Research on the oriented teaching method of computer network foundation course

Weimin Gan\textsuperscript{1,a} and Yuli Li\textsuperscript{2}

\textsuperscript{1} Department of network technology, South China Institute of software Engineering, Guangzhou University, Guangdong Province, 510990, China

\textsuperscript{2} Department of network technology, South China Institute of software Engineering, Guangzhou University, Guangdong Province, 510990, China

\textsuperscript{a} gwm@sise.com.cn

*Corresponding author’s e-mail: 21463798@qq.com

Abstract. In recent development of modern education reform, it is imperative to accelerate high-level education structure adjustment, and the trend from local undergraduate universities transformed to the ones which accord application and technology -type development being the general consensus in the industry. These universities took the demanding of application technology as orientation, defined the subject objection and optimized the teaching method, focused on the combination of theory & practice teaching methods. This article is mainly about the computer network technology application application oriented design concept in teaching. Convey useful simplification of theory to the students and they can learn in order to practise.

1. Teaching status

The basic courses offered by various majors in our college are mainly large courses - theoretical courses, which reflects the following problems: on the one hand, the teaching content is relatively abstract, and most students are difficult to understand, and most students lack the habit of preview before class and after class review; on the other hand, the classroom is large and the number of students in large class is large, and the phenomenon of students playing mobile phones is common in class. The number of students who attend lectures in middle school is very few. The students only study for the exam but not fail. As a result, the theoretical courses only rely on rote learning to cope with the examination. I feel that the students' scores can not fully reflect the content of what they have learned and apply them to practical application. Only the students with good thinking ability can understand the theoretical content, but most students do not have this ability at present. So what kind of teaching methods and methods should we formulate to change the current situation of the classroom? Through the course teaching, students can easily and intuitively reflect the abstract theoretical knowledge in the learning process, which is the ultimate goal and achievement of teaching work. Therefore, I think it is of great significance to adopt application-oriented teaching method to cultivate students' interest in learning and make it easy to understand and learn.

2. Curriculum design\cite{1}

In the large class teaching, I selected the textbook "computer network course" (4th Edition) compiled by Xie Jun and XieXiren. The book has 7 chapters. The contents of the book are mainly guided by the
network architecture, and the chapters are arranged in a hierarchical way from low to high. The content of this textbook is accurate in concept, rigorous in discussion, illustrated and easy to understand. It describes the most basic principles and concepts of computer network in an easy to understand way, and pays attention to the analysis of the principles and methods behind various technologies. It has laid a good theoretical foundation for students' practice and teachers' teaching!

In the small class teaching, I selected the experimental teaching material of "computer network experiment foundation and advanced" compiled by Professor Xu kejing. The textbook is based on the physical network platform and the advanced experiment based on the virtual network platform. It integrates the basic application of computer network, has low requirements for experimental equipment standards and high requirements for students' hands-on ability. It provides dual platforms of physical machine and virtual machine, and dual environment of physical interconnection equipment and simulator. Combined with the theoretical basis of large class, it is conducive to students' independent experiment and predictable improvement of their practical ability.

3. Course Introduction
This course is the main basic course of network engineering in our college. It is a course closely related to theory and practice. It introduces the basic knowledge of network, including basic knowledge of network, basic knowledge of data communication, network architecture, LAN technology, Wan and Internet application. With the wide application of network information in various fields, we should focus on teaching improvement, which plays an important role in promoting the development of computer.

4. Teaching methods
The teaching method of combining classroom multimedia teaching with computer room training is adopted Among them, theoretical teaching and practical teaching account for 50% respectively. Theoretical teaching should adopt modern multi-media teaching method as far as possible. In the specific implementation process, case teaching, task driven, multi-media explanation, classroom interaction, virtual machine demonstration are adopted, and multimedia (animation) materials are produced or introduced to enrich the demonstration effect, so that the original abstract and complex theoretical content becomes more intuitive To achieve the teaching effect of traditional teaching, multimedia teaching and network teaching complement each other. The practice teaching adopts the methods of classroom demonstration, guidance, discussion and thinking, with students as the main body, focusing on the cultivation of students' autonomous learning ability, comprehensive application of network basic knowledge to solve practical problems, and teachers timely supplement new technology and structure of computer network, and ultimately require students to independently complete comprehensive design experiments to achieve practical results.

