

## Exploration and Practice of Opening Computer Experiment Teaching Pattern

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### Abstract

This paper focuses on training and sustainable development of creative talents in computer major, analyzes the problems existing in traditional experimental teaching in most universities, and explores the methods of opening computer experimental teaching. We discuss the feasibility how to achieve opening computer experimental teaching in advanced computer network platform, virtual laboratory, scientific management system for laboratory and high level laboratory technical team. Opening computer experiment teaching pattern speed up training creativity of students, and the method is helpful to understand and master the knowledge of computer major, which needs to get remarkable ability to practice and operation. It improves the cultivation of students' autonomous learning ability.

**Key words:** Opening; Virtual; Creative; Scientific management

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### INTRODUCTION

In recent years, the computer practice teaching around the goal of personnel training, the requirements for the cultivation of innovative talents and the sustainable development are put forward. The practical ability and the

cultivation of innovative spirit are getting more and more attention. Practical ability is generally regarded as one of the key links in the cultivation of talents. At present most of the computer laboratory in colleges and universities is the traditional method of experimental teaching. The subjects of the experiment are mainly to verify the problem. Content and method of the experiment teaching are single, what ignores the cultivation of innovative spirit and innovative ability. Open experimental teaching is a good way to solve the above problems. In this paper, we discuss the problem of network information management, virtual laboratory, the management method and the team construction of high quality experimental team for the comprehensive and network construction of computer open laboratory.

### 1. LABORATORY NETWORK PLATFORM CONSTRUCTION

Information management system includes system management, experiment management, and instrument management. Open lab users are divided into: system administrator, teachers and students. The manager's job is to carry out the maintenance of the system, data backup, configuration of different applications, complete the data collection, statistics and analysis. At the same time administrators also complete the registration and maintenance of the instrument and equipment. The teachers can carry out the layout and inspection of the experimental subjects through the system. Then teachers can arrange experimental courses, online answering test reports, marking and so on. Students can log in to the virtual system to study, complete the experiment booking, applications of test equipment, information browsing, submit the experimental report, etc..

Experiment reservation system: It is the core of the network platform. In the open experiment, the time and

the contents of the students are not unified. In order to achieve the reasonable allocation of resources, students need to advance booking of the subject, time and the required test equipment. So the experimental teacher prepares the experiment to prepare the experiment and the hardware resources according to the reservation experiment content, the reasonable allocation of the classroom and the experiment instruction teacher. Students can query the recent and all of the experimental questions and requirements by the reservation system. Students according to their own interest in the choice of experiments make an appointment, after the experimental teacher audit through the completion of the experiment. If there are special circumstances, students can advance termination or re appointment.

Online Q&A: Online question answering system is an important part of the laboratory network platform. It makes the communication platform between the teachers and students to establish an exchange platform which is not restricted by space. Because the students on the machine time and the experimental contents are not sure, which requires that teachers who can answer must be all day online, at any time to answer questions of students' problems. At the same time, it can also guide the teachers to collect, classify and preserve the problems. In this way, students can query and learn to achieve autonomous learning. So teachers can reduce the burden, through the analysis of common problems in the classroom teaching, improve the teaching level. In the system design of the answering question, it should include the question of the student, the teacher to answer, the question browsing, the page display, to have answered the question according to the keywords fuzzy inquiry and so on function.

Distance education system: When the students are doing the experiment, may have the knowledge or not forget. Therefore they need to online Q & A, and online Q & A is not possible for a long time for a student to explain in detail. Therefore, it can be stored in the network server through the distance education system to store the knowledge of the network server so that students can browse and learn at any time. In addition, the topics of the open lab are the most of the design, comprehensive and innovative topics. Teachers can teach students in the form of distance education, and it can also provide students with large experimental projects and problems in the form of remote education, which the remote education system should include the video information uploading, downloading and sharing of learning materials, not only extends the knowledge of the students, but also reduces the burden on teachers.

