Teaching Reform and Practice of Computer Networking Courses Based on the OBE Concept

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Abstract: As China's technological level continues to rise, new opportunities have emerged for computer networking courses, highlighting their increasing importance. However, due to objective factors, there are certain shortcomings in the current teaching of computer networking courses. The content and methods of instruction are often monotonous, which can hardly stimulate students' interest in learning. To address these issues, teaching reform of computer networking courses based on the Outcome-Based Education (OBE) concept has been initiated. This educational philosophy emphasizes student learning outcomes as the guiding principle. Clear teaching objectives are set according to societal development needs and the syllabus requirements, focusing on personalized assessment to ensure that the set teaching goals and activities align closely with students' actual needs. Simultaneously, it is essential to increase the proportion of practical teaching, highlight the importance of assessment design, and foster students' practical and problem-solving skills through experiments and project practice. Teachers can thereby understand students' learning progress timely and adjust teaching plans accordingly to cultivate computer network talents with innovative and practical abilities, meeting societal talent demands.

Keywords: OBE Concept, Computer Networking Course, Teaching Reform

1. Introduction

In the era of informatization, computer networking, as the infrastructure of the information society, is widely used in various fields and plays a crucial role in the operation of society. Thus, the importance of computer networking courses is increasingly evident, as the quality of teaching directly affects students' adaptability and the needs of modern societal development. However, influenced by objective factors, traditional computer networking teaching models have certain drawbacks, with too much emphasis on the theoretical knowledge indoctrination and inadequate attention to the cultivation of students' practical abilities and innovative thinking, leading to unsatisfactory teaching outcomes. Therefore, accelerating the teaching reform of computer networking courses is a core task for relevant educators at this stage. In recent years, the OBE concept has gradually gained attention and recognition in the educational community. This philosophy emphasizes student learning outcomes as the guiding principle, focusing on students' learning processes and experiences to cultivate their practical abilities and innovative spirit[1-4]. Therefore, a thorough analysis of teaching reform and practice of computer networking courses based on the OBE concept provides useful references for improving teaching quality and cultivating versatile talents. After prolonged exploration and practice, computer networking teaching is poised to reach new heights.

2. The Applicability of the OBE Concept in the Teaching Reform of Computer Networking Courses

2.1 Setting Clear Teaching Objectives

The OBE concept plays a key role in computer networking courses, providing a more precise and accurate direction for setting teaching objectives. Compared to traditional teaching models, the OBE concept emphasizes the transfer of knowledge and skills training, focusing on students' capability development and practical application abilities. Under the guidance of the OBE concept, teachers need

to deeply consider and clarify the core knowledge, key skills, and essential abilities that students need to acquire. These goals are no longer vague and broad but are specific, measurable, and achievable. By clarifying these objectives, teachers can more effectively design course content and teaching methods, ensuring that students progressively meet these predetermined goals. Additionally, the OBE concept emphasizes students' practical application abilities. Teachers need to be aware of industry trends and job market demands to ensure that course objectives are closely linked to societal needs. Through practical teaching, case analysis, and project-driven methods, students can apply their knowledge in real-world scenarios, enhancing their problem-solving skills and laying a solid foundation for their future career development[5-6].

