

# Exploration on Opening Model of Teaching laboratory under the Background of “Double First-class” Construction——Taking the Biochemistry Laboratory of Guizhou University as an Example

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**Abstract.** In the context of the construction of "double first-class" university, facing many problems existing in the biochemical laboratory of our university, it is necessary to increase the opening degree of laboratory in order to play an important role in cultivating innovative talents. According to the current teaching situation of biochemical laboratories, the author put forward the laboratory opening mode based on "basic-improvement" dual-level personnel training and discipline competition. At the same time, in order to ensure the smooth development of laboratory opening, the incentive mechanism of laboratory teachers has been proposed.

**Keywords:** Double first-rate; Biochemical laboratory; Opening model.

## 1. Introduction

The teaching of theory and experimental practice are important contents of higher education. As an important base of teaching, laboratory plays great role in cultivating students' practical operation ability, innovation ability and scientific research quality. The construction of "double first-class" is another national strategy in China's higher education field after the "211" project and the "985" project. In the construction of "double first-class", laboratory construction has an irreplaceable position obviously. In view of laboratory.

In view of laboratory safety considerations, biochemical laboratories in many domestic universities are mostly classified based on teaching and scientific research. The conflict between the time and frequency of teaching and scientific research laboratories has resulted in the unbalanced use of the two types of laboratories [1], resulting in idle laboratory resources, declining enthusiasm of teachers and students, and other problems. It is not conducive to the development of experimental teaching and the cultivation of students' practical ability and innovative spirit. In order to solve the problems existing in traditional laboratories and meet the current goal of training innovative talents, the opening of laboratories is imperative. At present, many schools have carried out relevant exploration and shared experience. The Biochemistry Laboratory of Nankai University has established a multi-level open management experiment teaching system based on three different levels of experiment content of "basic-comprehension-innovation" [2]. The practice of multi-level laboratory opening in Nankai University has proved that carrying out corresponding laboratory management according to the characteristics of experiments at different levels effectively solves the problem of the imbalance of teaching and research laboratory resources, improves the enthusiasm of students' hands-on ability, and realizes the sharing of teaching and research laboratory resources. Zhejiang University established the Biology Innovation Open Laboratory in 2010, aiming to cultivate the innovative spirit and ability of college students, which formed an urban operating mechanism including access system, drug management, instrument management, team management, etc. [3]. With the support of the Innovation and Open Lab, students of the school have completed a number of extracurricular science and technology competitions such as "Challenge Cup" National College Students' extracurricular academic science and technology Works Competition and "National College Students' Life Science Competition". In the open exploration, the Laboratory of Medicinal Botany of Liaoning University of Traditional Chinese Medicine put forward suggestions

to improve the participation enthusiasm of teachers and students, including school support and incentive system, etc. In this exploration, the construction of open experimental teachers is particularly important [4]. According to the implementation of national college students' innovation and entrepreneurship projects, Tianjin Normal University has built an open management model for biological laboratories, which mainly includes three levels: guarantee mechanism, operation mechanism and feedback mechanism. The biological laboratory open management mode of Tianjin Normal University can effectively cultivate the comprehensive ability of students' scientific research literacy, and is conducive to the integration and optimization of the allocation of educational and teaching resources [5]. The biochemical laboratory of Guizhou University still has the typical problems of the traditional laboratory. Based on the existing laboratory opening cases, we explored the opening mode and management of the biochemical laboratory of Guizhou university.

## **2. Status of biochemical laboratory opening**

### **2.1 No separate course for biochemical experiments**

The Biochemical Laboratory of our school mainly undertakes the teaching of undergraduate biochemical experiment courses, and undertakes the experimental teaching tasks of 13 majors and more than 800 students every year. At present, the biochemistry experiment course has not been set up independently from the biochemistry theory course, and it is still in a relatively primitive state. The experimental projects are all traditional projects, mainly including basic and confirmatory experiments on protein, sugar, nucleic acid, enzyme properties, etc., focusing on the verification of theoretical knowledge. The experimental project lacks the independent design thinking process, and the students' experimental process is often copy blindly. Due to the huge and complex curriculum system of biochemistry, it is difficult for students to learn, and the content of biochemistry experiments is complicated and there are many steps and links, so students generally do not have a deep understanding of the purpose and significance of biochemistry experiment courses.

