Practice of Virtual Simulation Experiment on Principle of Computer Organization

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Abstract. The sudden "CONVID-19" epidemic in early 2020 has a great impact on social economic life and school teaching, and also puts forward higher requirements for online teaching and distance teaching. Benefiting from the development of modern communication technology, Internet technology, and software computing, online video recording and live broadcast courses are already very convenient, providing great convenience for theoretical courses. However, the principle of computer composition is a course with both principle and practice. How to effectively carry out the practical teaching of the principle of computer composition presents a huge challenge. This article discusses the organization of a practical experiment course of computer composition principle, virtual simulation the release of content gives a feasible solution. Exploring how to adapt to local conditions and the full-scene student training model, this achievement has been practiced for a period of time in the teaching of computer composition courses in ordinary undergraduate colleges and universities. It has achieved good results and has strong universal value.

Introduction

In the computer specialty, the principle of computer composition is the core of a professional basic course. Under the background of new engineering construction, college students should vigorously strengthen their technical ability and innovative ability in the direction of training. Therefore, it is necessary to highlight the core basic course capacity building [1,2].

At present, the internal structure of computers is becoming more and more complex, large and integrated. Students generally feel that the principles of composition are difficult to understand, the concepts are abstract, and the perception of perception is poor. The principle of computer composition is one of the compulsory courses for computer and related professional entrance examinations. It is of great importance to students 'employment and further education, but there are serious lagging problems in teaching organization and curriculum construction. The composition and architecture of computers are changing rapidly. The modern computer industry has entered a distributed, cloud computing, computing and storage separation architecture. At present, almost all the textbooks of composition principles have not yet been incorporated into relevant teaching content.

There are many courses of computer composition principles, insufficient teaching hours, high cost of teaching content organization and laboratory construction, and relatively lagging experimental methods. Strengthen the knowledge points of the computer composition principle course, improve the experimental teaching organization and arrangement, and reasonably change the experimental course teaching content. It makes the experimental teaching more practical, and strengthens the students' knowledge of computer composition and the perception of the computer architecture.

Virtual Simulation Experiment for Training Practical Ability

In the traditional computer specialty construction, the emphasis is mainly on the students' practical skills in software development, and the importance of cultivating practical skills in hardware, especially computer composition, is not enough [3]. This greatly limits the cultivation of students' comprehensive ability and the application ability of computer science systems. Therefore, through the
construction of the virtual simulation experiment system of the principle of computer composition, highlighting the cultivation of the practical ability of the computer system and composition, and strengthening the students’ cognition of the computer as a whole. Ability is an inherent requirement for the cultivation of higher education personnel in the new period, as shown in Fig.1.

Figure 1. Block Diagram of Virtual Simulation Experiment System.

The computer virtual simulation laboratory designed in this paper mainly includes three levels, and the infrastructure layer mainly includes the data storage server, network access control, and permission management that need to deploy the system. The middle layer is the system's core business process management and control, including experimental task management, student information management, homework management, homework discussion and arbitration management, homework review and evaluation. The user layer mainly includes the student access end and the teacher access end, and the business functions displayed by different user roles are different.

**Student Business Process of Virtual Simulation Experiment System**

From the perspective of the student's authority and perspective, first of all, the student logs in to the virtual simulation laboratory through a browser, and can view the requirements of the tasks to be completed, including the content of the requirements, the deadlines that need to be completed, and the experimental operation guidance to watch the tasks, as show in Fig.2. After completing the experimental task learning, open the local Logism client, complete the laboratory task, perform the test according to the task requirements (you can record the test video results), write the experimental report online, add the logism source file and the recorded experimental operation results to the system, Complete this experimental task.
Student Business Process of Virtual Simulation Experiment System

From the perspective of the teacher, when you enter the virtual simulation experiment, you can create an experimental class course, add class students, and generate student accounts; then you can create experimental tasks, add experimental task teaching resources (including experimental guidance videos), and set the completion time. You can choose to publish the experimental task, or set to regularly publish the experimental task. After the students complete the relevant experimental tasks, they can view the experimental results submitted by the students, including the results of the mutual evaluation of the students' experimental reports, arbitrate the students' mutual evaluation data, and review the students' experimental reports. View the statistical analysis report of the student's final score and the scores of all students as show in Fig. 3.
**Student Business Process of Virtual Simulation Experiment System**

In the system configuration, the Chinese Academy of Sciences sets that when all students complete the submission of the experimental report, or when the deadline for submitting the task set by the system is reached, the system can automatically and randomly complete the assignment of the mutual evaluation task of the experimental report so that each student participating in the experiment can receive several experimental reports that need to be evaluated, urging students not only to complete their own experimental reports, but also to have the ability to evaluate other students’ reports. Students must be carefully and timely reviewed, otherwise the system will conduct a review on students whose evaluation errors exceed the threshold or fail to review in time. Penalties for achievement. After the completion of all mutual evaluations, the system will automatically generate student experimental report mutual evaluation results, and push the experimental report whose evaluation error exceeds the threshold to the teacher for arbitration evaluation, as shown in Fig. 4.

