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Practical Research on Mixed Teaching Reform of Linux Operating System Course

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Abstract: With the rapid development of technology and the diversification of educational needs, the traditional teaching mode can no longer fully meet the requirements of modern education. Linux is widely used in servers, cloud computing, network infrastructure, embedded systems high-performance computing, etc. As an important part of the field of computer science and information technology, the teaching method of the Linux operating system needs to be constantly innovated and improved to adapt to this change. to adapt to this change. The hybrid teaching mode is a teaching method that combines online and offline teaching resources, which provides new possibilities to improve the teaching quality of Linux courses and the learning effect of students. The purpose of this paper is to discuss the reform practice of Linux operating system courses under the hybrid teaching mode, including the teaching method, course content, evaluation mechanism, and the cultivation of practical application ability.

Keywords: curriculum reform; hybrid teaching; Linux; operating system

Introduction

Linux operating system, as a free and open source operating system, its most notable features include high customizability, stability, security, and multi-user multi-tasking capability. Due to its open-source nature, Linux allows users to view, modify, and even redistribute its source code, which promotes widespread community support and rapid innovative development. In terms of stability, Linux is widely recognized as a very reliable operating system, capable of running for long periods without the need for rebooting, and is particularly suited to servers and critical systems that run continuously. The system's security is also an important advantage, with Linux offering a robust privilege management system and security mechanisms, making it the first choice for enterprises and network security professionals. In addition, as a multi-user, multi-tasking system, Linux can effectively manage multiple users and processes to ensure efficient resource allocation.

1. Main Problems in the Teaching of Linux Operating System

1.1 Long history and more knowledge points involved

Linux, as a free and open-source operating system, has its roots dating back to 1991 when it was first released by Linus Torvalds. Since then, it has undergone rapid growth and evolution, resulting in a vast ecosystem that encompasses a myriad of distributions, applications, and supported hardware platforms. The diversity of Linux is one of the challenges in its teaching. There are various Linux distributions such as Ubuntu, Fedora, Debian, etc. Each has its features, software management system, and user interface, and beginners may be confused in choosing the right distribution. In addition, each distribution has its own unique installation process and system configuration methods, adding to the complexity of learning. The core components of a Linux system, such as the kernel, filesystem, shell

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scripts, and system services, involve esoteric technical details. For example, understanding how the Linux kernel works requires an in-depth understanding of basic concepts in computer science and operating systems. Similarly, mastering various command-line tools and scripting languages such as Bash takes time and practice. In addition, Linux's permissions and user management mechanisms, while providing a high degree of security and flexibility, can be both complex and difficult for novices to understand. security features of Linux systems, such as SELinux and firewall configurations, often require specialized knowledge to properly configure and manage. Due to Linux's relatively small market share in desktop environments, community support and learning resources may not be as plentiful or accessible compared to Windows or macOS (Liu et al., 2022). While there are a large number of Linux tutorials and forums on the Internet, the quality and accuracy of the information may vary.

1.2 Fundamentals are boring and students memorize them by rote

The basics of the Linux system involve a lot of command line operations and configuration file editing, which are difficult to learn visually or interactively. Compared with graphical user interfaces (GUIs), command line interfaces (CLIs) lack intuitiveness and ease of use, making students potentially confused and disinterested when first learning. Due to the abstract nature of the command line, students are often unable to immediately see the direct results of operations, reducing the immediate feedback and satisfaction of learning. Many of the fundamental concepts of Linux, such as file system structure, permission settings, and process management, require an understanding of certain theoretical knowledge. This theoretical knowledge is often abstract and not easy to link to practical operations, so students may only be able to cope with exams or complete tasks through rote memorization without in-depth understanding. In addition, traditional teaching methods in Linux education may also be part of the problem. Many courses rely on lectures and demonstrations and lack sufficient hands-on sessions. Students may learn many commands and concepts in the classroom, but do not have the opportunity to practice this knowledge in real or simulated environments to effectively translate theoretical knowledge into practical skills. Furthermore, the complexity and constantly updated nature of Linux technology also pose a challenge for teaching. Teachers may be more inclined to teach stable basic knowledge, while at the same time, evolving technologies and tools may not be immediately incorporated into the syllabus, resulting in a gap between the teaching content and current industry practices.

