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# Practical Research on the Laboratory Management Model of Bar-Block Combination in Private Universities

Youwang Dai[1, a], Ziting Wang[1, b] and Fengnan Xiao[1, c]

[1]Experimental Center, Dalian University of Science and Technology, Dalian, 116052, China

[a]daiyouwang_hf@163.com, [b]1029725031@qq.com, [c]597507417@qq.com

## Abstract

**Aiming at the objective reality of limited experimental teaching resources in private universities, a laboratory management mode of bar-block combination was explored, through which some problems such as weak interdisciplinary, weak experimental management, and poor experimental teaching quality in the laboratory construction and management model of private universities can be solved. This model is used to scientifically plan laboratory construction, coordinate experimental teaching and management, and realize the sharing of experimental teaching resources. An open experimental education environment can be created for the cultivation of application-oriented talents, the effectiveness of experimental teaching in private universities can be improved.**

## Keywords

**Laboratory management; Private universities; Resource sharing; Application-oriented.**

## 1. Introduction

Private higher education is an important part of higher education, and the development of private higher education is the necessary way to implement popular education. With the transformation of private universities to application-oriented, cultivating diversified comprehensive application-oriented talents has become the focus [1, 2]. University laboratories are important places for teaching and scientific research, as well as a base for cultivating application-oriented talents, scientific and technological innovation. Experimental teaching exercises students' practical ability and innovative spirit, which is an important way to cultivate application-oriented talents [3-5].

Therefore, how to provide better guarantee of experimental conditions is an important issue to be solved in the construction and management of university laboratories. Dalian University of Science and Technology (hereinafter referred to as DLUST) is a private university focusing on training applied talents, which relies on the experimental practice system to provide basic guarantee for the training of applied talents. Based on the practice of DLUST in laboratory construction and management, the problems existing in the laboratory management mode of private universities and their corresponding countermeasures are analyzed.

## 2. Main Problems Existing in Laboratory Management of Private Universities

According to the survey, the laboratory management mode of private universities is mostly distributed mode, which belongs to various department. This management mode has the following problems: The first is that the specialty is fine and narrow, the laboratory is small and complete, and the function is single, which making it difficult to achieve interdisciplinary; The second is relatively closed, equipment utilization is low, and resources cannot be shared[6, 7];

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The third is the lack of overall planning, multiple similar laboratories may be built, which Leads to duplication of construction problems; Fourthly, due to the limited number of experimental personnel, it is not conducive to unified management, equipment maintenance is prone to shortcomings[8]. At the same time, the dispersion of the experimenters and the single work content are not conducive to the improvement of their professional ability.

The above-mentioned problems seriously restrict the construction and development of university laboratories, and affect the utilization of superior conditions of universities and the improvement of the quality of student training. How to innovate the laboratory management mode, scientifically and rationally coordinate the experimental teaching resources, and how to better provide an experimental and practical teaching platform for the cultivation of application-oriented talents [9, 10], which are very urgent issues facing private universities.

Based on this, DLUST changed the previous management mode of laboratory belonging to each secondary school, integrated the laboratory resources of the whole school, and carried out the exploration and practice of combined laboratory management mode.

## 3. Laboratory Management Model of Bar-block Combination

### 3.1. Laboratory Management System of Bar-block Combination Was Established, Which Promoted Scientific Laboratory Management

The laboratory management architecture is shown in Fig.1, an experimental center was established in DLUST to optimize the integration of laboratories in the school's engineering, management, literature, law, and art disciplines. The experimental center carries out unified planning, construction and management of basic, professional and comprehensive laboratories according to the development of disciplines, which making laboratory construction and management scientific, and playing a unified and coordinating role of "bar".

The experimental center has seven subject sub-centers, namely, mechanical engineering, electrical engineering, transportation, digital technology, economics management, design art and basic department. Sub-centers carry out laboratory planning and construction according to the subject development needs of the corresponding secondary colleges, and implement the management role of "block".

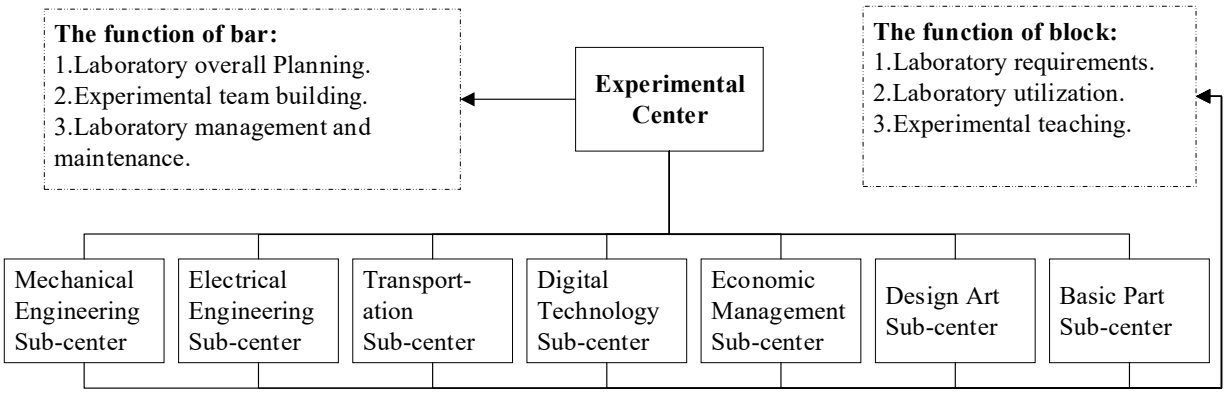


**Figure 1.** Laboratory management system of bar-block combination

The combined laboratory management model makes the laboratory move from decentralized block management to a combined management model of overall planning, which is conducive to the construction and development of the laboratory and the optimal deployment of experimental teaching resources.

