



REVIEW

Integration and Optimization of Railway Engineering Laboratory Resources under the Background of "Double First Class"

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ABSTRACT

With the continuous development of China's social economy, it has correspondingly promoted the development of the railway engineering experimental career, and has made tremendous progress in the cultivation of railway engineering experimental talents. At the same time, there are still many problems in the development of rail transit in the construction of "double first-class". Only by solving the existing problems can we further promote the smooth development of the training of railway engineering experimental talents. Therefore, the article mainly analyzes the problems and countermeasures of railway engineering experimental training, combined with the status and role of laboratories in the training of talents under the background of "double first-class", according to the society's demand for first-class engineering talents, we reformed and explored laboratory resource integration and optimization.

1. Introduction

At the end of 2015, the State Council issued the "Overall Plan for Promoting the Construction of World-Class Universities and First-Class Disciplines" (hereinafter referred to as the "Construction Plan"). The "Construction Plan" emphasizes that the foundation of colleges and universities lies in the establishment of virtue to cultivate first-class talent Universities can be called first-class universities. "Double first-class" construction universities should have high-quality undergraduate education and postgraduate education, optimize the allocation of subject resources and overall layout, and implement the fundamental goal of establishing a virtuous

person. The "Construction Plan" highlights the cultivation of people in the "double The core position in the construction of "first-class". High-quality laboratory resources play a key role in the construction of first-class undergraduate education and the improvement of talent training ability. Colleges and universities comprehensively improve the comprehensive benefits of teaching laboratories, integrate and optimize teaching laboratory resources is an important means to promote the construction of "double first-class". The railway engineering major is a traditional engineering major with strong practicality. With the development of practical engineering in the direction of high, large, difficult and complex, in the face of rapid development of new technologies, new equipment and new theories, society

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has put forward higher requirements for railway engineering professionals. As an important platform for cultivating students' practical ability, practical ability and innovation ability, the laboratory provides high-quality composite talents to the society, which is the key content of the "double first-class" construction work of colleges and universities^[1].

The Railway Engineering Laboratory of Central South University relies on the National Engineering Laboratory of High-speed Railway Construction Technology and the Key Laboratory of Heavy-Duty Railway Engineering Structure of the Ministry of Education. Its railway engineering professional training goal is to cultivate the master theory and basic knowledge of civil engineering and transportation. Obtain basic training of civil engineers, with basic engineering practice ability, can be used in domestic and international rail transportation (including: high-speed railway, ordinary speed railway, heavy-load railway, railway engineering experiment (including subway, light rail), urban and suburban rail transportation), Road engineering, bridge engineering, tunnel and underground structure engineering and other departments engaged in planning, design, construction, management and scientific research are applied, including complex and innovative senior civil engineering professionals. We aim at the problems existing in the construction of laboratory resources, combined with the construction experience of the Railway Experimental Center, put forward the exploration direction of laboratory resource integration and optimization, and promote the construction of "double first-class"^[2].

2. Analysis of the Current Situation of University Laboratories

2.1 Experimental Technical Team Urgently Needs to be Built

Only a first-class experimental team can build a first-class laboratory, but universities generally do not pay enough attention to experimental series^[3]. The phenomenon of emphasizing theory over experiment is common in colleges and universities. Experimental technicians belong to the series of "non-full-time" teachers. As assistant teachers, their labor relations are mostly "talent dispatch" and "labor dispatch". The age structure of the personnel of the experimental technical team is unreasonable, the aging is serious, and the reserve young force is insufficient. The level of the experimental technical team is low, and the lack of experimental personnel with a doctorate degree hinders innovation in the experimental teaching process and affects the improvement of teaching quality. It is difficult to promote the experimental technical team, and the

low salary is an urgent problem to be solved in the context of the "double first-class" construction. In colleges and universities, most of the titles of laboratory personnel are deputy senior and intermediate titles, and there are no regular senior experimenters in some of the series of laboratory personnel. Compared with full-time teachers, the experimental staff with the same professional title is relatively low. The cost of the same class hours is about half of that of full-time teachers, and the work happiness is not strong.

2.2 The Teaching Methods of Experimental Courses Are Backward

The experimental teaching involved in the railway engineering specialty includes the gauge and level measurement experiment, the rail wear experiment, the rail joint resistance experiment and the floating slab track isolator experiment. The experimental teaching link adopts the traditional teaching method, that is, the experimental teacher introduces the experimental principle and after the demonstration of the experimental operation, the students "painted the calabash", which led to the students' insecure grasp of the experimental content. The experimental courses are mostly opened in the middle and late stages of theoretical teaching and rarely set up separate courses. All experimental courses are completed at once. The "bridge" between the theoretical part and the experimental part is not smooth, and the cultivation of students' practical ability and innovative thinking is limited. In the current engineering development background, big data, BIM technology, Internet, artificial intelligence, etc. have been applied in the field of railway engineering, but the teaching content and methods of experimental courses rarely introduce new technologies and methods to meet the development needs of the engineering field and the purpose of "new engineering" talents^[4].