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## 2. VIRTUAL LABORATORY CONSTRUCTION

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There are a wide variety of computer specialized teaching courses, which have many kinds of

requirements for hardware and software. If a PC machine to meet all the hardware needs and run all the software, which is not achieved. Therefore, in the construction of computer experimental teaching laboratory, because of the different degrees of the hardware platform, programming language, operating system, network communication protocol and database structure. So in order to configure the different experimental requirements of the laboratory, we need to purchase a large number of computer equipment. What will lead to the low utilization of computer resources, the whole system maintenance difficulties, high energy consumption.

Laboratories usually undertake heavy teaching tasks. In practical teaching, the hours are limited, often only in accordance with the requirements of the syllabus teachers choose to do some validation experiments which related to important knowledge points.

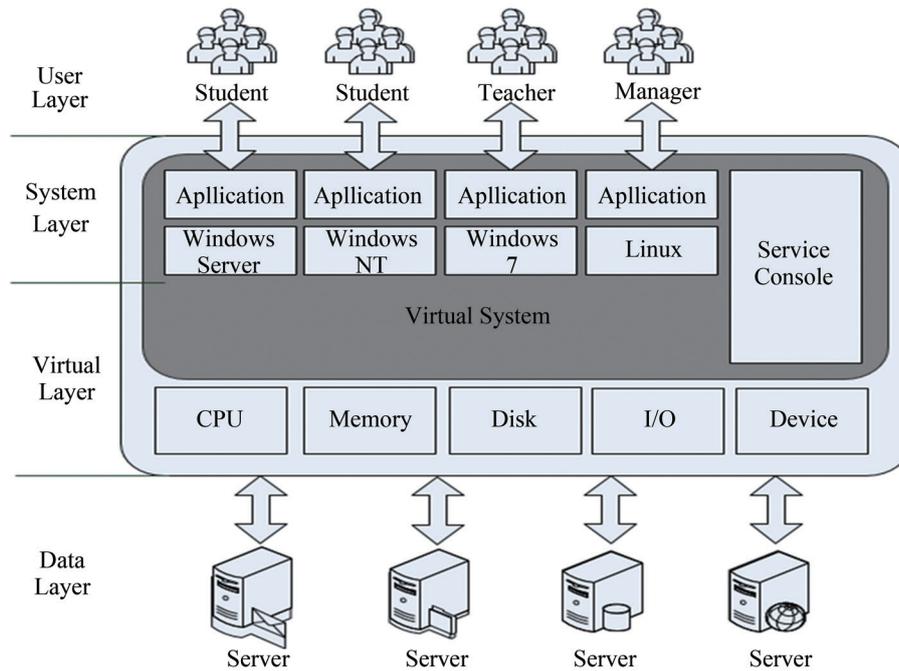
And the creation of comprehensive experiments and design experiments has been limited. After school, students can not buy high software and hardware equipment and can not achieve the understanding and consolidation of the knowledge. Which is very bad for improving students' practical ability and limits the students' independent innovation ability, is not conducive to the cultivation of innovative talents.

Virtualization technology is to combine multiple servers, software and hardware devices and other physical resources to abstract a number of logical resources to make these devices into several clusters or even hundreds of stand-alone PCs. As multiple servers are integrated together, CPU, memory, hard drive, I/O equipment, as a "resource pool" can be dynamically managed, so that the resources can be allocated reasonably according to different application systems which makes it no longer subject to physical constraints. Thus, it simplifies the maintenance and management of the application system, and greatly improves the utilization rate of resources and the use of the system.

Virtual system allows the same physical machine, can run a different operating system, which becomes a virtual machine. Each virtual machine is like an independent physical machine which has a set of virtual hardware. These hardware devices can load any operating system, run separate applications, and they do not interfere with each other.

Virtual machines can be copied and deployed quickly in a few minutes, and the whole system is moved from one computer to another to achieve zero downtime maintenance and continuous work load integration.

