Open Access Library Journal
2021, Volume 8, e7119
ISSN Online: 2333-9721
ISSN Print: 2333-9705

# Research on the Laboratory Management Mode Based on the Optimal Allocation of Resources

**Bo Yang**

School of Finance and Economics Management, Sichuan University of Arts and Science, Dazhou, China
Email: 10355852@qq.com

**How to cite this paper:** Yang, B. (2021) Research on the Laboratory Management Mode Based on the Optimal Allocation of Resources. *Open Access Library Journal*, **8**: e7119.
https://doi.org/10.4236/oalib.1107119

**Received:** December 28, 2020
**Accepted:** January 18, 2021
**Published:** January 21, 2021



## Abstract

According to the conditions of laboratory management in colleges and universities, through the analysis on the current conditions and mode of the allocation of laboratory resources, this paper proposes a scientific management mode from the perspective of optimal allocation of resources. We should improve the efficiency of laboratory equipments, ensure the sharing of experimental resources to a greater extent, and effectively arouse the enthusiasm of experimental technicians, so as to promote the improvement of experimental teaching quality and provide the effective guarantee for the cultivation of excellent talents and the construction of "double first-class" universities in colleges and universities.

## Subject Areas

General Management

## Keywords

Optimal Allocation of Resources, Laboratory Management Mode, Laboratory Construction

## 1. Introduction

### 1.1. The Purpose and Significance of the Research

With the deepening of the reform of the higher education system, in the cultivation of talents, colleges and universities pay more attention to the cultivation of talents who adapt to the local economic development and have the practical innovation ability. The development of innovation ability is reflected in the link of practice education to a large extent. Establishing and improving the new mechanism of practice education are a new requirement for the connotative devel-

opment of colleges and universities [1]. The practice teaching plays an important role in developing students' innovative consciousness, innovative thinking and innovative spirit, develops students' ability to combine knowledge and skills, develops students' professional skills better, and lays a good foundation for meeting the social needs in the future. As the carrier of practice teaching, the laboratory is an important teaching base in colleges and universities [2]. With the increasing demands for innovative talents of the society, the practice education in colleges and universities has become more and more important year by year. The content of practice teaching has become diversified, and teaching means and methods have been further increased. However, from the perspective of the allocation and investment of educational resources in colleges and universities, the reform and management of practice teaching are still a weak link in the talent cultivation in colleges and universities and many improvements can be made.

Colleges and universities can integrate the existing practice teaching resources, optimize the allocation of laboratory resources, highlight the characteristic majors and dominant majors, and improve the teaching quality from the perspective of the major construction according to the demands for the cultivation of professional talents of different disciplines, which is the inevitable requirement for the connotative development of colleges and universities. By optimizing the allocation of existing laboratory resources, they can reasonably arrange the experimental teaching resources and strengthen the link of practice teaching. Through the integration of experimental resources, they can integrate the teaching resources of multiple disciplines and majors, explore a set of scientific and reasonable management mode, and promote the reform of teaching content, methods and means, so as to realize the diversification of students' knowledge and the improvement of innovation and practical ability. At the same time, in the current laboratory construction and management of colleges and universities, it is urgent to establish a scientific laboratory management system, further promote the standardized management of resources of practice teaching, optimize the allocation of experimental resources, and improve the degree of resource sharing.

### 1.2. Research Status at Home and Abroad

The book "Practical Laboratory Design", edited by Australian Rui Ferguson, did a more detailed research and analysis on the structure, facilities and equipments of the laboratory. "Laboratory Design and Construction Guide" written by Huang Jiasheng and Tan Jinchun also gives a comprehensive description of laboratory design methods. Most of these theoretical books focus on in-depth research on the location and structure of the laboratory, and pay little attention to the commonality and sharing needs of certain disciplines of experimental equipments. The focus of this article is how to improve the sharing requirements of experimental equipment on the basis of the existing laboratory construction, and optimize the allocation of experimental resources to the greatest extent.