1.3 Stale experiment content and format, serious experiment plagiarism

The experimental contents of many Linux courses have been used for many years without major updates, leading to two major problems. On the one hand, the obsolete experimental content may not reflect the current practical applications and latest technologies of the Linux operating system. On the other hand, outdated experiment formats, such as over-reliance on written instructions and a single experimental step, lack innovation and challenge and may fail to stimulate students' interest and motivation in learning. The problem of experimental plagiarism is to some extent triggered by obsolete and one-dimensional experimental content. When experimental tasks and results are predictable and unchanged over time, students can easily find answers from previous students or online resources, reducing opportunities for hands-on practice and exploration while hindering the development of critical thinking and problem-solving skills. In addition, traditional methods of assessing experiments may promote plagiarism. If the assessment is mainly based on the correctness of the experimental results rather than the process and creative thinking (Ma et al., 2022), students may be more inclined to find shortcuts to ensure the "right answer" rather than to deeply understand and master the knowledge through the experimental process.

2. Reform of Mixed Teaching in Linux Operating System Courses

2.1 Theoretical foundation teaching

The hybrid teaching reform of the Linux operating system course, especially for the part of theoretical basic teaching, can be implemented through school-enterprise co-construction and enterprise research to ensure that the content of the course meets the academic standards and is close to the needs of the industry. The core of the reform lies in combining the course content with the practical application of the Linux operating system in the workplace, which improves the practicality and relevance of the course, and also better prepares the students to meet future career challenges. The reform of theoretical foundation teaching should be centered on practical projects and industry applications. The course should not only cover the basic concepts and principles of Linux operating systems, such as kernel structure, file system, process management, network configuration, etc. but also include examples of how these concepts can be applied in the actual working environment. For example, in the program development direction, the course should include how to do effective software development in the Linux environment, covering version control, debugging techniques, programming languages (such as C/C++ and Python), and the use and contribution of open-source software. Instruction in the Systems Integration Architecture direction needs to focus on the use of Linux systems in large enterprise environments, including teaching students how to configure and manage complex Linux systems, understanding virtualization technologies, containerization (e.g., Docker and Kubernetes), cloud computing fundamentals, and best practices in high availability and scalability. In the system operations direction, the course should emphasize Linux system maintenance and administration skills, including system monitoring, automation (using tools like Ansible or Puppet), security configuration, troubleshooting, and recovery strategies. In addition, to ensure that students can solve real-world problems, theoretical instruction should incorporate case studies, simulation labs, and project-driven learning methods (Long, 2022). By analyzing real-world Linux application cases, students can understand how theoretical knowledge can be applied to solve specific problems. Simulation experiments and project-driven learning methods encourage students to practice what they have learned in a controlled environment while providing the necessary real-world experience. The curriculum must be designed to emphasize a teaching model that combines theory and practice. Theoretical lectures should be closely integrated with laboratory exercises, group projects, and industry placements to ensure that students can translate theoretical knowledge into practical skills. For example, designing projects where students install and configure a Linux server on a virtual machine and then deploy a simple web application on the server can help students understand multiple aspects of Linux system administration. Course content should be updated regularly to stay current with technological developments. Rapid changes in the industry mean that course materials need to be constantly adapted to reflect the latest trends and best practices. A dynamic approach to course design helps students gain up-to-date knowledge and can stimulate continued interest in learning.