The integration architecture of virtual lab is divided into four layers: user layer, application layer, virtual platform layer and data layer. As shown in Figure 1.



**Figure 1**  
**Integration Architecture of Four Layer Virtual Lab**

The user layer is oriented to the use of the user and provides a virtual laboratory interface. Students can choose different terminals in the laboratory through the system according to the content of their own and configure different applications, can independently complete the experiment. Because of the popularity of the campus network, students can enter the virtual laboratory at any time and anywhere. The administrator is responsible for the installation and configuration of the server system. And complete the centralized management of all virtual servers, backup and restore the application system. Teachers can also use the virtual laboratory for scientific research.

Application system layer is mainly responsible for different application systems based on different needs of different experimental classes and performs hardware resource allocation, complete the daily operation and maintenance. Application system layer can quickly deploy and migrate different operating systems such as: Windows 2008 Server, Linux, Window 7 and so on.

The virtual platform layer is a virtual hardware environment, which is used to allocate and manage hardware resources for the operating system. The virtual system is a virtual layer between the server operating system and the hardware. The virtual system is a virtual layer between the server operating system and the hardware. These virtual machines are usually run in parallel, they are used by the hardware devices such as CPU, memory, hard drive, etc.. When the virtual machine stops running, the resource is returned to the server. Therefore, hardware resource sharing can be achieved, and the operating cost is greatly reduced.

The data layer is the support for the application system to provide the data, according to the different application system can set up the distributed database. For example: mail server, data storage server, application server and maintenance website management server, etc.. These are the servers that store data are independent of the virtual platform. Different virtual machines can access these databases.

The architecture of these systems is a good way to meet the requirements of different applications, different users and more system resources. Simple applications can be allocated less resources, the application can be allocated more resources, and can not be used for the time being used to lend more resources, which can improve the utilization of the overall system's resource. As long as the user through the campus network to the system in the virtual machine, as well as a high performance of the local PC, which can complete a variety of experiments and practical teaching.

### 3. LABORATORY SCIENCE MANAGEMENT SYSTEM CONSTRUCTION

Laboratory opening is a systematic project, the management system is the system guarantee of the normal operation of open laboratory. If the open system is not perfect, not perfect, it will inevitably lead to the confusion of the experimental teaching, but also cause the laboratory operation efficiency is low. How to embody the advantages of the development laboratory in the management system, to achieve a good development effect, we need to establish a scientific

and standardized laboratory opening management system.

First, in order to ensure the normal and efficient operation of the laboratory, need to be clear. We should establish an effective management system, clear division of labor, and the unity of responsibility. The center of the experiment center is the management of the center director, the management model of the school and the school is adopted. The school is responsible for the overall planning, financial support and the coordination of various departments. Center teaching resources should be allocated and this kind of resource sharing can make professional teaching and basic teaching organic combination. So the right of the center moves down, the division of responsibilities in the laboratory. We should increase the full-time teachers of the laboratory to put in the time and effort, at the same time build echelon according to the laboratory experiment teaching team, professor in charge of the implementation of the system. In addition, we need to develop the experimental teaching training program and teaching syllabus.

Secondly, we need to improve the rules and regulations, standardize management. In order to make the laboratory open, efficient and stable, we must have an effective rule and regulations. The lab requires a full-time staff responsible for the maintenance and management of the daily computer and related equipment, which can ensure that the equipment can operate normally. The lab requires a full - time staff responsible for the maintenance and management of the daily computer and related equipment, and to ensure that the equipment can operate normally.