## 2. Current Conditions of the Allocation of Laboratory Resources

### 2.1. The Efficiency of Allocation of Laboratory Resources Is Not High

Because there are many majors in colleges and universities, most laboratories are constructed to meet the demands of cultivation of the major. Each major will establish the laboratory with its own attributes and characteristics according to the demands of the cultivation of talents. The functions and management requirements of different laboratories are different, so the laboratory management in colleges and universities is generally based on the decentralized mode of schools and majors. Because the management of each laboratory is relatively scattered and independent, the level of management informatization is not high, and the degree of sharing of laboratory resources in different schools and majors is not high, which will lead to the waste of funds and equipments such as repeated construction of laboratories and repeated purchasing of equipments.

### 2.2. The Use Efficiency of Laboratory Resources Is Not High

For the decentralized management mode used in the laboratories, many colleges and universities adopt the mode of "who uses, who manages". The management and resource allocation of experiments is responsible by secondary schools. The major in the secondary unit is relatively single. Most laboratories of the major only serve teachers and students of the corresponding major, and cannot share the experimental equipments and resources with the teachers and students in the whole university. The opening degree of the laboratory is not high, which leads to the idleness of some equipments in the laboratory. The experimental teaching resources are not made good use of, so that the use efficiency of laboratory resources and the sharing degree of experimental resources are not high.

### 2.3. The Utilization Efficiency of Experimental Human Resources Is Low

Some colleges and universities lack a special work evaluation mechanism for experimental technicians in colleges and universities, which leads to the problems of unclear responsibilities, a low working efficiency and lack of working enthusiasm of experimental technicians. At the same time, there is no effective management mode and system in laboratory safety management, operation and maintenance, fund use and other aspects, resulting in the free allocation of resources, unscientific allocation of personnel and equipments, and a low utilization efficiency of experimental human resources.

## 3. Significance of Optimizing the Laboratory Management Mode

### 3.1. Reasonable Allocation of Experimental Equipments and Realize the Resource Sharing

Coordinating the experimental resources and reasonably planning and optimiz-

ing the management mode on the basis of the existing laboratory resources is an inevitable way to realize the resource sharing. According to characteristics of the discipline and the needs of experimental teaching and on the basis of completing the basic teaching tasks, the resources of similar teaching courses and laboratories with similar major directions should be integrated, the existing laboratories should be planned together, the resources of experimental courses should be allocated, and laboratories of similar majors and disciplines should be planned and built to serve teachers and students and teaching to the greatest extent and achieve a higher degree of resource sharing.

### 3.2. Improve the Use Efficiency of Resources and the Service Efficiency

The arrangement of traditional laboratory course teaching is generally based on the classes of each secondary teaching unit, and the teaching and use of the laboratory of the major under its management are arranged respectively. This method will lead to the unbalanced use of laboratory resources, and the use rate of laboratories in some majors is low, while experimental teaching resources have not been allocated to other teaching units that need to use experimental resources because they have no management and use authority of the laboratory. Therefore, we should break the traditional laboratory course arrangement system, ask a special department to coordinate the experimental resources of the whole university, manage the experimental technicians in a unified way, standardize the system, increase the opening time of the laboratories, give full play to the effectiveness of laboratory resources, and improve the service efficiency of the laboratory.

### 3.3. Define the Responsibilities of Laboratory Positions and Strengthen the Assessment Management

In order to ensure the efficient operation of the laboratory, we need an efficient management team, and the efficient team needs to be standardized by the system. We should define the position responsibilities of laboratory personnel, strengthen the measures for the management of performance assessment of laboratory personnel, give preference to laboratory technicians with high professional quality in terms of performance and treatment, optimize the laboratory management mode from the system, and fully arouse the working enthusiasm of laboratory technicians.

## 4. Thinking about the Management Mode of Laboratories in Colleges and Universities

### 4.1. Establish a Perfect Laboratory Management System and Framework

In order to effectively solve problems such as the separation of the laboratory management system, the inadequate allocation of resources and a low efficiency of personnel management, we should strengthen the macro management of the

laboratory at the university level, establish a special experimental center for the unified management of laboratories and equipments, coordinate the setting of relevant experimental courses in the whole university, make the appointment management for special laboratories, and open the laboratories to the whole university. According to the university's development direction and the overall discipline construction, we should integrate the scattered experimental resources, reasonably allocate the investment in experimental rooms, instruments, equipments, operation funds and others, and make the unified planning of the university at the macro level.

