TEACHING REFORM OF "LINUX MANAGEMENT AND APPLICATION" BASED ON CDIO

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ABSTRACT

As a new education model, CDIO has been highly recognized in the field of engineering education around the world, the main feature of CDIO is integrating the knowledge learned by students with practical skills. “Linux Management and Application” courses have relatively high requirements in practical operation, so the shortcomings of traditional teaching methods in current course design are becoming more and more obvious. In order to enhance students' learning initiative and master relevant basic theories and practical technical skills better, the paper firstly introduces teaching mode and connotation of CDIO, and then takes educational concept and evaluation standard of CDIO as guidance to discusses the teaching reform idea and teaching reform practice plan of "Linux Management and Application" based on Educational concept and educational standard of CDIO. The teaching reform has achieved remarkable results, that has significantly improved students’ ability of independent inquiry, greatly improved their consciousness of innovation and comprehensive quality.

KEYWORDS

Linux, CDIO, Teaching reform, Practical skills

CURRENT SITUATION OF LINUX MANAGEMENT AND APPLICATION COURSE

With the rapid development of information technology, requirements on the application ability of Linux talents has been higher and higher, and the demand for high-level technical talents has increased exponentially. In order to adapt to the current new requirements and bridge the gap between the employment difficulties of college graduates and the demand for technical talents, college education should undergo transformation and reform. As a new educational mode, CDIO has become the universal mode of international engineering education. The core concept of CDIO is guided by the design of engineering tasks and aims to cultivate students' basic project engineering knowledge, individual ability, teamwork ability. Its main feature is that it can integrate the theoretical knowledge learned by students with practical skills. Besides, modern teaching concept and real learning environment are used to create good conditions which combine learning with practical training.

Linux is the most representative open source software, which has been developed rapidly in recent years. Linux management and Application has the advantages of knowledge, skill and practice. At the same time, Linux management and application is a required core course for communication engineering major. A comprehensive analysis of Linux talent recruitment information has been conducted so that students can understand the current situation and career development prospects of the Linux talent demand market. According to the specific job responsibilities and job content of the recruitment position, job demands can be roughly divided into four types, including development jobs under the Linux environment, Linux system

operation and maintenance jobs, Linux system management jobs and other types Jobs such as Linux trainers.
Through the survey, it is found that regardless of the type of work, the recruitment requirements must have the following capabilities:
(1) Capable of installing and configuring Linux system;
(2) Master the basic operating commands of Linux, and have the basic management ability of Linux operating system;
(3) Capable of deploying, updating and maintaining various network services of Linux system;
(4) Capable of Linux system security management (including network security, data security, etc.).
It plays a connecting role in the teaching plan and is closely related to other professional courses. Content arrangement of the course should meet the employment demand in the future. Drawbacks in the traditional teaching include disconnection between theory and practice, too many principles and concepts, less involvement in the configuration process and lack of pertinence, application and inspiration of learning. As a result, students fail to grasp the core of Linux management and application as a whole. In the process of practical operation, students can't obtain ideal learning results by learning knowledge mechanically, and don't have high enthusiasm for learning. In order to improve their learning initiative and creativity, Linux management and Application needs to be reformed so that it can improve students' practical ability.

THE COURSE REFORM OF LINUX MANAGEMENT AND APPLICATION BASED ON CDIO MODE

The teaching objects, concept, method and content is updated based on CDIO mode, new tasks and school-enterprise collaboration are introduced in Linux class. In the course reform of Linux management and application, it should base on the CDIO engineering education concept, orient towards students' career development and market demand, and pay attention to the integration and innovation of students' basic theories with practical technologies.

Basic concept, object, method is reformed in the course

Firstly, teachers should change the traditional teaching concepts, emphasize student-oriented, attach great importance to the students' initiative, autonomy and innovation in acquiring knowledge, and cultivate students to acquire basic theories, and furthermore improve students' practical ability. It will strengthen ability of solving problems and cultivate the ability of innovation and entrepreneurship through practice for students.

Secondly, the teaching of Linux management and application adheres to the CDIO concept as the guiding principle, establishes the principle of "pertinence, practicability, and applicability", and takes the project teaching method as the main implementation policy. With the practical feature of this course, the content is arranged to eliminate unnecessary theory derivation process. Instead, it pays more attention to the use of conclusions, increase the introduction of new technologies and new equipment, and enhance students' interest. At the same time, it conducts targeted training on the project in order to adapt to the development and progress of science and technology, and cultivate students' professional skills, team cooperation and other comprehensive qualities in an all-round way.

Basic content setting of teaching

According to the analysis of the job requirements of the course, the main task of the "Linux Management and Application" course is to train students to use Linux operating commands to manage the system in a Linux system environment (including user and group management, disk and file system management, logical volume Management, process management, software management, etc.). students are capable of network configuration management (including basic network configuration, configuration of common network services), controlling and configuring Firewalls remotely, maintaining the safe and stable operation of the system.