Thirdly, we should establish incentive policies to improve the working enthusiasm of the experimental teachers. Scientific and effective and feasible incentive mechanism is the driving force of the development of laboratory opening, which is also a prerequisite for ensuring a stable, aggressive and aggressive experiment. In order to make the laboratory open not only in the form of a good effect, we must have an effective incentive policies to encourage teachers and students to actively participate in the experiment. It is also needed to develop an assessment method for the workload of the experimental teachers and laboratory technicians to guide the open experiments. The open subject is to be funded, and the good results obtained in the open practice are rewarded. We should encourage teachers to participate in scientific research, more than a paper, the results should be a reward system.

Lastly, provide the experimental funds and instruments to ensure the normal operation of the laboratory course. Each year, the school has special equipment maintenance costs and material costs, in order to ensure the equipment in good condition and the rate of experiment. We want to strive for national and provincial special subsidies, and to

update the equipment, to maintain the advanced nature of the experimental teaching equipment. But also actively and enterprise joint, joint establishment of research laboratories, in the guarantee of scientific research, and can serve for the computer experiment teaching. And enhance the teaching cooperation between the schools, and realize the professional direction of the subsidy. If the center does not establish the laboratory, the school can go to his school laboratory, this extensive laboratory development, can fully realize the real complementary resources.

#### **4. CONSTRUCTION OF HIGH LEVEL EXPERIMENTAL TEACHERS**

In an open laboratory, students can choose to be interested in the development of the time, and therefore the subject and content of the experiment are not certain, which requires teachers to experiment who is a higher level of business ability, proficient in many courses knowledge. To open up the computer teaching in real time, we must improve the laboratory instruction and the number and the service level of the teachers and the mud scraper. In the past, most colleges and universities ignored the experimental teaching, the laboratory work of the experimental team so not to be taken seriously, the teaching task of teachers and the experimental teaching task is heavy, and the workload is not enough. In this way, the responsibility of the teachers is poor and the laboratory management is confused. What have greatly affected the practice teaching effect.

The construction of the open laboratory must attract high level, high degree of professional teachers to actively participate, especially young doctor and young teacher. On the one hand, the teachers' enthusiasm is high, energetic, can better guide students; On the other hand, they also need scientific research, which can make them exercise in practice. For young teachers who have just come to work, if they themselves teach a course or to guide the experimental courses, what are relatively thin, because they have the ability and experience to subsidize. Young teachers can introduce their own professional knowledge and related scientific research projects into open experimental teaching in practice teaching to broaden students' vision, improve students' ability, so as to improve students' innovation ability. Similarly, in this process young teachers in the guidance strengthen their knowledge theory, at the same time it has accumulated the teaching experience, mastered the teaching method and means, and laid a solid foundation for the teaching.

According to individual scientific research situation, the young doctor is appropriate to select the subject front and difficult to design a comprehensive, design and innovative practice teaching topics for students to do. In this way, the students in the teaching will be exposed to

the highest level of theory, which can develop students' experimental skills and scientific research ability. Which can increase the interest of students in scientific research, but also allows students to experience the hardships of scientific research in practice, to stimulate students' sense of accomplishment and create desire, forming a virtuous cycle of innovation process.

The college should pay attention to the construction of high level experimental team, to give the corresponding dividend policy for the experimental team are evil. High quality, high level of experimental teachers, not only can improve the students' innovation ability, but also to the whole of the professional teaching also has a great role in promoting.

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## CONCLUSION

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The specialty of the computer science and technology has the inherent advantages in the construction of open laboratory. Computers and laboratory equipment can completely realize the unified distribution and utilization of resources through virtualization technology and through the campus network and the Internet to share with the vast number of teachers and students. Which makes them no longer subject to geographical and time constraints,

the high computer server equipment, etc. from now on, no longer idle, to achieve full reasonable use. Laboratory opening is conducive to the cultivation of students' innovative spirit and innovative ability, which is beneficial to the students' understanding and mastery of professional knowledge, and to strengthen the cultivation of students' autonomous learning ability. Students improve the ability to find problems and solve problems, and cultivate a sense of unity and collaboration team through the study of the design, comprehensive and innovative experiment subjects.

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