In terms of the laboratory management methods, the combination of the centralized laboratory management mode with the major disciplines as the platform for construction and the decentralized management mode with courses as the object can be used [3]. According to different methods, the university laboratory management mode can be divided into the Level-1 management system of school-experimental teaching center and Level-2 management system of school-department [4]. Taking the centralized experimental management mode as an example, through the experimental teaching center, with the common goal such as teaching research and scientific research cooperation as the purpose, the resources of many schools and departments are integrated, and a laboratory management framework with a complete systematic construction based on the platform of university departments is formed. Based on the field investigation of the laboratory setting in colleges and universities, a hierarchical subject experimental teaching center management model is proposed under the multi-level management system, which is jointly built and shared by the colleges and the schools, as shown in **Figure 1**.

### 4.2. Establish the Resource Sharing Mechanism and Promote the Effective Utilization of Resources

The construction of disciplines and the cultivation of talents need a lot of experimental instruments and equipments and experimental technologies, but it is difficult for a university to purchase equipments for all the departments and majors that need relevant equipments. Therefore, it is particularly important to integrate resources and promote the sharing of experimental equipments at the university level. The establishment of the experiment centers based on major disciplines not only promotes the interdisciplinary cooperation, but also improves the use rate of experimental equipments and the innovation efficiency of science and technology.

### 4.3. Standardize the Construction Process and Improve the Assessment System

In the decentralized management mode of laboratories, the construction of laboratories is based on the discipline construction and needs of the secondary schools. The secondary schools demonstrate and apply for the establishment of

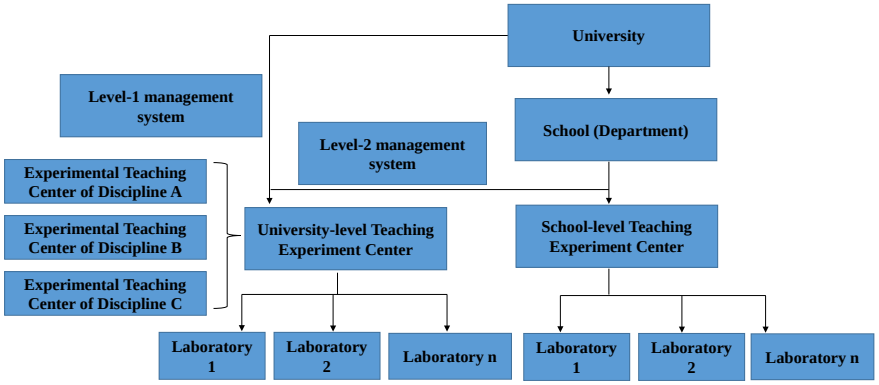


**Figure 1.** Management structure of laboratories in colleges and universities.

relevant laboratories, and then the university demonstrates from a macro perspective and decides whether the project for the construction is approved. In this process, the secondary schools may not fully understand the construction of other schools, and there may be repeated applications for construction by laboratories with similar functions and the same equipments, which is a waste of experimental resources and funds for the development and construction of the university. The reason is the information asymmetry and non-sharing between the secondary schools. Therefore, the approval of a new laboratory project requires the multi-party investigation. The laboratory to be established should have a clear discipline development direction, stable experimental teaching, scientific research technology development tasks, houses suitable, facilities and environment for the experiment, and relatively stable and reasonable laboratory staffs [5]. A registration system should be implemented for laboratories that have been built, and the items and contents of experiments that can be made should be published online for easy inquiry.