2.2 Cultivation of practical application skills

The hybrid teaching reform of the Linux operating system course is crucial in the cultivation of practical application ability, especially the reform of the experimental link. The experiments are divided into daily operation and maintenance experiments, network management experiments, Web application development experiments, and website maintenance experiments, which can comprehensively improve students' practical skills and meet various challenges in their careers. The focus of the daily operation and maintenance experiment is to familiarize students with the daily management and maintenance tasks of the Linux operating system. Specific content can include system installation and configuration, user and permission management, package installation and update, system monitoring, log analysis, and

basic troubleshooting. Through these experiments, students can acquire the necessary system administration skills and understand the basic principles and best practices of system operation and maintenance. To increase the practical applicability of the experiments, simulated O&M scenarios can be set up to allow students to deal with common system problems in a controlled environment. Network management experiments should focus on network configuration and management under Linux, including network interface configuration, firewall setup, route management, VPN configuration, and the use of network tools such as tables and tables. The goal of these experiments is to deepen students' understanding of network fundamentals and to be able to perform effective network administration and troubleshooting in a Linux environment. Experiments may include creating and managing virtual network environments so that students can practice and explore various network configurations in a secure environment (Hu, 2022). Web application development experiments are designed to enhance students' programming and application development skills on the Linux platform. This includes Web application development using Linux-supported programming languages (e.g., Python, PHP, JavaScript, etc.), as well as related database technologies (e.g., MySQL, PostgreSQL). Experiments can be centered around the creation of specific Web applications such as blogging systems, e-commerce sites, or online forums. These projects not only provide practical coding experience, but also help students understand the entire development cycle of a Web application, including design, development, testing, and deployment. Website maintenance experiments should focus on the deployment, configuration, and maintenance of websites, including the use of Linux servers for hosting websites, configuration of web server software (e.g., Apache, Nginx), and the optimization of website performance and maintenance of security (Li, 2022). Experiments can cover the deployment of SSL certificates, website backup and recovery strategies, and strategies for dealing with common security threats (e.g., DDoS attacks). The above experiments not only provide valuable technical skills but also help students understand the importance of maintaining high availability and security in real-world environments.

2.3 Integration of online and offline teaching

The integration of online and offline teaching modes for Linux OS courses aims to combine the flexibility and accessibility of online teaching with the interactivity and practicability of offline teaching to provide a more comprehensive and efficient learning experience. The online component may include pre-recorded lecture videos, interactive online courses, virtual labs, and forum discussions. Pre-recorded videos allow students to watch lectures at their own pace and on their schedule while ensuring quality and consistency of content. Interactive online courses can provide a dynamic learning environment through simulated tests, video conferencing, and online Q&A (Dai et al., 2022). Virtual labs provide a secure environment for students to practice Linux operating system installation, configuration, and troubleshooting without fear of causing damage to the actual system. Forums and online discussion groups, on the other hand, provide a platform for students to exchange ideas and solve problems with peers and the instructor. The offline portion of the instruction focuses on hands-on lab work, group discussions, face-to-face mentoring, and project-oriented learning. In the labs, students can work on more complex experiments and projects under the direct supervision of the instructor, and these often involve teamwork and advanced problem-solving skills. Group discussions and seminars provide highly interactive learning environments in which students can share experiences, think critically, and solve real-world problems. Face-to-face tutorials, on the other hand, are an important way to provide personalized feedback and guidance to students, especially those who need extra help. To effectively integrate online and offline instruction, courses need to be designed to ensure that the two modes work seamlessly together. For example, online courses can be used as

a preparation for offline labs, providing the necessary theoretical knowledge and background, while offline courses can be used to deepen and consolidate what is learned online, ensuring that students can make connections between theory and practice and gain a deeper understanding (Tian et al., 2022). In addition, the use of technology is crucial in this model of integrated teaching and learning. Teaching platforms need to support features such as video streaming, online interaction, assignment submission, and feedback, and both students and teachers need to be trained accordingly to use these tools effectively.