2.2 Enhancing Personalized Assessment

In computer networking courses, the OBE concept emphasizes personalized assessment, which is crucial for meeting the individual differences and learning needs of students. Traditional assessment methods are often too general and may not accurately reflect each student's actual learning situation. In contrast, personalized assessment can more precisely evaluate students' learning outcomes, providing targeted teaching support and guidance for teachers. In practicing personalized assessment, teachers set different assessment standards and plans based on students' learning outcomes and needs. By collecting comprehensive data on students' learning, teachers can gain in-depth insights into each student's knowledge mastery, skill application abilities, and learning challenges. Based on this data, teachers can offer personalized learning suggestions and guidance to each student, helping them better grasp computer networking knowledge and enhance their practical application skills. The advantages of personalized assessment lie in its specificity and flexibility. By conducting differentiated assessments tailored to individual student characteristics, teachers can more effectively meet students' learning needs and unlock their learning potential. This method also helps cultivate students' self-learning abilities and problem-solving skills, laying a solid foundation for their future career development.
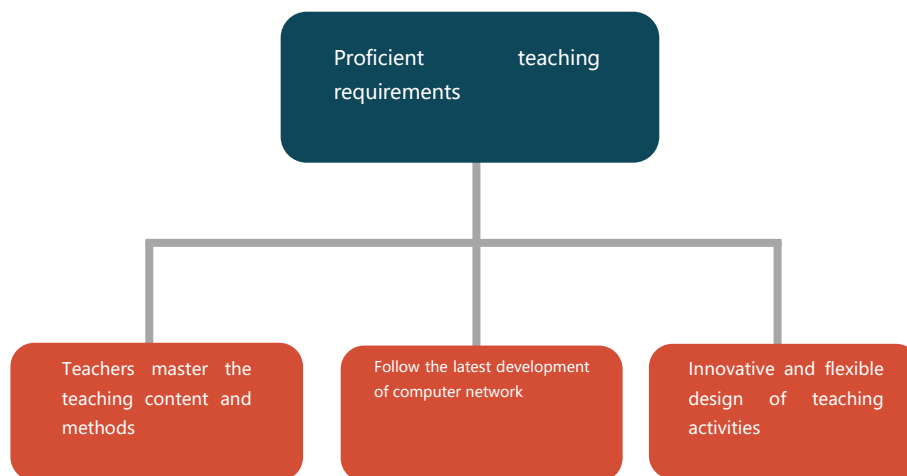
2.3 Advocating Mastery Learning

Figure 1: Requirements of Mastery Learning

The knowledge system of computer networking courses is vast, with deep and broad technical applications, demanding high professional competence and practical skills from students. Mastery learning, advocated by the OBE concept, is particularly important in computer networking courses. In this context, the professional competence and teaching abilities of teachers become key factors affecting teaching quality, as shown in Figure 1. Mastery learning requires teachers to have a deep understanding and mastery of the teaching content, to clearly articulate core concepts such as network principles, protocols, and technologies, and to integrate these with practical applications. Teachers also need to keep up with the latest developments in the field of computer networking, introducing new technologies and applications into their teaching to ensure that the content is cutting-edge and practical. In terms of teaching methods, mastery learning also emphasizes the innovation and flexibility of teachers. Teachers should design diverse teaching activities according to students' learning characteristics and needs, such as case analysis, project practice, and group discussions, to stimulate students' interest and initiative in learning. Additionally, teachers should focus on cultivating students'

innovative thinking and problem-solving skills by guiding students to participate in solving real-world problems, enhancing their practical application skills and laying a solid foundation for their future career development.

3. Current Challenges in Computer Network Course Teaching

3.1 Lack of Student Engagement

Student engagement and participation directly impact the effectiveness of computer network instruction. Active participation and interaction hold significant weight in computer network teaching. However, the lack of face-to-face communication and interaction often leaves many students feeling isolated and demotivated. Therefore, designing effective teaching activities to enhance student participation and interaction becomes a critical issue needing immediate attention in computer network teaching. Influenced by objective factors, teachers often resort to traditional teaching methods, delivering relatively dry content. Additionally, the abstract nature of some content makes it difficult to understand, directly diminishing students' interest and even leading to aversion. To enhance student engagement, teachers can capitalize on the advantages of online teaching platforms by setting up discussion forums and interactive Q&A sessions, encouraging students to express their opinions and ask questions. Introducing project-based learning or group collaboration can also enhance communication and cooperation among students during task completion, boosting their motivation. Through diverse teaching activities and the use of modern technological means, student participation and interactivity in computer network teaching can be effectively enhanced, thus improving teaching quality.