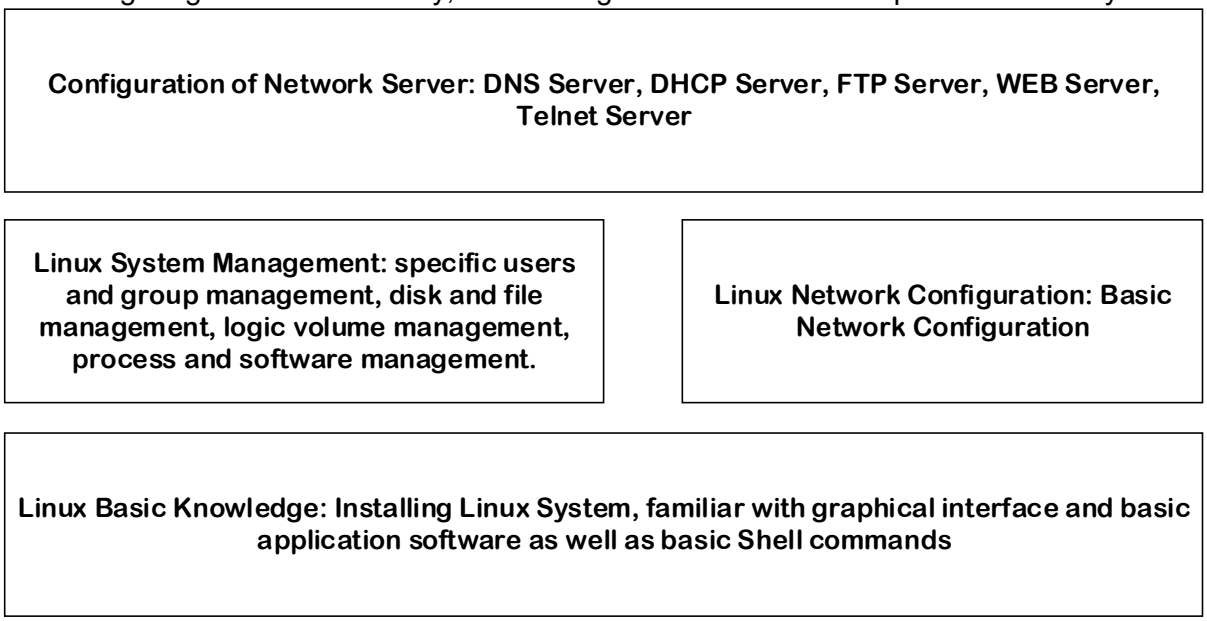

Figure 1. Basic teaching content architecture

Task Design

Task design is the basis of CDIO's application in Linux course teaching. The goal of Linux course is not only to introduce knowledge, but also to cultivate abilities in various aspects.
Under the guidance of this goal, the Linux course task should be designed with several basic principles including moderating difficulty, fitting for life, and focusing on practice. Specifically, teachers should understand the students' mastery of knowledge, and then design learning tasks reasonably within the scope of teaching requirements take into account all students, so that students ensure the difficulty of the tasks is moderate. The tasks can effectively mobilize students' participation enthusiasm, rather than hitting self-confidence.
At the same time, the Linux course task design should be closely integrated with real life. A good course design is able to infiltrate the contents into practice. In this way, the design covers not only students' understanding and mastery of knowledge, but also good sense of application and practical ability, making up for the deficiency of theoretical knowledge and effectively arouses students' interest in learning.

Project example

The following project design is taken as an example to explain the entire project design process. A certain training school, there are different student classes, and different classes have

different operating permissions on the server. In order to build DNS, DHCP, WEB, FTP, Mail and other service functions for the school's local area network, the servers need to be purchased and set up. Since the school only purchases one server, it is required to have the above network service functions on the server at the same time. Specific project modules are built based on the teaching content architectures which are shown in Figure 1 above.

(1) Linux basic application is to install Linux operating system for this server. Familiar with graphical interface and basic application software as well as basic Shell commands, such as login, logout, switch users, switch working directories, display files, copy, delete and move files, create files, compress and decompress files, display text, display help information Wait for the order.

(2) The Linux system manages different classes of the school, sets up corresponding groups for different classes, and creates corresponding users in each group. Design some directory structures, and use different directories for different groups. According to the needs of different departments of company, we set different access permissions for each file.

(3) Linux network configuration. According to the actual situation of the company's network planning, the IP addresses and other information for the server are set, then the connectivity is tested, and the configuration file is modified to make the IP addresses permanent. The security setting to the server is carried on, such as the firewall, guarantee the server are installed in the network security.