2.4 Reform of the evaluation mechanism

The traditional evaluation mechanism tends to emphasize the results of exams and homework assignments but is not sufficient to fully reflect students' performance in understanding concepts, skill application, and innovative thinking. Therefore, an effective evaluation system should be able to comprehensively consider students' knowledge mastery, skill application, project completion, teamwork, and innovation. The evaluation mechanism should be changed from a single examination result to a diversified assessment, which, in addition to the traditional closed-book examination, should include multiple dimensions of assessment such as open-ended questions, practical projects, laboratory reports, teamwork, and classroom participation. For example, practical projects can assess students' ability to solve real-world problems in a Linux environment, while team assignments can reflect their collaboration and communication skills. Ongoing assessment is also an important component, focusing on the final learning outcomes and also on progress and development during the learning process. Through regular assignments, experiments, and quizzes, teachers can track students' learning progress, provide feedback and guidance, and encourage continuous learning rather than just ad-hoc work before exams (Fu et al., 2022). Evaluation mechanisms should encourage innovation and self-directed learning, and this can be achieved by designing projects and assignments that require students to explore new technologies and come up with innovative solutions, assessing their knowledge and skills, and incentivizing critical thinking and innovation. In addition, peer assessment and self-evaluation should be included in the evaluation system (Li, 2022). Peer assessment allows students to assess each other's work, develop assessment skills, and also increase understanding of their peers' work. Self-evaluation, on the other hand, encourages students to reflect on their learning process and identify their strengths and areas for improvement.

Conclusion

Hybrid instructional reform in Linux operating systems courses is a complex but necessary process that requires faculty, students, and educational administrators to work together to innovate teaching methods and improve course design. Through the practical exploration in this paper, the blended teaching model effectively improves teaching quality and learning efficiency. The effective combination of online and offline teaching provides students with flexible and diversified learning paths; the optimization of course content ensures that teaching keeps pace with the times; the reform of the evaluation mechanism reflects students' learning outcomes more comprehensively; and the reinforcement of practical application skills better prepares students to face future career challenges.

Conflict of Interest

The author declares that he has no conflicts of interest to this work.

References

Liu, L., Wei, X., & Cai, Z. (2022). Application of blended teaching in the teaching reform of linux operating system course. *China Science and Technology Journal Database Scientific Research*, *2022*(10), 87–90.

Ma, H., Yan, L., & Li, L. (2022). Design and implementation of blended teaching in operating system course. *University Education*, *2022*(05), 127–129.

Long, N. (2022). Research and practice of teaching "Linux operating system" under the concept of curriculum politics. *Industry and Information Technology Education*, *2022*(05), 85–88, 94.

Hu, L. (2022). Exploration of practical teaching mode of "Linux operating system" in cloud computing curriculum system. *Journal of Huaibei Institute of Vocational Technology*, *21*(03).

Li, P. (2022). Research on online and offline hybrid teaching modes of "Linux operating system" courses in colleges and universities. *Chinese Science and Technology Journal Database (Full Text Edition) Education Science*, *2022*(12), 41–43.

Dai, S., Li, Y., & Cha , L. (2022). Design of online and offline hybrid teaching for operating system course. *Science and Technology Innovation Herald*, *19*(19), 230–234.

Tian, X., Zhao, J., & Yang, X. (2022). Practice and reflection on the teaching mode of "dual-line mixing"--taking linux network operating system course as an example. *Shijiazhuang Polytechnic Vocational College Academic Research*, *17*(01), 43–46.

Fu, M., Zhao, C., & Zhu, T. (2022). Research on blended teaching mode under the view of classroom civics--taking linux operating system as an example. *Computer Knowledge and Technology: Academic Edition*, *18*(26), 98–100.

Li, P. (2022). Exploration of hybrid teaching of Linux operating system in colleges and universities. *Chinese Science and Technology Journal Database (Full Text Edition) Education Science*, *2022*(12), 146–149.

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