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### 3.2. A Full-time Experimental Technical Team Was Established to Coordinate Experimental Management and Teaching

The unified deployment of experimental equipment resources highlights the shared advantages, and the reasonable construction of the experimental technical team can better play the role of human [11, 12]. Adopt the talent construction plan of "bring in, go out" to establish a full-time experimental technical team for the whole school. Each major is equipped with full-time experimental technicians to perform laboratory management, experimental teaching operation, and maintenance of experimental equipment. They complete experiments, internships and training tasks together with professional teachers.

The construction of a full-time experimental technical team forms the characteristics of "Three Ones": The first is the transformation of management tasks, from a model where experimental teachers are only responsible for single management to a model where experimental training teaching and laboratory management are both shouldered; The second is the transformation of teaching tasks, from the experimental teacher only instructing in-class experiments to a three-task model of instructing in-class experiments, internships and extracurricular open experiments; The third is the role change, from single (teacher) to a multi-functional (teacher and engineer, teacher and technician), and insist on cultivating the "craftsman spirit"[13]. The construction of full-time laboratory technical team improves the overall quality of laboratory technicians, and also contributes to the scientific management and utilization of the laboratory.

### 3.3. A Comprehensive Application-oriented Talent Training Platform with "Three Excellent and One High" Was Built

In order to cultivate application-oriented talents with strong comprehensive ability, the experimental center has adopted the construction goal of "three excellent and one high". That is, to create a high-quality experimental teaching environment with a complete range of disciplines, especially the construction of high-level laboratories in cooperation between schools and enterprises; To build an excellent experimental teaching team with industry engineering background, which has specialization and multiple abilities; To build an excellent, fully open education environment, which is opened to students of different grades and disciplines; To build a high-level practical teaching platform. Through first-class open resources and scientific management, it provides strong conditions for cultivating more comprehensive application-oriented talents [14-16].

## 4. Innovative Benefits of Laboratory Management Model of Bar-block Combination

### 4.1. Laboratory Construction Is More Reasonable

Laboratory management model of bar-block combination follows the principle of "mainly constructed by school, integration of unity and division, mainly used by second-level colleges, and resource sharing", and explores a laboratory operation mechanism that integrates construction, use and management. In recent years, a total of 103 laboratories had been established at different levels in accordance with the national talent training requirements and the needs of professional development, which including basic, professional, comprehensive laboratories, school-enterprise co-construction laboratories, and new engineering experimental training centers, etc. It reaches a larger scale and covers a wider range of disciplines.

### 4.2. Better Utilization of Laboratory Resources

According to the teaching plan of the academic year, the experimental center arranges experimental courses uniformly for different colleges and majors. Except for highly specialized

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laboratories, most laboratories open experiments for different majors and students. For example, the Microprocessor Lab used to conduct experiments only for 4 majors in the School of Electrical Engineering, but now it can also conduct experiments for 18 majors in the School of Mechanical Engineering, the School of Transportation, and the School of Digital Technology at the same time. Centralize the overall planning of experimental teaching resources, and solve the limitation of the independent construction and management of the laboratory belonging to each second-level college. Achieve the sharing of laboratory resources, improve laboratory utilization, and maximize the benefits of experimental resources.

### 4.3. Application-oriented Talent Training Has Achieved Good Results

Experiment management and teaching serve the training of application-oriented talents. The experimental center advocates teaching students in accordance with their aptitude, and builds a fully open platform for students of different majors in grades one to four, so as to form an open mode of organic integration of "time, place, inside and outside class". Activities such as "University Student Science and Technology Innovation Competition" and "Laboratory Open Project Competition" were organized every semester. In the past three years, a total of more than 2,000 students had participated in those projects, the number of applications for the projects had reached more than 300, and it had been increasing year by year at a growth rate of about 10%. The experimental center coordinates the deployment of laboratory resources to open after class, at present, the open places have gradually expanded from professional and comprehensive laboratories to school-enterprise co-built laboratories, campus incubation bases, etc, which provides strong support for cultivating students' comprehensive application capabilities and innovation capabilities. In recent years, through the extracurricular open of the laboratory, a number of innovative and entrepreneurial projects had emerged and won provincial, ministerial and national awards, which laid a solid foundation for future employment of students.

## 5. Conclusion

In the case of limited experimental resources in private universities and incompatible with the requirements of application-oriented transformation, laboratory management model of bar-block combination highlights its advantages: larger laboratory scale and wider subject coverage; Sharing the experimental teaching environment and resources, coordinating and optimizing the reasonable allocation of teaching resources such as human, financial and material. The seamless combination of overall planning and block management can achieve efficient staffing and maximize the utilization of experimental equipment. Thus, really builds a dynamic and high-efficiency laboratory management mechanism, so as to provide more adequate conditions for the training of application-oriented talents in private universities, which has a good value for promotion and reference.

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