

Research on the Teaching Reform of Computer Network in the New Era

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Abstract: The Computer Network course is widely offered in colleges and universities. This course is both theoretical and practical. It organically combines theory and practice in order to achieve the goal of teaching. The main objective of the course is to train students to have various skills, including those of enterprise scale network construction, network management, and network maintenance. Influenced by traditional teaching for a long time, the existing teaching of the course in colleges and universities urgently needs reform; otherwise, it will not be able to meet the social demand for talents in the new era. This paper focuses on the practical problems of the Computer Network teaching reform and proposes some effective reform suggestions, hoping to engender an efficient link among the Computer Network course teaching, talent training, and the social needs in colleges and universities.

Keywords: Colleges and universities; Computer Network; Teaching; Reform; Method

Online publication: May 30, 2022

1. Introduction

Nowadays, with the advancement and popularization of the internet, Computer Network has become a professional course offered by many colleges and universities. Not only computer majors are taking this course, but also other information majors. Due to the characteristics of the course itself, there are several problems in the teaching process. Therefore, it is necessary to face up to the current situation of teaching in colleges and universities as well as formulate reform strategies with reference to the teaching objectives, so as to ensure the growth of the course's teaching quality in colleges and universities.

2. Problems in the teaching of Computer Network in colleges and universities in the new era

There are several problems in the teaching of Computer Network in colleges and universities in the new era. The current situation of teaching is shown in **Figure 1**.

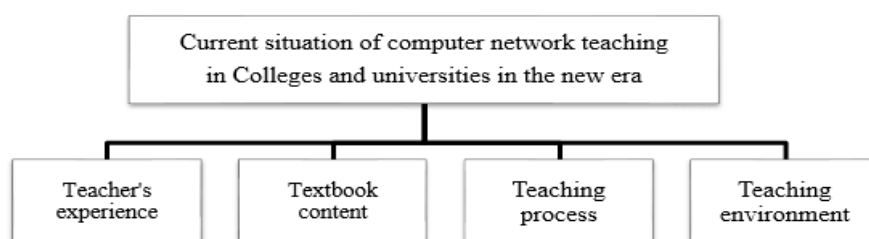


Figure 1. Current situation of Computer Network teaching in colleges and universities in the new era

2.1. Teachers lack theoretical and practical experience

The Computer Network course in colleges and universities concerns the knowledge of communication technology and computer technology. It is an interdisciplinary course with interdisciplinary characteristics. A new curriculum system has been established by integrating the concepts and methods of both, communication technology and computer technology. At the same time, this course is different from other computer specialty courses. It combines hardware and software and closely connects theory and application. It can be appreciated that the course has application, intersection, and complexity characteristics, which requires teachers to have rich knowledge structure and teaching experience. However, at present, most college and university teachers in China do not have the interdisciplinary theoretical knowledge and teaching experience of communication technology and computer technology. Furthermore, in view of the unique nature of the Computer Network field, not every teacher has experience in large-scale network construction and network management projects, so teachers are bound to lack cognition and operation experience in some large-scale network forms and equipment. As a result, teaching this course poses a challenge as well.

2.2. Backward textbook contents

In terms of Computer Network textbooks, the updating speed of textbooks is extremely slow. At present, computer technology and communication technology are developing rapidly in their respective fields, with a number of new technologies emerging, thus promoting the continuous and in-depth development of these two technologies and expanding the development space. However, it takes two to three years to compile and publish teaching materials related to computer network. The technology involved and related knowledge in this field are clearly falling behind in the teaching materials, which lack cutting-edge resources and information. Therefore, there is always a gap between Computer Network textbooks and the current development trend of computer technology.

2.3. Emphasis on theory over practice in teaching

At present, in the teaching of Computer Network in colleges and universities, restricted by various factors, such as experimental conditions, teaching methods, and the teaching experience of teachers, the teaching of this course is overly dependent on theoretical teaching; in classroom, more attention is paid to theoretical explanation rather than experimental content. In the experiment process, students often conduct experiments based on the steps demonstrated by their teachers, which lack innovation and design; thus, students' subjective initiative cannot be maximized, neither are they able to generate strong interest in practical approaches, resulting in reduced attention to practical operations and a serious disconnection between theory and practical application. Consequently, the phenomenon of "high scores and low skills" is inevitable among students.