### **2.2 Not enough for the biochemical laboratory**

At present, the laboratory is open in the form of open experimental projects, and open experimental projects are generally applied by experimental teachers. However, due to the fact that teachers in experimental positions focus on laboratory management and maintenance, the scientific research and innovation of open experimental projects are insufficient, students mostly choose open experimental projects due to the "second class" credit tasks, so the effectiveness in cultivating students' comprehensive scientific research literacy is insufficient. For example, a full-time teacher in the biological laboratory applied to the laboratory Equipment Department for an open experimental project - "The influence of high and low temperature on the stability of blueberry anthocyanins". After the project is reviewed and approved by the Laboratory Equipment Department, students can carry out the corresponding operation according to the established experimental purpose and experimental process after free selection. There are three problems exposed in this process. First, The management system of open laboratory is not systematic and comprehensive. Second, Old equipment and insufficient capital investment make it difficult to update the equipment. Third, The laboratory is set up according to the subject curriculum, which leads to the lack of openness of the laboratory and the lack of communication and integration of laboratories in various disciplines.

## **3. Laboratory opening mode**

In order to solve the problems existing in biochemical laboratories, it is the only way to increase the laboratory opening and explore the suitable laboratory opening mode.

### **3.1 Establish an opening mode based on dual-level personnel training**

According to the educational theory of teaching students in accordance with their aptitude, students have different efficiency in acquiring knowledge and skills. At present, under the traditional experimental teaching mode, students are required to complete the experiment within the allotted time (generally 4 hours). Some students cannot master the basic experimental skills, while others can quickly master the experimental skills. However, due to the huge tasks of experimental courses and the full schedule of laboratory tasks, there is no time for students who need to repeat the basic experimental operation or further improve their experimental skills, which seriously inhibits students' learning enthusiasm. At the same time, it results in the imbalance of laboratory use time.

Therefore, the laboratory opening mode can be constructed based on the two levels of "basic and improved". According to the students' mastery of basic experiments, teachers can set up "basic experimental projects" and "improvement experimental projects" in the free time of the laboratory. The former gives students a chance to master experimental skills again, and the latter provides students with a way to design experiments independently. The open mode based on dual-level personnel training is in line with the laboratory's personnel training objectives and can solve the imbalance of laboratory use time.

### **3.2 Establish an innovative and opening mode based on discipline competition**

Innovative talents are the most important strategic resources in the world today, and cultivating innovative and applied talents is an important content of university teaching personnel training. Various discipline competitions (college students' Innovation Project, Challenge Cup, CULSC, etc.) focus on innovative design, scientific practice and research exploration. Universities across the country encourage students to participate in various disciplines in order to achieve the purpose of cultivating innovative talents, among which the opening of laboratories is an important factor restricting the effectiveness of discipline competitions.

The laboratory based on discipline competition is open as a platform to support and help students to participate in various science and technology competitions as well as undergraduate science and technology innovation project activities at all levels. Students form teams based on competition projects, formulate research objectives and research plans, allocate tasks reasonably within the team, arrange tasks regularly, and engage in regular discussions. According to the process of discipline competition, the laboratory sets open objects, open hours and open venues.

## **4. Guarantee System for Laboratory Opening**

The increase of laboratory opening is bound to bring the risk of laboratory safety, and greatly increase the workload of laboratory teachers. The safety of experimental drugs and equipment is an important part of laboratory safety, and its related management has been mature and stable. How to improve the enthusiasm of laboratory teachers has become an important part of the sustainable development of laboratory opening.

### **4.1 The assistant management system of graduate students**

In order to improve the management ability and scientific research level of graduate students, they should be encouraged to actively participate in management and research assistance work. We can apply for part of the laboratory operation funds as a work-study subsidy, and arrange the work reasonably. There are three advantages of this method. Firstly, reduce the workload of the laboratory teachers, so that they can concentrate on the most important work. Secondly, ensure graduate students to receive systematic and comprehensive ability development and training. Thirdly, hone their willpower, enhance their comprehensive abilities, and prepare them for future employment.

## 4.2 Incentive mechanism

Reward was given in the form of calculating workload and scientific research points to stimulate the enthusiasm of teachers. For laboratory teachers who strictly manage the laboratory according to regulations and make the laboratory safe and stable operation, priority is given to evaluation and rating.

## 4.3 Feedback mechanism

The feedback mechanism is an important criterion. Through the feedback of students and mentors, problems can be found and solved in time, and the efficiency and safety of the laboratory can be improved. Some feedback channels can be set up, such as suggestion box, college wechat channel or official website feedback area. Students and mentors can provide feedback and suggestions through these channels, providing valuable references for laboratory improvement.

## 5. Summary

In the context of the construction of "double first-class" university, facing many problems existing in the biochemical laboratory of our university, it is necessary to increase the opening degree of laboratory in order to play an important role in cultivating innovative talents. According to the current teaching situation of biochemical laboratories, the author put forward the laboratory opening mode based on "basic-improvement" dual-level personnel training and discipline competition. At the same time, in order to ensure the smooth development of laboratory opening, the incentive mechanism of laboratory teachers has been proposed.

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