

## Exploration on the Fully Open Laboratory Management Model Oriented to Independent Colleges

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**Abstract:** This paper focuses on the analysis of how to do a good job in opening and innovating the laboratory based on the fully open laboratory management model, mainly from improving the level of experimental teaching, solving the current lack of experimental basic teaching and innovation to achieve the intermediate bridge, exploring a practical teaching system oriented to independent innovation, thus effectively solving the pain of disconnection between basic experiment and innovation, so that students can establish active innovation, awareness and initiative. Through the application in control disciplines, good results have been achieved.

### 1. Introduction

With the further deepening of the reform of the management system of higher education, the reform of the teaching content and curriculum system in the 21st century, the further expansion of the scale of higher education, and the change of the employment system and concept of graduates, all of these mean that the mode of higher education is undergoing a profound change, which gives the laboratory work of higher education institutions. Work in laboratory has played an increasingly important role in achieving the goal of school personnel training [1-4]. According to the requirements of the Ministry of Education's "Evaluation Index System of Teaching Level in General Colleges and Universities", the proportion of courses offered in designing and comprehensive experiments should be more than 80%. At the same time, the scope, time, content and coverage of laboratories to students should be assessed. It has become the top priority of all disciplines to carry out the innovation-oriented reform of the experimental curriculum system, and take the construction of innovative experiments as the grasp, drive the new mode of practical teaching and education in this discipline, stimulate students' creativity and cultivate students' creativity. In order to do a good job in opening and innovating laboratories and improve the level of experimental teaching, colleges and universities have taken corresponding measures [5-8]. At present, the research is focused on how to innovate, and how to solve the problems in the implementation of innovation. There is a lack of intermediate bridge between experimental basic teaching and innovative realization, and there is a phenomenon of disconnection or rootlessness in the implementation. This topic will explore a practical teaching system of control subjects oriented to independent innovation [9-10]. It will effectively solve the pain point of disconnection between basic experiment and innovation realization, so that students can build up the consciousness of initiative innovation and the ability of initiative innovation.

### 2. Fully Opening Laboratories to Enhance the Viscosities to Students

#### 2.1. Actively Open Laboratory Sites, Equipment and Instruments and other Fixed Assets.

In order to attract students to enter the laboratory, teachers can encourage students to carry out innovative design experiments by identifying comprehensive and design-oriented optional experimental subjects other than the teaching plan. Teacher only give experimental purposes, students can choose experimental subjects according to their own interests and hobbies, and complete the project design independently in extra-curricular time, which is approved by the

instructor. In the experiment, students must independently complete the installation and debugging of the test device, complete the experiment and write the experiment report. This kind of experiment is mainly designed to strengthen the training of basic experiment content and improve students' experimental skill quality.

Through the active opening of the laboratory and the corresponding experiments set up on their own initiative, the students' interest in the laboratory has been enhanced. At the same time, the students' consciousness of arranging the study independently is preliminarily cultivated by doing the experiments according to their own time arrangement.

## **2.2. Fully Satisfy Students' Initiative in Small Innovations.**

As educators, students should be fully satisfied with any innovative ideas, and as experimental instructors, they should actively provide experimental environment. According to the content of theoretical classroom, in order to observe certain phenomena or verify some assumptions, students can design and realize experimental projects with certain research and development purposes. On the one hand, they can determine experimental topics by themselves according to the conditions of instruments and equipment in the laboratory, on the other hand, they can also draw up scientific and technological activities topics according to their interests, or they can combine the direction and direction of the laboratory. Conditions, contact the corresponding laboratories and instructors to carry out small inventions, small production, small papers and other experimental activities. Either way, students must think independently, consult relevant documents and materials, synthesize various knowledge and skills, analyze, design and debug the experimental system without any restrictions on the experimental equipment and operation link. These active explorations have accumulated the step from foundation to innovation, and are the practical teaching entities oriented to initiative innovation. In this department, we should cherish and guide the spark of innovation.

## **2.3. Invite Students to Participate in Teachers' Scientific Research Activities in Depth.**

Actively attract students to participate in teachers' scientific research activities, so that students can be exercised and improved in teachers' scientific research projects. As the carrier of social service in colleges and universities, scientific research itself has advanced technology and advanced theory, which undoubtedly has a natural attraction for students. Teachers' scientific research activities are divided into several operable experimental projects and experimental requirements are put forward. Under the guidance of teachers, students can collect relevant experimental data, formulate experimental programs and carry out experimental research. This process is a very good process from foundation to innovation. A complete process from purpose, background, method and implementation is summarized. It not only plays a positive role in the completion of studies, but also has far-reaching significance for active innovation.

Through the above three forms, students are interested in the laboratory to rely on, and the laboratory also enhances the viscosity of students. As the most important place of practice in the teaching of science and engineering students, laboratories should actively explore more effective practical teaching mode.

## **3. Bridges between Foundation and Innovation through Reconstruction**

There is a big gap between basic knowledge and innovative thinking, and the laboratory is the best filling assistant. Active innovation-oriented practice teaching mode builds a bridge between foundation and innovation through the interaction between laboratory and students.

### **3.1. Reconstruction of Experimental Equipment to Enhance Students' Practical Ability.**

At present, most of the experimental equipment in colleges and universities are teaching-oriented. Students can acquire basic knowledge by completing experimental projects on the equipment. Active innovation oriented practice teaching mode can make full use of experimental equipment to make the equipment open to students, that is, students can disassemble experimental equipment, and independently complete some parts or hanging boxes in the equipment, which is especially suitable

for engineering experimental projects, such as electrical or mechanical. The first step is to fully understand the experimental instruments by disassembling them, which is very helpful to deepen the theory. The second step is to partially reconstruct the core components of the experimental equipment, i.e. to copy some of the core components. On the one hand, the understanding of basic knowledge is deepened; on the other hand, it also enhances the students' practical ability. In addition, if we can put forward improvement measures on these aspects, it will arouse the fire of innovation. Flowers have achieved the goal of guiding students to innovate.