![Flow chart of the system's automatic completion of tasks.](image)

**Evaluation and Feedback System of Virtual Simulation Experiment**

The biggest feature of this system is that by setting up a mutual evaluation mechanism, students' experimental reports can be reviewed in time, teachers can be freed from the burden of review tasks, and teachers' energy can be concentrated on the selection of experimental tasks and experimental guidance. However, in order to ensure the quality of the evaluation, this article carefully designs the evaluation rules and establishes a suitable appeal and arbitration feedback mechanism. The specific evaluation rules are as follows:

- Each experiment task starts to enter the mutual evaluation process after all students complete the submission or after the submission deadline is reached. According to the mutual evaluation rules, there is a virtual experimental system that automatically sends a certain number of pending reviews to each participating student randomly for the experimental report, after receiving the system-assigned evaluation report, the student needs to complete the evaluation of the experimental report before the deadline for mutual evaluation.

- If the student fails to complete the review task within the timeout period, the student will be penalized for this experiment report (lack of cooperation and dedication). Secondly, according to the rules, if there is a huge deviation between the student’s evaluation results and the average evaluation result, the experiment report will be sent to the teacher user for arbitration review. The result of the arbitration will be determined to be malicious or the student’s review report will be penalized.
In order to improve the evaluation quality of the mutual evaluation report, the number of copies of the mutual evaluation, the minimum number of copies of the mutual evaluation, and the error score of the evaluation can be set in advance and displayed to the students in the form of prompts.

Summary

The core goal of practical teaching in computer science is to cultivate college students' practical ability in all directions, transform knowledge into ability, so as to make college students reserve a powerful force for future development[4]. At the same time, the development of modern technology is getting faster and faster. Outdated experimental equipment cannot meet the needs of technological iteration. The update speed of the experimental equipment cannot keep up with the update speed of knowledge and technology [5]. The virtual simulation experiment teaching scheme of the computer composition principle discussed in this article is a very useful supplement to the physics experiment. It has the characteristics of low construction cost, flexible experiment methods, and teaching goals that meet the actual needs of students. At the same time, a mutual evaluation mechanism is reasonably introduced. Experiment teachers can be freed from the heavy review of experimental reports, so that they can devote more energy to the experimental design, task design, and design of more excellent experimental teaching courses, operation demonstration training courses, which greatly improves the quality of experimental teaching and also enhances Students are interested in hands-on lab courses. Obtained good results and won many praises from students and teachers in the course. The influence of the test-oriented education model is still widespread in higher education, resulting in a general lack of training of students' practical ability in higher education. According to the society's demand for talents, higher education itself should not be limited to knowledge itself, but should also be the method of acquiring knowledge and the ability to put it into practice. However, under the exam-oriented education model, the teaching of knowledge is mainly indoctrination, focusing on theory and practice, focusing only on the theorem laws taught by book knowledge without thinking about breaking new ideas and deep exploration, lacking practical opportunities and creating platforms.

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References

[1] Jian-Hua, S., Fei, L. I. Chong-Hu, C., Qi, Z., Xiao-Rong, Z., & Amp, N. C. (2015). State-level virtual simulation experiment teaching center of communication & information network. Research and Exploration in Laboratory.

[2] Ying, Y., & Yuhui, Z. (2011). Virtual Simulation Experiment Analysis of Chevron Deceleration Marking Based on Driving Simulator. IEEE.

[3] Liu Jiying. (2019). Design of a virtual simulation experiment automation platform for smart teaching under a cloud platform. New Generation Information Technology, 02 (2012), 30-35.

[4] Wang Weiguo. (2013). Thoughts and suggestions on the construction of virtual simulation experiment teaching center. Laboratory Research and Exploration (12), 13-16.

[5] Guo, Xin-you; Wen, Shi-ting; Liu Yang-guang; Towards Improving the Practical Ability by Teaching Mode Reform of Courses of Programming, International Conference on Advanced Education and Management (AEMS 2017), 214-218.