The standard construction and smooth operation of a laboratory need the scientific work standard and the perfect management system. In 2015, the Ministry of Education issued *the Key Laboratory Evaluation Index System of the Ministry of Education* [6]. According to their own school running orientation and discipline characteristics, colleges and universities can develop the relevant assessment system of laboratory construction, regularly assess the laboratories, master the real conditions of construction and use of laboratories, and adjust the construction direction and resource allocation according to the assessment results, so as to achieve the best use rate of the laboratory and improve the comprehensive use efficiency of the laboratory.

### 4.4. Set up Positions Scientifically, Determine the Personnel Allocation Reasonably and Optimize the Structure of Laboratory Staffs

The standardized and orderly operation of a laboratory and the safe and standardized operation of experimental equipments cannot go without professional experimental technicians. Laboratory technicians with the professional quality

play an important role in the construction and use of the laboratory. Any experimental equipment cannot play its role without the operation, use and maintenance of professional personnel. To enhance the construction of laboratory technicians is to improve the efficiency of use of experimental resources. Therefore, focusing on the development of professional skills of laboratory technicians, improve the construction of the team of laboratory staffs and optimize the structure of laboratory staffs is an important part of the laboratory management mode. Under the condition that the existing number of staffs is limited and it is difficult to increase, the management department of the laboratory should strengthen the team building of laboratory staffs through scientific position setting, regular training, etc. On the basis of the comprehensive consideration of factors such as size and type of experiment, the total number of instruments and equipments and service ability, more positions and number of staffs can be appropriately given to the key experimental technical positions [7]. The particularity of the experimental technicians can be considered in terms of professional title promotion, performance assessment, etc. The assessment system can be set up separately for them to solve the problems such as insufficient laboratory technicians and the lack of professionalism and enthusiasm.

## 5. Conclusion

Practice teaching is a very important part of the talent cultivation in colleges and universities. From the perspective of optimizing the allocation of resources, the development of the laboratory management mode suitable for the positioning and talent cultivation program in colleges and universities is the premise to ensure the quality of education and the key factor affecting the level of experimental teaching [8]. According to the discipline and major setting of the university, this article fully investigates, integrates similar professional experimental resources, and builds a university science, teaching and research system based on a set of hierarchical and layered laboratory management models. This model provides a set of scientific and practical, efficient and standardized laboratory management methods. At the same time, it has further discussed the establishment of mechanisms, standardized processes, and optimized structures; so as to promote the improvement of the experimental teaching quality and provide the effective guarantee for the cultivation of excellent talents and the construction of "double first-class" universities in colleges and universities.

## Fund Project

Education and Teaching Research and Reform Project of Sichuan University of Arts and Science (2020JY043).

## Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

## References

[1] Wei, W. and Hu, W. (2014) Innovation and Practice of the Experimental Teaching Management System in Colleges and Universities. *Experimental Technology and Management*, **31**, 130-132.

[2] Xu, S.D. (2014) Grasp the Principles and Rules and Do a Good Job in Laboratory Management. *Experimental Technology and Management*, **31**, 195-197.

[3] Xu, H.B. and Ren, W.X. (2010) Discussion about the Exploration of the Laboratory Management Mode. *Education Science & Culture Magazine*, No. 2, 182-183.

[4] Jiang, Z. and Wang, Y. (2017) Laboratory Management Mode from the Perspective of Optimal Allocation of Resources. *Experimental Technology and Management*, No. 7, 231-231.

[5] Wang, Y., Yuan, G. and Liu, J.X. (2017) Thinking about the Construction and Management of Laboratories in Colleges and Universities. *Experimental Technology and Management*, No. 3, 276-278.

[6] Yu, P. (2016) A Brief Introduction to the New Evaluation Index System of Key Laboratories of the Ministry of Education. *Education and Teaching Forum*, No. 27, 269-273.

[7] Li, X. and Liang, Q. (2015) Reform and Development of the Construction of the Laboratory and Engineering Team in Colleges and Universities. *Laboratory Technology and Management*, **32**, 5-8.

[8] Zhang, J.D. (2009) Discussion about the Construction of the Experimental Technical Team Suitable for Research Universities. *Journal of Beijing Jiaotong University* (*Social Science Edition*), No. 4, 96-99.