(4) Network server configuration. The network server is configured according to the actual situation, such as an FTP server is set up for the class, multiple users are created, and corresponding access permissions are set for each user. A WEB site is created for each class, which can be accessed by domain name, then a DNS server is needed to set up and configure the DNS server to resolve domain names for related sites. A DHCP server is created for getting IP addresses.

Linux course practice ability training mechanism based on school-enterprise collaboration

The Linux course is a close combination of practical teaching and theoretical teaching, as well as a deepening of theoretical teaching, which is related to the realization of course goals and graduation requirements. In the process of teaching reform of Linux courses under the background of engineering education certification, the school-enterprise collaboration mode is introduced.

A progressive practice system is constructed, enterprise experts are guided to enter the classroom and set up teaching content reasonably, in order to form a continuous practice system that runs through students' learning career and form an effective quality monitoring mechanism, which is essential for students to fully and steadily exercise their engineering qualities.

It can be combined with the current semester professional course content to invite experts from related majors to the school classroom to teach students (the course content corresponds to the actual work of the teaching content, mainly related to the industry application prospects and other parts, for the demonstration experiment and verification experiment part).

On the other hand, students can be organized to visit the company for on-site visit and instruction, and the person in charge of the company and personnel from the personnel department can be invited to introduce and recommend internship positions to the students (mainly for the comprehensive experiment part).

These methods are used to enhance students' intuitive experience of social and industry needs, clarify the direction and purpose of the course practice, and effectively exercise practical ability.

The implementation of teaching projects in the course

In the Linux course, the students are divided into different teams according to their ability, and there are 3 to 4 students in each team. Each team should have a team leader who will coordinate the team members to complete all the projects together. During the conception and Design of each project, the team members are required to brainstorm, analyze and discuss the project requirement carefully, and make the optimal design. During the stage of implementation and operation, each student should be assigned some task. The team should not only complete the project within the specific time, but also to prepare speech PPT and project report. Finally, the completed design scheme and implementation process of the team is described in the class. During the whole process of the project, the team leader is responsible for recording the contribution and effectiveness of the team member and giving scores. The scores of the team member are jointly given by other team members. At the same time each student will give his or her own sore for the role he or she played in the team. The scores given in this stage are called mutual evaluation of student.
During the implementation of the teaching project, the role of the teacher is mainly to provide information, answer questions, give appropriate guidance, monitor and solve important problems to ensure that the learning enthusiasm of the student is maximized. At the same time the teacher will give evaluation scores according to the final results and the presentation given by each team.

Course assessment

assessment method that only focuses on results in the pass should be changed. The assessment should pay more attention to the evaluation of students' operating steps and practical processes, and guide students to devote more energy and time to the practical process. By designing diversified assessment methods and examination links, we should focus on effective process assessments, and improve diversified evaluation standards and systems. According to the type of experiment, the level of the process, ability and quality, etc., a comprehensive evaluation system can be constructed based on "normal performance, effective code, complete documentation, clear reply, personal contribution, and teamwork", which can evaluate students periodically during the whole Linux course learning process, to periodically evaluate the learning achievements of students, thereby avoiding the previous one-size-fits-all assessment.
It is more conducive for improving the effect of practical teaching, promoting the continuous improvement of "teaching" and "learning", and ensuring the achievement of graduation requirements. The final score evaluation consists of three parts: usual scores, project scores and final exam scores. The specific methods are as follows:
(1) Normal Scores (10%) = Normal homework (10%)
(2) Project scores (40%) = inter-group evaluation (5%) + intra-group evaluation (5%) + teacher's evaluation (30%). Specific scoring criteria is show in Table 1 and Table 2.
(3) Final examination score (50%).

Table 1. Teacher evaluation criteria

Evaluation Content	Score Proportion
Project analysis capability	15%
The rationality and effectiveness of the project implementation	15%

Project progress	10%
Teamwork and communication Skills	10%
Defence	15%
Project report	15%
Project completion status	20%

Table 2. Evaluation criteria for student self-grading and mutual evaluation

Evaluation Content	Score Proportion
Contribution	45%
Teamwork and communication skills	20%
Defence	10%
Project completion status	25%

Compared with the traditional assessment method, the project-guided assessment method allows students to apply the theoretical knowledge learned in class in the project and solve practical problems with the theoretical knowledge. It not only grasps the content of theoretical teaching, but also stimulates students' learning initiative. During this process, the communication skills and teamwork awareness of students have been improved. The description of the project can improve students' logical thinking ability and expression ability.

CONCLUSION

CDIO engineering education model is introduced into the curriculum construction in this paper, which has achieved visible phased results in the teaching process of “Linux management and application” with the teaching method of “task-driven, employment-oriented, and engineering projects”. The course project designed according to the requirements of the CDIO model can better stimulate the students’ enthusiasm for learning. Compared with the previous classroom teaching method, students make great progress in understanding and mastering the knowledge. it can improve students' self-learning ability, engineering ability, teamwork ability, communication ability and innovation ability.

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