

The Research of the Opening System of University Laboratory and the Design of the Laboratory Reservation System

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Abstract. In this paper, the problems and solutions of laboratory opening system is discussed, a laboratory reservation system is designed based on mobile device, students and teachers can use smart device to login laboratory reservation system, make reservation and management of laboratory whenever and wherever as possible. The laboratory reservation system would made administrator's management more convenient, and reservation for students is no longer confined to location, laboratory reservation system would greatly improve the efficiency of the use of the laboratory.

Introduction

Laboratory is an important base of cultivating students' innovative spirit and practical ability, not only has the function of teaching and scientific research, but also has the ability to opening and served beyond the class. Laboratory is a comprehensive experimental base of multi-disciplinary and interdisciplinary, it is an important base for cultivating students' innovative spirit and practical ability, the main place for teachers' teaching and scientific research.

Opening laboratory to break the enclosing state of the laboratory, implement resource sharing of laboratory equipment under the premise of accomplish the task for teaching and scientific research, to make full use of the existing advantages of material conditions, academic and technological in the laboratory, such as experimental sites, equipment, teachers, a variety of materials and resource. Opening laboratory provide students with practical learning and scientific research conditions. The fundamental purpose of the construction of opening laboratory is to provide students with an open and relaxed environment for research, to cultivate students' design thinking, pioneering consciousness, creative ability, scientific quality and practical ability, establish the foundation for the students to grow up quickly and adapt to the work as soon as possible. Opening laboratory can make full use of experimental resources; can also provide students with independent development and practical training space. It is an effective measure to improve the utilization rate of instrument and equipment, and it is an important process to carry out the reform of experiment teaching.

Current situation of laboratory opening

The traditional laboratory management mode seems to be out of date, many of the instruments and equipment are used when required, many of the equipment procurement basically in accordance with the teaching plan. Many of the equipment is in accordance with the purchase of the curriculum plan, it is easy to lead to the use of classes, the result of a serious waste of idle resources. Laboratory opening can thoroughly solve the problems in the management of opening time, opening content, laboratory equipment management and so on. The outstanding problems existing in the management and operation of the opening laboratory of the University, mainly in the following aspects:

The low utilization rate of experimental equipment

The phenomenon of low utilization rate of experimental instrument is common in many colleges and universities, under the traditional management mode, the utilization rate of the experimental equipment is low, lead to the purchase of the experimental equipment is only complete the role of

class teaching. Many colleges and universities experiment curriculum is single, the content is mainly based on the verification experiment, the teacher propose the experimental requirements and do demonstration, experiment teaching is lack of innovation leads to the difficulty of cultivating students' creativity, students are bound in the framework of teaching lesson, can only follow the design steps to finish experiment, it greatly limits the improvement of students' innovative ability. The innovation of the experiment is mainly a small part of the students follow the research topic of the teachers do the experiment. However, it is difficult for students to carry out technical training or to carry out non-project research, the effect is not ideal from the students' individual development and the ability of independent innovation. Laboratory opening can enable students to understand the whole process from the experimental preparation until the experiment is completed, to make the experiment more close to the actual operation of the project development.

Management of laboratory equipment

There are some problems in the standardization and institutionalization of the management and operation of the laboratory in colleges and universities. Some laboratory equipment is not the same, so manage by way of decentralized model, comes the problem with effective integration of limited resources, teaching resources cannot be maximize use. Some laboratories are managed by a unified management center, staffing of laboratory do not have clearly defined division of labor, resulting in some laboratories do not have a specially-assigned staff, no specially-assigned person is responsible for most of the experimental equipment problems, cause influence on the standardization of the use of the instrument.

There are also some laboratories due to the lack of independent equipment maintenance funds to support, the purchase of for equipment maintenance, low consumption and other necessary expenses is difficult to maintain, the laboratory opening is bound to increase the probability of damage to the equipment without the initiative of the maintenance funds affect the teachers of opening laboratory.

Students' need for laboratory opening

The student can use the laboratory time is generally the teaching time, causes the student to be able to use the experimental equipment time is insufficient, the opening to the student should be after the class. The experiment content of the laboratory opening must be the supplement of the personnel training program, is the continuation and improvement of the experiment in the talent training program, including the comprehensive and design experiment, as well as software development, courseware making and website construction. Laboratory opening provides students with independent activities of the space, for outstanding students to establish a platform for innovation; Students can design the experimental program by their own, adjust or modify the experimental program according to their actual situation in the course of the experiment. Gradually tap their own potential, to display their creative talents. Laboratory opening can also enable students to form extra-curricular science and technology interest group according to their own interests and hobbies, carry out extracurricular activities under the guidance of teachers; this is also an excellent exercise for students to advance into the role of scientific research.

Laboratory reservation system

The construction of scientific and practical information laboratory reservation system is a way to improve the utilization rate of laboratory, which is beneficial to the management of laboratory equipment. With advanced laboratory reservation system is an important basis for network management of laboratory equipment and resources. In recent years, many colleges and universities have laboratory opening platform into the laboratory opening construction, some domestic and foreign universities or research institutions has established a relatively perfect equipment share management system, but many are not up to the expected effect. These systems generally include several parts: large equipment booking management system, authorization management system and accounting management system, process automation management of the large-scale instruments and

equipment information by reservation and authorization module. The resource allocation, teaching facilities and facilities management are carried out by the experimental center. The construction of the reservation system will make the operation mechanism of the laboratory opening more perfect, the use of the equipment is more convenient, and the operation efficiency is greatly improved. Advanced laboratory reservation system construction will be beneficial to the development of scientific research work in universities, but in use is not convenient, often becomes a mere formality.

