# Research on Computer Experimental Teaching Mode Based on Virtualization Technology

**Yan LIU[1,a], Renjie Liu[2,b]**

Hunan Open University, Changsha, 410004 Hunan, China

Changsha University of Science and Technology, Changsha, 410086 Hunan, China

[a]501675674@qq.com, [b]kjcxdb102@163.com

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**Abstract:** The rise of virtualization technology (VT) in universities belongs to the category of emerging technology. Through VT, independent operating systems can be established in computers, thereby completing the organic integration of software operations and experimental work. In the teaching of various majors in universities, computer experiment teaching has certain difficulties and strong practicality. In response to this situation, many college teachers have tried to apply VT in the teaching process, aiming at solving practical problems such as poor performance of computer hardware, further improving students' learning efficiency, and ensuring the quality of computer experiment teaching. Nowadays, computers are often used in university teaching. The application of computers enriches teaching content and makes teaching more vivid. However, universities have not paid attention to the management of computers, resulting in many problems in computer experimental teaching. At present, the VT in computer experimental teaching cannot keep pace with the development of the Internet, which should attract sufficient attention from schools and teachers. This article takes computer experimental teaching as the research object, and analyzes the application of VT combined with computer experimental teaching.

## 1. Introduction

With the continuous development of information technology in the process of computer teaching in China, the research and application of VT have been deeply explored in higher computer experimental teaching. For students majoring in computer science, it is not only necessary to master theoretical knowledge during the learning process, but also necessary to participate reasonably in experiments. Through experiments, students' actual operating level can be improved. Due to the practical nature of computer science teaching itself, only through the implementation of teaching activities to improve students' operating ability can education objectives be better achieved[1]. Computer laboratories are the main places for experimental teaching design in computer majors and other professional courses, which virtually increases the pressure and difficulty of daily work in computer laboratories. For computer majors, the combination of VT and computer experimental teaching has significantly improved the level of computer experimental teaching and is conducive to cultivating students' practical abilities. In order to ensure the quality of computer experimental teaching, enable students to master computer knowledge, and promote their future development, universities should reasonably apply VT[2].

With the continuous development of higher education work, significant achievements have been achieved in the reform and innovation of college curriculum teaching, with significant changes in teaching methods, teaching content, and curriculum settings. In computer courses, students should not only master basic theoretical knowledge, but also conduct relevant basic experimental operations to enable them to better learn and master knowledge. The experimental teaching taught by the teacher is the key part of the experimental operation, which can well solve the problems encountered in the experimental operation for students. Currently, most computer experimental teaching centers in universities remain at the stage of being composed of ordinary computer rooms[3]. Problems such as the large number of computers and the easy aging of parts have brought

many difficulties to laboratory management and experimental teaching. The content that the computer experiment teaching teacher will explain focuses on the experimental operation. In this key link, the teacher can intuitively see the problems that students encounter during the operation process, and point out the problems that students have[4]. In order to make schools more in line with the pace of social development, various universities have opened computer courses to enable students to quickly adapt to social changes after joining the work force. Nowadays, many majors in universities need to use computers, so computer teaching should ensure quality even more[5].

With the rapid development of information technology, the requirements for students to master computer technology are increasingly high; However, the upgrading and obsolescence of computer laboratory equipment is relatively lagging behind. How to meet the needs of practical teaching on the existing basis, while utilizing existing resources, to ensure efficient and orderly teaching has become an urgent issue for laboratories.

## 2. Main Problems in Computer Experimental Teaching

### 2.1 Uneven Machine Performance and Serious Waste of Resources

Due to the increasing investment of universities in experimental centers year by year, computers will become more and more sophisticated in terms of configuration and performance, which results in larger differences in the construction time of laboratories and larger differences in computer hardware configuration and performance, leading to some highly specialized experimental courses that require higher hardware configuration and can only be offered in laboratories with better performance, However, laboratories with low performance can only offer courses that do not require high machine performance, resulting in uneven use of laboratory equipment and inadequate utilization of laboratories[6]. Computers have been running under excessive load for a long time, and various common failures often occur, such as crashes and system crashes.

