

# OPTIMIZE FOR LABORATORY RESOURCES AND IMPROVE ITS OPEN MANAGEMENT SYSTEM

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## **ABSTRACT**

In order to improve students' practical ability and have a creative mind, it is not only necessary to optimize the laboratory resources and open laboratory but also an important reform based on CDIO. By means of opening the project of independent innovation and sharing laboratory resources, it can provide students an open and liberal environment for experiments and research, thereby strengthening students' practical ability, training students' design thinking, scientific literacy and pioneering spirit. As a strong basis for laboratory widely open, it is essential to formulate a perfect opening and operation management system. This system can make full use of existing laboratory equipment to achieve the purpose of the integration of resources and bring the laboratory operation effectively. The paper shows the reform measures for the laboratory opening and operation management, that is, an experimental teaching system theory and practice in harmony.

## **KEYWORDS**

open laboratory, practical ability, operation management system, laboratory resources, 6

## **INTRODUCTION**

In most colleges and universities, practical ability is viewed as an important evaluation criterion, which is an indispensable part of four-year undergraduate programs. With the advance of CDIO Engineering Education Reform, students' practical ability and innovation spirit gradually increase. Accordingly, the hardware facilities, such as the venue, equipment, rules and regulations, ought to meet the needs of teaching. Opening laboratory is an effective

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measure to improve the utilization rate of experimental equipment, optimize and integrate the laboratory resources and provide students an open and liberal environment for experiments and research. The goal of university laboratory is to foster the ability of innovation and practice, which openness and management pattern are widely concerned. Therefore, it's so significant that the laboratory opening management must be fully implemented in order to achieve the modern experimental teaching conditions ( Li Guizhi et al, 2010).

## CURRENT SITUATION OF OPENING LABORATORY

Nowadays, the laboratory opening is a trend of the development and reform in colleges and universities, due to pay more and more attention to bring up the practical ability, design thinking, scientific quality and innovative consciousness. According to the function and meaning of the opening laboratory, its form can be giving open on time, place, and experiment contents. Among them, opening on time and place is the premise, and opening the experiment content is the core ( Wang Yunping, 2010).

### *Opening on Time and Place*

It's a basic requirement of opening laboratory that there is independent time, abundant experimental resources, and adequate experimental environment for student. In the laboratory, there are many things for student to complete independently, such as self-conception, designing innovative projects, expanding curricular experimental and join the research team. In view of this, it can not only improve the students' experimental skills, the utilization rate of laboratory equipment, but also cultivate students' consciousness of team cooperation and the ability of self-practice and self-management.

The pattern of "listen to learn" and "learn to do" have been replaced by that of "learning by doing" ( Jiang Jie, 2009). The later can guide the students to actively learn knowledge. At the same time, it can achieve the vision of CDIO (Conceive, Design, Implement and Operate). Opening on time and place can provide the necessary conditions for the pattern of "learning by doing". There are 46 laboratories for undergraduate teaching and 7 laboratories for students' independent innovation in our university. In addition to the daily teaching work, the undergraduate teaching laboratory can also be open to students. The undergraduate independent innovation laboratory can be open for students at the whole day, and it is managed by students.

The statistics purposes of the undergraduate teaching laboratory are shown in Tab.1.

Table 1. The Statistics Purposes of the Undergraduate Teaching Laboratory

Daily experimental teaching	Research	Independent opening	No-opening
11.3%	6.6%	21.4%	60.7%

### ***Opening on Experimental Contents and Users***

It's very essential to open on experimental contents for students' practical and innovation ability (Qin Changming, 2009). It can be divided into two parts for opening the experimental contents. One part is the experiment in the daily teaching; the other is the independent innovation project which is outside the teaching plans. For the program open, it not only needs the improvement of classroom and experimental teaching, but also constantly updates the content, adds the scientific research into experiment teaching and continues to increase the breadth and depth of the experimental teaching. There are a variety of forms to support the students' innovation, for example, open topics, the extracurricular innovation training project, the entrepreneurial projects, various academic competitions and so on. These items take a strong guarantee for strengthening students' practical and innovation ability. In recent three years, there are 86 scientific and technological competitions, 136 innovation training projects and 28 entrepreneurial projects. Most of them are completed in the students' independent innovation laboratory, such as "Challenge Cup" national undergraduate extracurricular scientific work contest, national undergraduate electronic design contest, energy-saving and emission-reduction contest and so on.

Opening subjects is an extension of opening the experimental contents. The subjects are expanded from experimental class to the innovation and entrepreneurial team, the research team and institute of technology. Oriented to project, the opening laboratory makes each member of the team join the work of innovation and entrepreneurship.

### **THE OPENING LABORATORY MANAGEMENT SYSTEM**

In order to realize the function of the opening laboratory, it's necessary to find the innovation management mode of the opening laboratory. There are a few of measures to establish a diversified practice teaching system, such as establish perfect rules and regulations, strengthen the construction of practice teaching conditions, deepen the reform of practice teaching and implement the Undergraduate Innovation and Entrepreneurship Education Project and so on. These measures provide strong guarantee for training high quality talents with innovation ability in practice (Wang Feng & Yu Jing, 2011). As shown in Figure 1 is the opening laboratory management system in this paper.