2.3 Chaotic Management Model

The three-level management model of school-faculty-department (institute, teaching and research department) is a more traditional management method, which is easy to cause a single discipline and less interdisciplinary integration, which is not conducive to the comprehensive development of disciplines. During the operation of the laboratory, the distinction between the undergraduate teaching laboratory and the scientific research teaching and research department is not clear, and the safety, hygiene, and equipment operation of the scientific research laboratory cannot be guaranteed. The utilization rate of laboratories and equipment for undergraduate experimental teaching is

low, and it is only open for the corresponding experimental courses. The update speed of experimental equipment is slow, and the measurement data has errors, which is difficult to meet the needs of experimental teaching.

3. Construction of High-Quality Laboratory Teaching Resources

3.1 Construction of Experimental Technical Team

The resources of the Railway Engineering Experimental Center and the Railway Engineering Experimental Center adhere to the "people-oriented" rational allocation of center personnel, optimize the structure, improve quality, and stabilize the team^[5]. Adopting the method of "full-time, part-time and employment", encourage high-level full-time teachers to enter the laboratory and strengthen the training of experimental staff. Improve the hiring and evaluation of laboratory technicians through fixed-post establishment, open recruitment, competitive employment, and performance-based evaluation. Specific assessment indicators include laboratory use and management, work performance, and laboratory safety and environment, with weights of 40%, 30%, and 30%, respectively. All newly-entered experimental technicians have master's degree and above, and all graduated from key universities. Some special experimental projects are best to require the graduation of famous foreign rail transit universities. The labor contract in the first contract year is in the form of talent dispatch. You can transfer to a full-time experimental compilation if you get two excellent and one good assessment results. The formation of a new type of experimental teaching team led by high-level professors, theory teachers, experimental teachers, and graduate teaching assistants, with a stable core backbone and skilled experimental technology.

3.2 Optimization of Teaching Methods of Experimental Courses

The railway engineering major is a major combined with engineering practice. The experimental course teaching is an important link to consolidate the theoretical basis, broaden professional knowledge and cultivate practical innovation ability^[6]. The experimental course achievement assessment is free from the experimental report as the only evaluation index. The achievement is composed of three parts: the pre-class preview report, the experimental actual operation performance and the experimental summary report, which stimulates the students' initiative and interest in the experimental course. Reasonably arrange the class time of the experimental course, do not stick to

the way that the theoretical class is in front of the experimental class, and succeed in building a "bridge" between theory and practice. Railway engineering education based on the background of "new engineering" fully relies on the advantages of scientific research and school-enterprise cooperation in railway engineering disciplines. On the one hand, it combines the latest scientific research results with experimental classroom teaching. The Key Laboratory of Railway Engineering Structure of the Ministry of Education and the Virtual Simulation Teaching and Experiment Center of Civil Engineering of Central South University introduced new technologies and new methods into the experimental teaching link; on the other hand, the railway engineering major of Central South University has the extensive project cooperation established by the company, railway bureau, subway company, etc., can display the data and site conditions of each base in the experimental class through network video^[7].

3.3 Optimization of Laboratory Management Methods

The Railway Engineering Experimental Center divides the laboratory into an undergraduate teaching laboratory and a scientific research laboratory, and each experimental course corresponds to an experimental teacher. Due to the scattered and unconcentrated class time of undergraduates, in addition to the normal class hours, undergraduates can also make appointments to supplement and consolidate experiments. The laboratory management model has changed from passive closed to autonomous open. The National College Students' Innovative Experiment Program focuses on the "research process" and uses high-quality laboratory resources in the project topics, which not only improves the utilization rate of laboratory equipment but also provides protection for the project implementation, and stimulates students' innovative thinking and innovative awareness. The cost of renewal of experimental equipment is mainly borne by special funds for improving basic school running conditions. Schools, colleges and departments jointly bear the cost of equipment maintenance and experimental consumables, ensuring everyone's participation and hands-on^[8].

4. Conclusion

We mainly analyzed and studied the problems and countermeasures for the training of railway engineering experimental talents. Through the discussion of the article, the training process of railway engineering experimental talents should be combined with the current actual situation and adopt targeted training strategies. Only then can

we further improve the quality of railway engineering experiment talents and promote the sound development of railway engineering experiments. Under the background of "double first-class" construction, the quality of talent training has received widespread attention from the society, and laboratories are an important base for training high-quality talents. First-class laboratories provide guarantees for training first-class talents. Taking the Railway Engineering Laboratory of Central South University as an example, reforms and explorations in the integration of laboratory personnel, experimental teaching methods, laboratory management models, etc. are aimed at establishing first-class laboratory resources and cultivating both engineering practice ability, innovation ability and High-quality compound first-class talents with international competitiveness promote "double first-class construction."

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