Based on mobile terminal

Laboratory opening can be made by reservation on a personal computer, but it is not convenient. Mobile terminal can be wirelessly accessed to the Internet, with good expandability and software support; to make a reservation to the laboratory through the mobile terminal equipment is more convenient and humane than through the computer. In recent years, intelligent equipment has become an indispensable electronic equipment in personal life for its ease of carrying. As a new carrier, the mobile terminal has a strong controllability and is used under less constraint conditions, especially suitable for the needs in work and study of modern university teachers and students, it has greater flexibility and is more convenient for the students, laboratory assistants to use.

The system application of XML technology to achieve the sharing of mobile phone embedded database and WEB system database, establish the digital laboratory management system. Achieve the inquiries for laboratory equipment and student booking situation; information for students and teachers account, laboratory curriculum import to the database server through a unified SDK interface; The overall development framework of the system will be based on the popular MVC development model software development, will use the C Objective language developed by iOS system.

System design

Through the LRSA (Laboratory Reservation System APP), achieve the laboratory management and laboratory reservation function, and ultimately achieve the target of making full use of laboratory experiment resources; can improve the efficiency and other shortcomings for manual management of laboratory equipment. Previous APP for laboratory opening reservation system is an APP that teachers and students can use easily, to maximize the use of laboratory resources, to facilitate the management of laboratory resources to complete more teaching tasks. It can achieve the following functions (Figure 1):

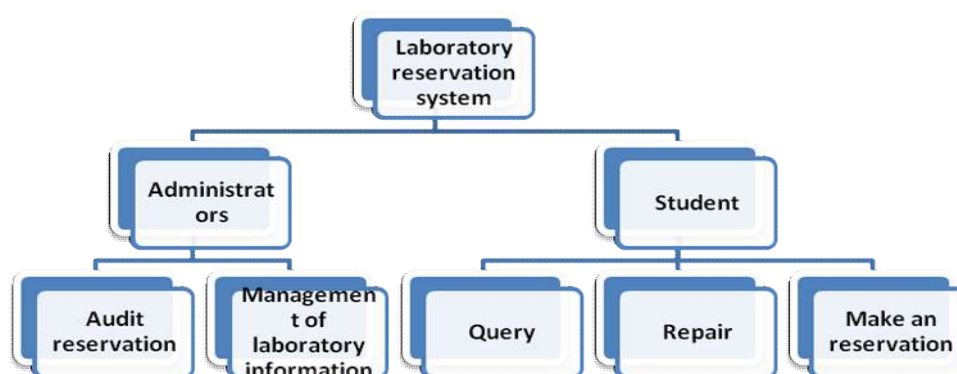


Fig 1. The basic model of LRSA

Laboratory management function: Administrators can add, modify, delete, laboratory information and related information, to the basic information of students, teachers, laboratory, and the release of laboratory reservation acceptance;

Reservation laboratory function: To view the laboratory condition list and the list already made an reservation, the manager informs the reservation result, as well as the inquiry from the client; Students can query the available laboratory and equipment, and no need to laboratories

in the field view or by finding paper schedule, students can reservation laboratory by their ID, laboratory manager approval and audit results immediately through the platform update.

Classroom equipment repair and treatment: The system administrator can make statistics and summary on the reservation of the laboratory and the experiment equipment. Students find laboratory equipment damage and changed to needed repair status immediately in the system, administrators found the needed repair equipment, will inform maintenance person went to repair, to ensure the maximum utilization of the laboratory resources.

Overall system architecture

Program structures of LRSA is based on intelligent equipment, the system finally achieve multiple function modules: user login, idle laboratory query, query curriculum schedule, reservation laboratory, and equipment repair.

Student users: Student ID registration and login; Viewing laboratory information: including laboratory equipment, laboratory equipment, laboratory opening hours, laboratory reservation; Reservation in accordance with the requirements of the experiment by the name of the laboratory and the use of time; View and modify the reservation results: check whether the reservation is successful reservation booking audit, review their past reservation history, you can also modify or delete the contents of the reservation booking. And the student an carry out the maintenance of the equipment which can't carry on the experiment;

Administrator user: Administrator account registration and login; Administrator check the lab information: preview the laboratory information is correct, acquaintance the laboratory reservation situation, acquaintance the frequency of use and use time for each lab, to facilitate more reasonable to be managed; Laboratory information update: The laboratory equipment will change in period of time, experimental courses are not the same in each semester, so the system should have the update function; To make an reservation for a student: Audit student reservation according to the actual information; Review and update the experimental equipment for needed repair experimental equipment information.

Conclusion

There are general requirements for college students for query the laboratory information and the reservation of the laboratory. In this article, design the laboratory reservation system used on intelligent terminal, using the app development technology, make teachers and students can query lab resource allocation and submit laboratory application anytime and anywhere, at the same time, managers are using the system to management of all kinds of information for effective management, the APP is easy to use and good maintenance for laboratory.

LRSA's client is an open system, users can use any smart device to login, made an reservation for laboratory whenever and wherever. Student's reservation operation more convenient, the management of the administrator is more convenient, is no longer confined to a certain place, greatly improving the utilization efficiency of laboratory.

This system can not only meet the basic needs of the laboratory booking, you can also use the statistics module to acknowledge time length of each student in the experimental activity, the use efficiency of each laboratory at different time periods.

System communicating with the server, to help administrators query laboratory real-time information, make an reservation for laboratory, audit student's reservation, provides more efficient and effective management scheme for the school laboratory resource, in order to achieve the maximum utilization of the laboratory teaching resources.

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