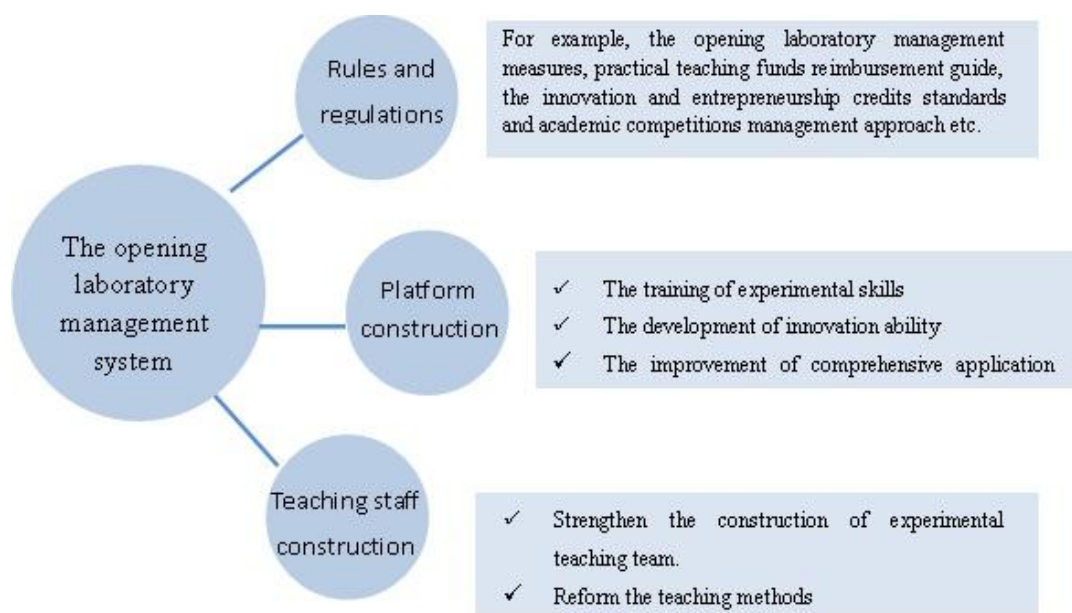


Figure 1. The Opening Laboratory Management System

### ***Well-developed Rules and Regulations***

Through establishing the well-developed rules and regulations, it can build the effective restriction mechanism and support experimental funds (Wang Guicai & Yang Jiumin, 2011). The rules include the opening laboratory management measures, practical teaching funds reimbursement guide, the undergraduate innovation and entrepreneurship management measures, the innovation and entrepreneurship credits standards and academic competitions management approach. The rules play a good role in promoting the daily work of the opening laboratory.

### ***Operation and Management Mechanism***

#### ***Platform Construction***

The opening laboratory can provide some hardware platforms, for instance, equipment and site to train the experiment, scientific research and innovation project etc.. It can bring the enthusiasm of students and put students into the innovation activities spontaneously. According to the content and characteristics of the experiment, it can be used for the training of experimental skills, the development of innovation ability and the improvement of comprehensive application ability. The experimental skill training can be carried out through the use of instrument equipment in the appointment and time opening laboratory. Meanwhile, by means of continuously renewing experiment contents, the skills can gradually improve. The development of innovation ability is that students can do some creative design projects in the independent innovation laboratory all day. Based on this, it can bring up students' interest in scientific research and stimulate enthusiasm and creativity. In the entrepreneurial team,

such comprehensive ability can be trained ,such as design thinking, innovation consciousness and scientific quality.

### *Teaching Staff Construction*

In order to ensure the quality and effect of opening experimental teaching, it is essential to choose experimental teachers to join the opening experimental project, which have strong sense of responsibility, wide knowledge and high level of experimental skills. In the university, there are a few of advanced studies and trainings to improve the professional level and overall qualities. In addition, it' s important to stimulate teachers' initiative by the strengthening of the incentive measures.

An opening laboratory management system based on network can not only simplify the process of opening and monitor the laboratory management, but also know the use of laboratory instrument and equipment. Due to lack of funds, the system has not been built.

## **CONCLSION**

Opening laboratory is necessary to reform the experimental teaching under the guidance of modern education concept. The independent experiment taking the advanced education as guidance, can enhance the interest and learning initiative. In order to cultivate specialized talents with practical and innovation ability, only opening laboratory is not enough. It also needs to further study the problems in the experimental teaching. At the same time, it requires managers to improve the opening laboratory management system. Finally, the undergraduate teaching laboratory needs to open for students as much as possible in the spare time.

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## **REFERENCES**

Li Guizhi et al (2010). Opening of the Laboratory for the Cultivation of Students' Innovative Ability. *Computer Education*, 7,101-103.

Wang Yunping (2010). Management of International University Laboratory and Its Revelation for Domestic Open Laboratory. *Experimental Technology and Management*, 27, 149-151.

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Jiang Jie (2009). Inspiration on the Multi-method for Teaching in British Universities. *Experimental Technology and Management*, 26(2), 175-177.

Qin Changming (2009). Survey on Construction of University Teaching Lab Opening Management System. *Research and Exploration in Laboratory*, 28(3), 138-144.

Wang Feng & Yu Jing (2011). Open Laboratory in Universities and Colleges and Fostering of Students' Innovation Ability. *Research and Exploration in Laboratory*, 30(3), 320-322.

Wang Guicai & Yang Jiumin (2011). On Laboratory Opening. *Research and Exploration in Laboratory*, 30(9), 317-320.

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