5. Teaching ideas
According to the decision of the State Council on accelerating the development of modern vocational education, we should attach importance to the undergraduate vocational education and guide most of the undergraduate colleges and universities to cultivate applied technology colleges and universities. In terms of professional training objectives and curriculum setting, colleges and universities should take the application technology demand as the guidance, clarify the social applicability of professional talents, link the curriculum objectives with social needs, optimize teachers and improve teaching methods, so that application-oriented students can easily master the theoretical knowledge they have learned and apply it to practice. In this context, I take "computer network technology" as an example to discuss the application-oriented teaching design and teaching ideas. In the teaching of computer network technology, the theoretical knowledge is combined with the practical application, and the practical application examples are used to explain the abstract theoretical knowledge that is difficult to understand.

The overall teaching design of computer network technology is shown in table (1).
| Table 1. teaching design |
|-------------------------|
| Teaching orientation    |
| Large class             |
| Network Overview        | teaching design          |
| Network architecture and |
| protocol communication  | Small class              |
| physical layer          | TCP, IP property settings |
| data link layer         | Introduction of network  |
| network layer           | packet capturing tools    |
| Transport layer         | Introduction of twisted  |
|                         | pair type                |
|                         | Ethernet construction    |
|                         | Wireless network         |
|                         | technology               |
|                         | Basic configuration of   |
|                         | switch                   |
|                         | VLAN partition           |
|                         | Making twisted pair      |
|                         | Building dormitory       |
|                         | network with switch      |
|                         | Wireless WiFi construction|
|                         | Using Cisco Pt simulator |
|                         | to master the basic mode |
|                         | of switch                |
|                         | Simple network partition |
|                         | VLAN based on Cisco Pt   |
|                         | simulator                |
|                         | Introduction of          |
|                         | ARP Protocol             |
|                         | Working principle of     |
|                         | IP address division      |
|                         | Basic configuration of   |
|                         | router                   |
|                         | Static routing and rip,  |
|                         | OSPF                     |
|                         | TCP protocol analysis    |
|                         | experiment               |
|                         | UDP protocol analysis    |
|                         | experiment               |
|                         | FTP protocol, HTTP       |
|                         | protocol                 |
|                         | DNS , DHCP               |
|                         | Build DNS server and     |
|                         | DHCP server              |

6. Teaching objectives
Through the study of this course, students can have a systematic understanding of computer network on the basis of existing computer knowledge, master the basic principles, basic knowledge and basic theory of computer network, and master the new technology of computer network; through practice and training, students' understanding of computer network, planning ability of local area network and network installation and adjustment can be improved Try, maintain and apply skills to lay a good foundation for the study of follow-up courses and future work. The course content takes the network architecture as the main line, and consists of seven modules: Computer Network Overview, computer network architecture, physical layer, link layer, network layer, transportation layer, application layer and network security. The expected learning objectives are shown in Table 2.

| Table 2. target design |
|------------------------|
| content summary        |
| Big class goal         |
| Understand the definition, function, classification, communication protocol, communication mode and performance index of network; be familiar with OSI and TCP / IP reference model; |
| Small class goal       |
| Through visiting the network laboratory, we can understand the software and hardware composition of the network, master the basic command of the network, and be proficient in Wireshark packet capture analysis; |