Due to the diversity and complexity of computer experimental teaching, with the continuous deepening of teaching work, related teaching software must also be continuously upgraded and optimized to meet the increasingly complex and difficulty experimental teaching needs. Currently, computer equipment in computer laboratories is purchased in batches. The configuration performance of equipment purchased earlier is low, while the performance of equipment purchased recently is relatively high. As a result, there may be significant differences in equipment performance. Due to the rapid updating speed of computers, the hardware configuration of computers often cannot meet the needs of new teaching software within 3-5 years. It is necessary to purchase a new batch of computers with higher configuration, and the old computers can only be eliminated, resulting in a serious waste of resources.

### 2.2 Difficulty to Manage and Meet the Needs of Experimental Teaching

Traditional computer labs rely on restore cards for management and maintenance. Using a restore card can make it easy to install software and recover a failed system, but sometimes it can be troublesome to use a restore card. Restore cards are all for simultaneous interpreting of machines of the same model, so they are generally simultaneous interpreting of a single laboratory[7]. Due to large differences in equipment performance and multiple brands, unified maintenance is not possible, which increases the difficulty of later management and is prone to failures, bringing adverse effects to experimental teaching. In addition, the restore card has high requirements on the performance of the network. If the network speed is too slow or the network is unstable, the whole simultaneous interpreting will be too slow.

Judging from the current conditions of computer laboratory equipment in universities, due to the generally low performance of existing equipment in university computer laboratories, some experimental teaching cannot be conducted, affecting normal computer experimental teaching activities. Sometimes teachers need to share learning materials in the classroom and have students submit homework on-site, which can only be met by purchasing additional electronic classroom software. Electronic classroom software also requires additional encryption dogs to be used.

Inserting the encryption dog on the computer for a long time can cause failures due to heat, and poor management can also easily lead to loss[8]. For some destructive computer experimental projects, teachers do not allow students to conduct specific experimental operations due to concerns about damaging the computer. Computer experimental teaching is based on computer equipment. If the performance of computer equipment is poor or damaged, teaching cannot proceed normally.

Integrate the above problems in computer experimental teaching, as shown in Figure 1.
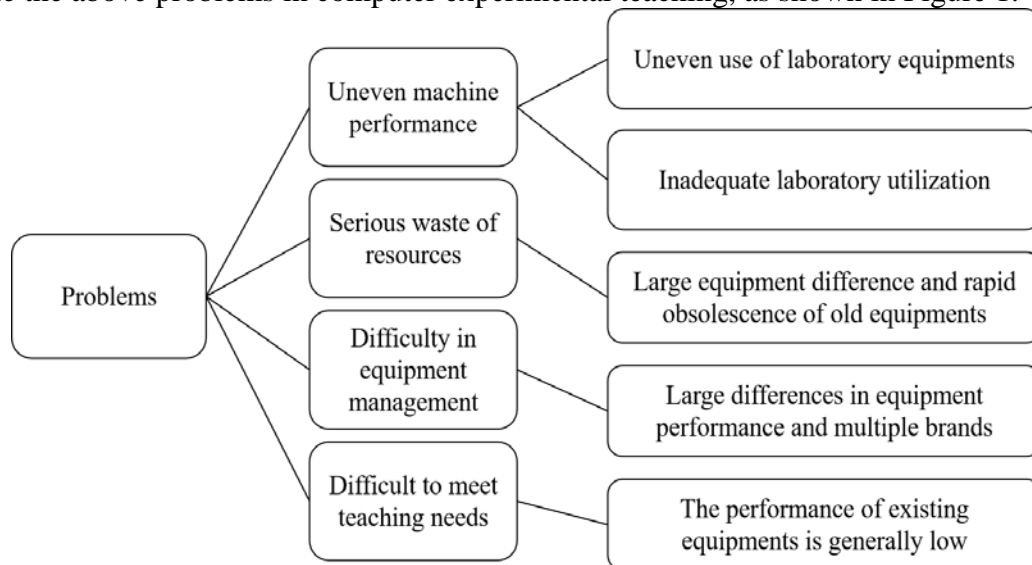


