. Enable students to gradually understand the basic knowledge of network security, keep up with the progress of experimental classes, and thus fall in love with the course of computer network security. In the process of designing experimental assessments, it can be divided into independent experimental assessments and group experimental assessments. Students who participate in independent experimental assessments have a certain level of network security design ability and can independently complete tasks assigned by teachers. Experimental group assessment can enhance students' teamwork spirit and lay the foundation for subsequent teaching activities.

### **3.2 Practice teaching**

Practical teaching is an effective way to deepen theoretical understanding and an important link in cultivating high-quality engineering and technical personnel with innovative consciousness. At the same time, practical teaching is also an important platform for integrating theory with practice, cultivating students to master scientific methods, and improving hands-on abilities. Through the previous stage of experimental teaching, students have mastered the basic knowledge of network security and gradually expanded their knowledge. Therefore, by organizing students to participate in various competitions such as the Blue Bridge Cup and the "Challenge Cup" extracurricular academic and technological works competition for college students, students can learn to apply relatively scattered theories from the past to relatively complete practical projects. To cultivate students' logical thinking, broaden their thinking, and improve their ability to solve practical problems.

### **3.3 Enterprise internship**

Enterprise internship is an important link in talent cultivation. At this stage, students can truly enter the enterprise and experience the actual workflow. Clear regulations should be made on the training objectives, standards, plans, selection of enterprises, engineering practice conditions, and faculty allocation for students in the enterprise learning stage. In the selection of internship units, it is mainly aimed at well-known enterprises or research institutions in relevant professional fields. By collaborating with enterprises in various ways, establish a stable and high-level off campus internship base. Students enter multiple off campus internship bases for internships, allowing them to fully understand the specific needs and requirements of enterprises for current students. Applying their existing skills to society can help students recognize the scalability of knowledge and the limitations of their abilities, thereby stimulating their own learning motivation and improving their practical operational abilities.

### **3.4 Training session**

Practical training refers to the teaching process of training students in vocational and technical application abilities in accordance with the laws and objectives of talent cultivation under the control of the school. The ultimate goal of practical training is to comprehensively improve the professional quality of students, and ultimately achieve the goal of satisfying employment for students and satisfying employment for enterprises. Reasonable practical training education should be an important component of university education. Traditional classroom teaching often focuses on teacher lectures, with the teacher at the center of the teaching process, resulting in high teaching efficiency and more suitable teaching for theoretical courses; Enterprise job placement internship is to directly assign students to work positions, learn in the workplace, and is more suitable for vocational training that focuses on hands-on operations. And practical training combines the advantages of both. By simulating

the actual work environment, teaching adopts practical cases from real work projects, combining theory with practice in the teaching process, and emphasizing student participatory learning, it can improve students in professional skills, practical experience, work methods, team cooperation, and other aspects in the shortest possible time.

#### **4 The requirements of the "four in one" model for teachers**

The proposal of the "four in one" model has put forward higher requirements for teachers, which will lead to the improvement of teaching staff. Under the concept of engineering, attention should be paid to the industry engineering background of the course "Computer Network Security" for the teaching staff. Encourage teachers to become engineers, so as to effectively enhance the engineering ability and literacy of each frontline teacher and strengthen their frontline engineering knowledge background. This requires our course team to carry out long-term teacher team building, and the institutionalization and standardization of teacher team building will greatly promote the formation of a practical teaching system. With the continuous updating of teaching content, the college can cultivate its own full-time teachers or hire relevant enterprise engineers as part-time teachers. Teaching the most cutting-edge computer network security courses has enabled students to keep up with social needs and also promoted the learning of new knowledge by the teachers in this course group, keeping up with the pace of the times. In addition, for cultivating applied undergraduate talents, it is necessary to highlight the concept of engineering based training, encourage teachers to participate in educational and teaching reforms, and compile suitable practical teaching materials. The vast majority of published textbooks focus on cultivating students' engineering practical abilities, highlighting the characteristics of applied education and effectively supporting the formation of a talent cultivation model for frontline engineers.

#### **5 Conclusion**

In summary, the proposal of the "four in one" teaching model will promote the reform of computer network security courses, optimize corresponding textbooks and teaching content, and embark on the path of industry university research cooperation. At the same time, we will increase investment in the construction of laboratories and internship training bases, cultivate a "dual teacher" teaching team, and through the reform of "four in one" teaching, enable students to improve their adaptability, analysis, and problem-solving abilities while receiving new knowledge, thus accumulating energy for future work development.

Project source: Shandong Xiehe University's 2020 school level first-class course "Computer Network Security"

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