3.2 Challenges in Content Delivery

While online teaching offers convenience, it also brings unique challenges that teachers need to thoughtfully address when designing and delivering content. First, choosing suitable teaching tools and platforms is a significant challenge. Online teaching formats vary, including live streaming, recorded lectures, and online discussions, each with its characteristics and applicable scenarios. Teachers need to select appropriate tools and platforms based on the teaching content, objectives, and students' needs and preferences[7-8]. This requires teachers to have a deep understanding of various tools and platforms and to possess a spirit of innovation and experimentation. Secondly, simplifying complex concepts to make them easy to understand is another challenge faced by teachers. Computer networking involves many abstract and complex concepts. Presenting these concepts in a straightforward and comprehensible manner to ensure that students truly understand and grasp them requires considerable effort from teachers. Lastly, ensuring the coherence and systematic nature of the teaching content, as well as adjusting the content based on students' learning progress and feedback, are also critical challenges in content delivery.

4. Teaching Practices of Computer Network Courses Based on OBE Concept

4.1 Clear Course Objectives

Introducing the OBE concept in the teaching reform and practice of computer network courses can further enhance teaching quality and cultivate students' practical application abilities. Traditional teaching in computer networking has overly focused on knowledge dissemination, neglecting the actual needs of students and industry evolution. The OBE concept, however, emphasizes centering on students' learning outcomes, as illustrated in Figure 2. Based on industry demands and societal development trends, clear course objectives are formulated, and teaching content and methods are designed around these objectives. In the reform of computer networking courses, teachers must first clarify the educational goals, which should include the fundamental knowledge, skills, and competencies that students should acquire, as well as the practical application abilities they should achieve. Teachers also need to conduct a deep analysis of industry demands and career development to ensure that course objectives closely align with societal needs. In teaching practice, a variety of teaching methods and tools are employed to implement the OBE concept. For example, through case teaching and project practice, students learn and master knowledge in practical settings, enhancing their application skills. Additionally, utilizing modern teaching technologies, such as online teaching platforms and virtual labs, provides students with richer learning resources and more convenient

learning methods.

1 Analyze industry needs and career development

2 Define course objectives

3 Design Teaching Content

4 Collect data on student learning outcomes

5 Evaluate Teaching Effectiveness

6 Optimize teaching content and methods

Figure 2: Steps in Teaching Reform and Practice

4.2 Reverse Design Courses

In designing computer network courses based on the OBE concept, teachers should fully respect the central role of students, comprehensively understanding their learning needs and using their learning outcomes as the starting point to deduce course content and teaching methods. Firstly, to ensure the rationality of educational objectives, teachers need to engage extensively with students to understand their learning expectations and career plans. Based on this, in conjunction with industry trends and job requirements, clear targets for knowledge, skills, and qualities are established. Secondly, in arranging course content, teachers should select teaching content that matches students' cognitive levels and practical needs while focusing on updating and iterating course content to keep pace with industry developments. Lastly, in choosing teaching methods, teachers should consider students' learning characteristics and interests, employing a variety of teaching means and strategies. For example, through case teaching, project practice, and online learning, teachers can stimulate students' learning interest and initiative, enhancing their practical application skills to achieve predetermined course objectives and promote comprehensive student development.

4.3 Strengthen Practical Teaching

As a highly practical subject, a key direction for the reform of computer network courses is to strengthen practical teaching. Through practical teaching, students can master knowledge and skills in actual operations, improving their problem-solving abilities and better adapting to industry demands and career development. In implementing practical teaching, teachers can use various methods to enhance students' practical skills. For example, through experiments, students can operate network equipment hands-on, gaining an in-depth understanding of network protocols' working principles and configuration methods. Project practice is an effective approach where teachers design projects with practical application value for students to complete in teams, thus fostering their teamwork and project management skills. Case analysis is a common practical teaching method; by analyzing real network failure cases, students learn how to diagnose and resolve network issues. Besides these methods, collaborating with businesses to conduct practical teaching activities is also essential. Through partnerships with businesses, students gain access to more authentic practice environments and specific tasks, better understanding industry demands and career directions. Meanwhile, businesses also benefit from acquiring excellent talent resources and technical support, achieving a win-win situation for both academia and industry.