Fig.1 Main Problems in Computer Experiments

## 3. Strategies for Promoting the Application of VT in Computer Experimental Teaching in Universities

### 3.1 Strengthen Virtualization Devices

Using VT in computer teaching can reduce the cost of running compared to real computers. It can create the same software running environment as real computers, while consuming less resources. Faced with the increasing number of students majoring in computer science enrolled in universities, early computer practical teaching equipment cannot carry such a large number of students, let alone meet a large number of teaching content needs. Therefore, strengthening VT equipment is of great significance for computer experimental teaching in universities, which is also a milestone in computer teaching in China, universities must fully attach importance to and apply VT to teaching practice[9].

VT includes software virtualization, desktop virtualization, and server virtualization. Software VT can save original steps, run independently, and reduce resource consumption, thereby effectively improving the speed of computer operation. Desktop VT can virtualize software on the desktop. For example, students can use desktop VT for desktop access, and teachers can use desktop VT to authenticate students' identities and communicate with students through remote protocols. Server virtualization is a type of resource VT that separates hardware devices from application systems through its powerful capabilities, facilitating file backup, transfer, and replication, as shown in Figure 2.
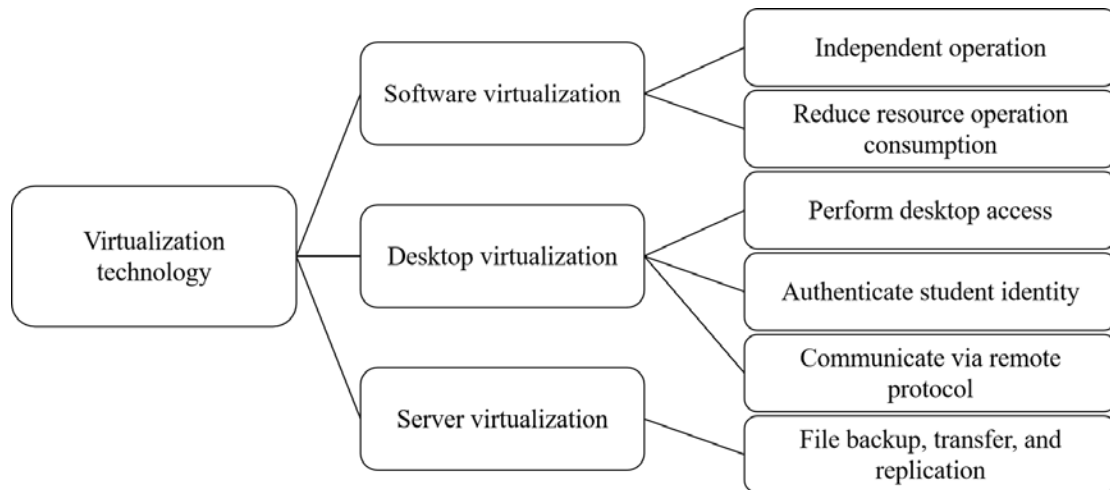
Fig.2 VT Types

Applying VT in computer teaching can solve the problem of frequently upgrading some software or installing multiple operating systems on a single computer. Compared to the pressure and high consumption of various previous software updates from time to time, virtualization computer technology can achieve running multiple virtual machines on the same server, This can effectively alleviate problems such as system upgrades that affect the actual operation of the computer.