### **3.2. New Construction of Experimental Equipment.**

Because of the problems of site and fund, the teaching experiment equipment has great limitations. The practice teaching mode oriented to initiative innovation can let students design experiment device and debug it according to the experiment content. The laboratory provides necessary site, instrument and guidance. After all, the laboratory equipment is limited. For experiments that cannot be verified or observed, students should be encouraged to develop and implement some of the experimental equipment by themselves. In this way, not only the experimental content can be enriched, but also the students' practical ability can be improved, and the students' innovative ability can be cultivated. At the same time, students' interests can be understood and teaching work can be carried out according to local conditions.

### **3.3. New Construction of Experimental Content.**

With the rapid development of modern science and technology, practical teaching cannot remain unchanged. Active innovation oriented practice teaching mode should adjust the content of experiment in real time according to students' interest points, increase students' interest, divergence and comprehensive experiment, increase students' opportunity to do it, and improve students' ability to do it and innovate. The new experimental content should not be confined to the knowledge framework of textbooks, but should be anchored to the technological frontier and applied; moreover, the new content should be as much as possible to enhance selectivity.

Active innovation-oriented practical teaching mode makes use of the interaction between laboratory and students, which enables students to complete the leap from foundation to innovation by disassembling and assembling experimental equipment, duplicating core components, designing new equipment and new content, etc. It is worth further research.

## **4. Break the Barriers to Achieve the Integration of All Departments**

Because of the limitation of knowledge, students generally only pay attention to the content related to the curriculum after entering the laboratory, which inevitably forms an island of knowledge or concept. The practice teaching mode for initiative innovation will expand the content of the whole curriculum system to students at the same time, and integrate the contents of relevant courses, so that students can form a closed-loop concept.

### **4.1. Explaining Concepts from Point to Area.**

Engineering courses are generally inherited, so it is inevitable to learn a concept or knowledge point separately, resulting in partial generalization and incomplete understanding. Active innovation-oriented practical teaching mode requires that when explaining a concept, the content related to the concept should be open at the same time, knowledge points should correspond to each other, forming a situation of "point-to-point" and "face-to-face" so that students can apply what they have learned. It will not only understand the current concept, but also have a deeper understanding of the whole curriculum system, which will help to broaden the horizon of the curriculum.

### **4.2. Linking up to Create the Concept of Closed-Loop Curriculum.**

The teaching of knowledge points is independent, but the curriculum system of knowledge points is interlinked. The practice teaching mode for initiative innovation always reminds students of the position of knowledge points in the whole closed-loop curriculum system, enables students to

view the current knowledge points from the height of the entire curriculum system, and deepens the concept of closed-loop through a large number of comprehensive experiments, which is of great benefit to the cultivation of high-level talents.

#### **4.3. Integration is the Only Way to Innovate.**

The concept of the whole curriculum system has been clear, the concept of closed-loop has been formed, and it has the basis of integration and innovation in the current system. It can guide students and prepare conditions to help students develop or research. Through the above three steps, an experimental environment oriented to initiative innovation will eventually be formed, which can not only make full use of laboratory instruments and equipment, but also help students build a bridge between basic knowledge and innovation, and eventually form a positive and innovative learning environment.

### **5. Key Elements of Sustainable Development**

#### **5.1. Institutionalization.**

Safety is the top priority of laboratory construction. Due to the lack of experience of experimental instructors in managing large-scale equipment and preventing injury accidents, the implementation of safety system should always be guaranteed in the process of laboratory construction. According to their respective research fields, detailed rules should be formulated for the storage, storage, maintenance and archives of instruments and equipment; management of toxic and dangerous drugs storage in laboratories and operation of large instruments with dangerous factors should be strengthened; specific safety emergency plans should be formulated; and safety awareness education in laboratories should be strengthened.

#### **5.2. Teachers' Team Building.**

The practice teaching mode oriented to initiative innovation can be guided by experts, but in order to ensure the long-term development of laboratories, it is necessary to select excellent teachers with both ability and moral integrity as innovative laboratory teachers, establish the mechanism of teachers' introduction, cultivation, training and corresponding incentive system, provide broad space for teachers' professional growth and ability improvement, and help teachers to establish innovative ideas. We should attach great importance to the cultivation of students' innovative spirit and practical ability.

#### **5.3. Construction of Theoretical System.**

Active innovation-oriented practical teaching mode is a new thing. Its operation mode under the current curriculum and teaching material system needs to be clear. Its role in the process of cultivating innovative talents needs to be positioned. How to use and protect students' research results needs to be studied. All these require us to constantly strengthen and improve the theoretical system construction of innovative laboratories. In order to ensure the sustainable and healthy development of the active innovation model, it is also essential to establish a complete curriculum and textbook system.

### **6. Conclusion**

According to the implementation process of fully open experimental teaching mode and the actual situation of curriculum and laboratory equipment and instruments, the course is divided into basic knowledge part and self-learning application part. In the reconstruction stage, experimental equipment such as testing technology, motor and drag is selected for equipment reconstruction, equipment reconstruction and content reconstruction. In the integration innovation stage, the whole course system is integrated and designed. The closed-loop system composed of controllers,

actuators, sensors and control objects produces positive responses among students of electrical and control categories, and the overall teaching effect has been significantly improved.

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