4.4 Emphasize Assessment Design

In computer networking courses, to comprehensively assess students' learning outcomes, a diversified assessment system incorporating the OBE philosophy can be adopted to ensure the evaluation process covers the entire course, emphasizing knowledge analysis. This system accurately

reflects students' performance in knowledge mastery, skill development, and quality improvement. Specifically, the assessment method in computer networking courses consists of summative assessments and formative evaluations, as shown in Figure 3. Summative assessments, accounting for 60% of the total, are conducted through closed-book exams to ensure students have a comprehensive understanding of the course content. Teachers randomly select objective and subjective questions from a question bank to test students' basic knowledge and their abilities to analyze and solve problems. Formative evaluations, making up 40% of the total, include experimental reports, platform assignments, chapter tests, and classroom participation, among other aspects. Experimental reports reflect students' practical skills and innovative thinking; platform assignments test students' post-class learning outcomes; chapter tests help students consolidate learned content; classroom performance reflects students' attitudes and engagement. These diverse evaluation methods comprehensively assess students' learning outcomes, stimulating their interest and participation, and encouraging them to engage fully in the teaching process[9-10].
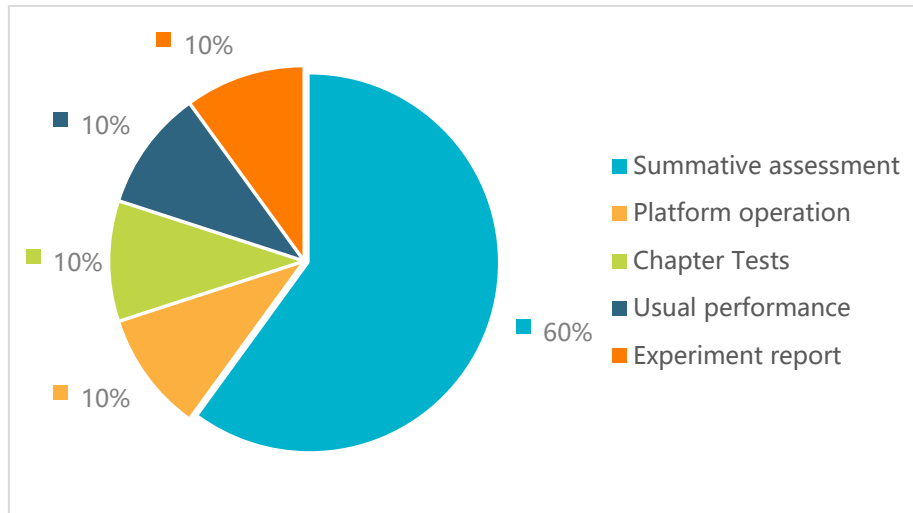

Figure 3: The composition of the diversified assessment evaluation method

5. Conclusion

With the rapid development of information technology, computer networks play a crucial supporting role in modern societal development, making the training of highly skilled computer networking professionals significantly important. Computer networking courses, as the main avenue for training such talents, require teachers and related personnel to deeply recognize their responsibilities. Building on traditional teaching philosophies and models, targeted innovations in teaching methods are necessary to meet contemporary societal demands for talent. The OBE philosophy, focusing on student learning outcomes and emphasizing the learning process and experience, provides new teaching ideas and methods for teachers, pointing the way for the future development of computer networking courses. Meanwhile, teachers must also recognize that current teaching in computer networking courses still faces many challenges, requiring ongoing exploration to find more effective solutions. In the future, with the collective efforts of all educators, computer networking courses will undoubtedly become a critical arena for cultivating high-quality, innovative talents, contributing more to the informatization development of society.

Acknowledgement

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