## 3.2 Improve the Comprehensive Quality of VT Teachers

VT can build a LAN virtual environment, which can better adapt to the actual needs of students. If students are not familiar with the relevant operating systems and processes of computer experiments, they may easily cause some damage to the machine due to operational errors during the experiment process. Therefore, it is particularly important to strengthen teachers' literacy in VT in computer experiments[10]. Teachers should be familiar with the characteristics of computer practical teaching in universities and should adopt virtualization technologies that are suitable for their own characteristics, such as packaging existing resources in the form of copies, so that physical resources can truly be independent of the computer hardware environment.

Virtual technology requires a high level of literacy for teachers in computer experimental teaching in universities. Teachers are required to fully utilize the characteristics of server clusters to generate their own dedicated desktop for each student. Students can access the desktop to enter data and complete the storage of server clusters. Teachers need to strengthen the analysis of common problems, and then respond to them in a reasonable manner. Specifically, in the process of teaching, problems such as network attacks and processor overclocking testing often occur. If these problems cannot be properly resolved, they may damage the system. Therefore, teachers should use VT reasonably, control multiple virtual machines, and switch between different systems to reduce the probability of problems occurring.

## 4. Conclusions

Experimental teaching is an extension of classroom theoretical teaching, and is a major method for cultivating students' practical abilities and helping them master basic knowledge. It plays a significant role in improving teaching quality and cultivating students' abilities. With the development of society, the application of computers has penetrated into various industries in society. Therefore, universities should strengthen the configuration of computer equipment, actively carry out corresponding computer experiments, and reasonably utilize virtual technology to create favorable conditions for students to adapt to society and learn professional knowledge. For computer experimental teaching, it is necessary to introduce VT into teaching, promote teaching reform and innovation, and comprehensively improve teaching effectiveness. In order to ensure the quality of computer experimental teaching, enable students to master computer knowledge, and promote the future development of students, universities should reasonably apply VT. VT has an

independent operating system, which can enrich resources, help teachers make reasonable use of high-quality resources, and on this basis, simplify the originally cumbersome procedures to improve the management level of resources. Using VT in computer teaching can ensure the quality of experimental teaching and increase students' computer experimental skills. The application of VT can continuously reduce the cost of computer experiments, fully integrate computer resources in universities, and ultimately cultivate a group of high-quality, strong application ability and innovative computer comprehensive talents.

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## References

[1] Li Jiaming. Exploration of teaching management mode in colleges and universities based on virtualization technology [J]. Journal of Sichuan Cadre Correspondence College, 2018(3):3.

[2] Yang Guishan. Analysis on the application of virtualization technology in the construction of computer laboratory rooms in colleges and universities [J]. New Campus (Theoretical Edition), 2018, 000(003):33.

[3] Qiao Jinsong. Research on the application of virtualization technology in computer experiment teaching in colleges and universities [J]. Charming China, 2019(11).

[4] Wen Jia. The application of virtualization technology in college computer experiment teaching [J]. Chinese and foreign entrepreneurs, 2020(9):1.

[5] Zhang Xiaohui. Application of virtualization technology in computer experiment teaching in higher vocational colleges [J]. Digital World, 2018(2):1.

[6] Wang Fuzeng. Application of virtualization technology in computer experiment teaching [J]. Electronic Technology (Shanghai), 2022, 51(10):2.

[7] Xia Lei. Research on the application of virtualization technology in computer experiment teaching in colleges and universities [J]. Journal of Multimedia and Network Teaching in China (Mid-term Journal), 2019(11):50-51.

[8] Ren Xuegang. Analysis on the management mode of computer laboratory of virtual desktop [J]. Integrated Circuit Application, 2021(010):038.

[9] Liao Shan. Research on the management mode of university computer laboratory with virtual desktop [J]. China New Communication, 2020, 22(22):2.

[10] Li Guoxing, Shen Maohua. The application of virtualization technology in computer practice teaching [J]. Teacher Dao: Teaching and Research, 2018(9):1.