2.4. Poor teaching environment

The teaching of Computer Network involves the installation of various software and equipment, as well as the application of a large number of network experimental equipment. However, due to the extremely rapid updating speed of equipment, most colleges and universities cannot meet the learning needs of contemporary students due to the constraints of experimental sites and funds. Even though some colleges and universities have built advanced training bases, the equipment cannot be upgraded in time due to the lack of funds. Nowadays, in the development of most colleges and universities, the network experimental platform is simple. There are mainly two types. On the one hand, dozens of computers are connected to the equipment via network connection to form a small LAN. On the other hand, only providing basic routers,

switches, and computers makes it difficult for students to set up networks on their own, which is not conducive to having a better understanding of computer network principles and network communication technology; thus, the goal of training students to set up network engineering and cultivate their skills in this aspect cannot be achieved.

3. Teaching orientation and reform of Computer Network in colleges and universities in the new era

Computer Network courses offered by colleges and universities include network data management, internet, LAN, data communication, and network security. Students are required to master basic network equipment installation methods and debugging methods, network server configuration methods, as well as internet access technology and network security knowledge. Therefore, colleges and universities need to carefully design the content of these courses, optimize the teaching plan, and regularly modify the talent training plan in line with the specific needs of the major for talents, so as to cultivate more talents needed by the society ^[1]. When constructing the course system, it is crucial to pay attention to integrating computer thinking, comprehensively excavate computer thinking and methods, as well as run them through every link of the teaching process, so as to achieve the reform goal of cultivating students' computational thinking and comprehensive quality ^[2]. Along with the new concept of computer network, it is also important to optimize the hybrid teaching mode, expand in-class teaching to extracurricular learning, urge students to improve their practical skills, and develop students' network technology application skills ^[3].

4. Teaching reform suggestions for Computer Network in colleges and universities in the new era

After in-depth discussion and research, the teaching reform strategies include introducing new concepts of computer network, highlighting the core position of curriculum reform and construction, innovating practical training teaching, implementing the "online + offline" hybrid teaching mode, as well as strengthening experimental teaching (Figure 2).

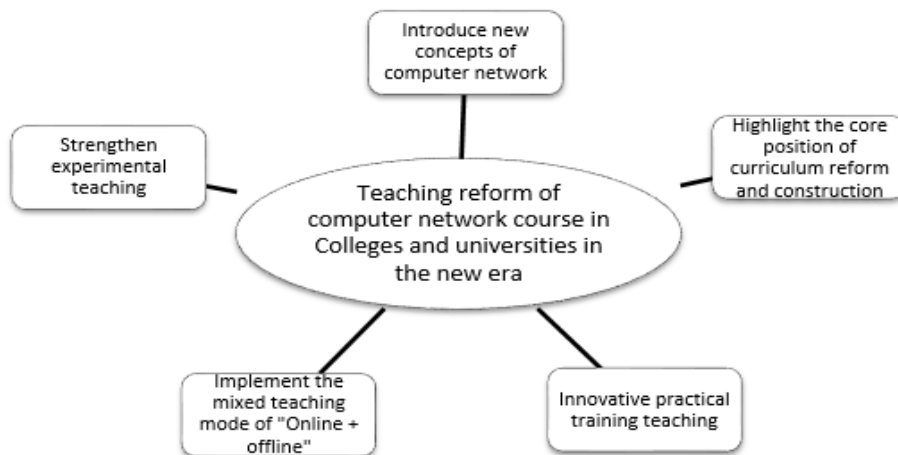


Figure 2. Teaching reform strategies for the Computer Network course in colleges and universities in the new era

4.1. Introduce new computer network concepts

At present, computer network technology is developing rapidly, but the teaching materials of this course are being updated slowly. Therefore, colleges, universities, and professional teachers are required to grasp the development trend of computer network technology, actively pay attention to the dynamic information related to computer network technology, understand cutting-edge theories, advanced technologies, and new methods, combine 5G mobile communication technology, internet of things, and cloud computing, introduce new technologies into computer network courses from different angles, optimize case teaching,

raise problems for discussion in classroom, and improve students' computational thinking ^[4]. In addition, teachers should encourage students to maximize the advantages of the internet, independently query relevant literature at home and abroad, make effort to understand advanced network technology and network development trends, as well as comprehensively improve students' self-learning ability and initiative in learning new knowledge pertaining to computer network ^[5,6].