3
| layer        | the composition of communication system; understand the types and characteristics of common transmission media; understand the definition of data, signal and channel; be familiar with digital coding technology, modulation technology, channel multiplexing technology and broadband access technology; |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| link layer   | Understand the basic services of data link layer: frame encapsulation, transparent transmission, error detection, flow control; understand the principle of point-to-point channel communication (PPP Protocol), broadcast channel communication principle (CSMA / CD protocol), reliable mechanism (ARQ protocol); be familiar with the working principle of network bridge and switch; |
| network layer | Understand the principles of IP protocol, ICMP Protocol, ARP protocol and routing protocol, master IP address structure, subnet division, hypernetwork division and router principle; |
| Transpor t layer | Master the UDP protocol, TCP protocol encapsulation process, message structure, port number setting; understand the establishment and release process of TCP connection; understand the principle of TCP flow control and congestion control; |
| application layer security | Familiar with the working principle of FTP, HTTP, DHCP, DNS, SMTP, Telnet, etc; master FTP, HTTP, DHCP, DNS server architecture process; |
|              | Understand the model of network security data encryption, master the basic encryption algorithm and encryption mechanism; |
|              | Master FTP, HTTP, DHCP, DNS server architecture process; |

7. **Application orientation [3]**

The main line of application orientation is theoretical explanation of large class, experimental operation of small class, and application after class. It enables students to be familiar with basic theoretical knowledge through large class learning, master basic practical technology combined with small class experiment, understand what they have learned, analyze and write experiment summary after class. According to the teaching ideas in the table above, the contents of large and small classes are closely combined, and the two complement each other. Under the guidance of clear levels of large class contents, small class experiments are carried out in order to reasonably decompose and quantify the teaching contents of large courses, promote students' concrete absorption. It is necessary to master the knowledge efficiently and achieve the teaching goal.

8. **Conclusion**
The teaching of this course is designed by combining theory with practice. The teaching materials for large courses are based on the fourth edition of computer network course compiled by Xie Jun and Xie Xiren, and the teaching materials for small courses are based on the computer network experimental basis and advanced level compiled by Professor Xu kejing. Using a variety of network tools, the abstract theoretical knowledge is vividly reflected, and the role of theory in practice teaching is fully exerted. Application oriented instructional design is one of the important means of teaching reform, which makes teaching easier to understand and makes abstract theoretical knowledge more vivid. It is easy for students to master the principles of network professional knowledge through applied learning, so that the learning efficiency can be doubled with half the effort, and students' learning enthusiasm can be promoted simultaneously. Therefore, the research on application-oriented teaching method of computer network technology is worth exploring and implementing.

Acknowledgements
This work was supported by Teaching team of network security technology in Guangdong Province.

References
[1] Ma Yingying. (2017) Research on the Reform of Teaching Objectives of "Computer Network"Course for Non-computer Majors. Quality Education in the West.
[2] Li lulu. 2013 (34). Exploration on the application of project teaching method in computer network foundation course [J]. Curriculum education research.
[3] Cui Yan, 2011 (17) .you Hui. Research on improving teaching methods of computer network foundation course [J]. China management informatization.
[4] Luo Luoyang. 2015(2). Research on application oriented teaching of computer network [J]. Computer knowledge and technology. 47-48.
[5] Zhang Qian,Gong (2017). Research on Computer Network Curriculum Reform Based on "Subject Inquiry" Three-Segment Teaching Model. Educational Forum.
[6] Wang Xiaoyan,. (2017). Exploration of the Teaching Reform of "Computer Network" Course in the "Internet+" Era. Educational Forum.
[7] Xie Jun, Xie Xiren. (2015) . Computer network course. Version 4 [M]. Beijing: People's Posts and Telecommunications Press.
[8] Xu kejing. (2014). Fundamentals and advancement of computer network experiment. 1st edition [M]. Beijing: Tsinghua University Press. 97-101.
[9] Zhang Qifeng. 2010 (04). Discussion on teaching methods and teaching means of computer network foundation course [J]. Henan Education (middle school).