4.2. Highlight the core position of curriculum reform and construction

The Computer Network course system in colleges and universities should be dynamic; it is also necessary to constantly update the teaching system in consideration of social needs and modify the teaching objectives in line with market changes. Students should not only be encouraged to master basic computer network knowledge, but also basic computer network operation ability ^[7,8]. Therefore, in the teaching process, teachers should refine the teaching content into independent modules, ensure that each module not only exists independently, but also has a certain connection, pay attention to improving training projects, encourage students to complete training tasks, ensure the pertinence and flexibility of these tasks, as well as use actual network application problems and closely combine projects with various application situations ^[9,10].

4.3. Innovative practical training

In order to ensure the teaching reform of Computer Network in colleges and universities in the new era and achieve the expected objectives, it is necessary to pay attention to the reform of teaching contents and comprehensively optimize basic teaching contents, while keeping pace with today's computer technology development trend ^[11,12]. At the same time, it is also important to pay attention to optimizing practical teaching links as well as cultivate and improve students' professional quality and innovation ability through practical teaching ^[13]. In this context, it is then necessary to increase the proportion of practical links in terms of the course's educational hours and the total amount of practical hours. Practical training tests students' mastery of computer knowledge and skills as well as promote in-depth learning. It enables students to understand relevant design ideas, master network planning skills, and improve in terms of analyzing and solving problems. In that way, it comprehensively cultivates the application ability of computer network technology among students ^[14,15].

4.4. Implement the "online + offline" hybrid teaching mode

When implementing the hybrid teaching mode, it is important to integrate the professional teaching objectives, adopt the MOOC platform and micro course teaching mode, implement flipped classroom through the project-driven method and heuristic teaching method, as well as introduce new ideas for the teaching reform of the Computer Network course in colleges and universities, so as to assist students in remembering relevant knowledge pertaining to computer network, encourage students to learn independently, and continuously improve their computational thinking as well as innovation ability ^[16,17]. Through case teaching and enlightening teaching, it is possible to achieve remarkable teaching results and assist students in understanding certain concepts as well as in remembering obscure knowledge ^[18].

4.5. Strengthen experimental teaching

In the teaching of the theoretical aspect of the course in colleges and universities, teachers can set up comprehensive experimental computer network contents and research experimental computer network contents to promote the effective integration of theoretical knowledge with experimental knowledge, supplement theoretical questions, and deepen theoretical understanding through experimental teaching, so as to help students deeply understand abstract concepts and master abstract principles ^[19]. On the one hand,

confirmatory experiments can meet the verification of basic theories, cultivate students' basic skills, strengthen their cognition of theoretical knowledge, and enhance their computational thinking. On the other hand, the use of comprehensive experiments can cultivate students' ability to deal with problems and strengthen their thinking consciousness with the comprehensive application of computers^[20].

5. Retrospect and prospect

In conclusion, the Computer Network course in colleges and universities is a comprehensive discipline, involving communication technology and computer technology, which coexist systematically, practically, and theoretically. At the same time, with the emergence of new technologies, it is necessary to include more contents in the course. In this situation, maximizing the teaching of this course in colleges and universities has become an important issue that concerns teachers of this field. Therefore, it is necessary for teachers to constantly enrich their theoretical knowledge and practical experience, innovate teaching contents, strengthen students' computer learning experience, and cultivate professionals with skills in computer development, computer management, network maintenance, and network analysis.

Funding

The 2021 Heilongjiang Education Scientific Planning Key Projects "Research and Practice of 'Multi-Course Fusion' Online and Offline Hybrid Teaching Mode Based on Improving Employment Competitiveness – Taking Computer Basic Course as An Example" (Project Number: GJB1421199 and GJB1422190)

The 2019 Teaching Research Project of Heilongjiang Bayi Agricultural University "Online and Offline Hybrid Teaching of Office Automation Course" (Project Number: NDJY1918)

The 2021 Teaching Research Project of Heilongjiang Bayi Agricultural University "Machine Learning Course Based on Case Teaching in Application Exploration of Big Data Specialty" (Project Number: NDJY2121)

Disclosure statement

The authors declare no conflict of interest.

Author contributions

T.M. and X.W. conceived the idea of the study; Z.C., N.X., and A.L. performed the experiments; L.L. analyzed the data and wrote the paper.

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