

Plan, Construction and Application of Railway Training Base

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Abstract. Under the background that the speed of railway is greatly improved and railway transport lines become increasingly busy, students from our university have encountered numerous difficulties in field practice and the quality of practice teaching is restrained by objective conditions. In order to solve these problems, our university plans and constructs high quality railway training base which covers all professional fields in railway by combining physical objects with stimulation ones. In order to make full use of railway training base in practical teaching, several measures are taken to ensure teaching quality, such as adapting delicacy management and employing front-line technicians. Besides that, the application of training base is greatly promoted from four teaching aspects. In 2015, the number of interns who learnt in the training center was over 5500, which achieves good teaching effects. The plan and construction of railway training base is a successful trial in our development into a well-known featured university in China.

1. Necessity of constructing Railway Training Base

In current situation, university students always have weak engineering practice capacity and social adaptability[1], which is the short plank in our national advanced education. In order to improve the quality of advanced education, Ministry of Education has issued documents No.1 and No.2 in 2007, which stresses that advanced schools shall strengthen practical teaching reform, focus on students' practice capacity and innovation spirit and improve quality of students[2,3]. In "the National Outline for Medium and Long-term Education Reform and Development (2010-2020)", it is proposed that "students' participation in scientific researches shall be supported and practical teaching shall be strengthened"[4]. It has become an important way to further improve quality of talents by strengthening practical teaching and students' engineering practical capacity[5,6,7].

Shijiazhuang Tiedao University has clear railway features and the major settings and future jobs of graduates are mainly about railway construction and transportation. Therefore, in order to equip students with common sense and professional knowledge of railway, according to training plan, students of all majors are arranged with internships and experiments related to railway in practical teaching. In the past, to finish railway internship tasks, instructors always led interns to railway field or related enterprises. In recent years, in order to further improve teaching quality, our university pays much attention on practical teaching and proposes higher standards for practical teaching quality. Facing new requirements, traditional railway internship cannot totally meet the development of current education. The main problems are as follows:

(1) With rapid development of national railway technology, the railway speed has been improved for six times. The speed of common railway train has reached 200km/h and the speed of high speed railway train has achieved 350km/h. With railway lines becoming increasingly busy, there is great potential safety hazard for students' internship in railway field.

(2) Railway transportation has strict requirement for related work because any negligence or mistakes may cause serious accidents. However, the internship of students in the railway field may disturb normal work of front-line workers, which may further affect safe operation of railway

transportation.

(3) For the specialization of railway transportation, students can only observe key equipment from remote-distance, such as traction power supply devices, railway signal devices and operational control devices, instead of operating them in person. The knowledge obtained from field internship is limited and the effect is not so good.

(4) For the limitation of running time schedule, students cannot be provided with large-scale line maintenance and adjustment internship opportunities, which mean that the internship of operating various maintenance tools is affected.

In order to solve all existing problems in railway internship, our university provides a proposal of building railway practical training base in engineering training center. Starting from 2010, the planned construction has been completed basically and implemented in practical teaching, which achieves good teaching results. In order to construct good railway practical training base, our university has founded railway practical training base team, which is consisted of State-owned Assets, Academic Affairs, Engineering Training Center, leaders and professional teachers from various colleges with deputy president who is responsible for teaching management as the team leader. With the special team responsible for plan and construction of railway practical training base, the construction efficiency is improved and the quality is guaranteed.

2. Overall Plan of Railway Practical Training Base

The overall plan is the foundation for constructing railway practical training base. Before preparing overall plan for railway practical training base, the team shall organize engineering training center and various teaching institutes to make a list of internship and experiment projects to determine specific teaching demands of railway practical training base. Then the team will organize related workers to have investigation in railway universities and railway transportation companies. On the base of work below, together with repeated validation, the overall plan of railway practical training base is made. In order to meet the demands of practical teaching, the following guidance is proposed in the preparation of overall plan for railway practical training base:

(1) The construction of railway practical training center is aimed to meet railway internship demands of students from various majors. Meanwhile, it also contributes to experiments for some courses and scientific researches of the staff.

(2) The construction of railway practical training base shall cover all major areas and the technology level shall keep up with or even a little ahead of current main railway technology.

(3) The construction of various practical training rooms and fields shall be conducted by combining physical objects with stimulation ones. The physical objects shall copy the ones used in railway field as much as possible.

(4) In order to have convenient practical training and be harmonized with practical training equipment, there shall be enough space for various training rooms and equipped with multimedia teaching devices.

(5) Various training rooms and fields shall be concentrated as much as possible, which will be convenient for the shift among different internship content and the general management of railway practical training base.

According to overall plan, it is planned to build 9 training rooms and 5 training fields in railway practical training base. The 9 training rooms include traction power supply practice room, control room between stations and sections, high-speed railway training room, railway signal stimulation room, bogie model exhibition hall, vehicle model exhibition hall, railway bridge safety monitoring training room and vehicle stimulation driving training field. The 5 outdoor practical training field includes railway bridge training field, vehicle training field, railway line training field and measurement training field.

3. Construction of Railway Practical Training Base

According to the overall plan of railway practical training base, the main construction has been

conducted as a three-phase project since 2010, which establishes a system-completed modern training platform for students' railway internship.

During the first-phase railway training base construction, railway line training field and vehicle training field has been completed. In the railway line training field, there are ballast tracks and ballast-less tracks. In the vehicle training field, there are diesel locomotive and box wagon and it is planned to have electrical vehicles and motor train unit. Along ballast-less track lines, there are catenaries, signal machines and short-support cantilevers, which are good for students to adjust catenaries.

During the second-phase railway training base project, the constructions of traction power electricity training room and station-section training room have been completed. The traction power supply training room is consisted of physical objects and stimulated sand-table. The physical parts are constructed according to the basic structure of traction substation and the power supply equipment are the same with those used in railway field. Indoor power supply equipment, outdoor catenary and pantograph consist a completed traction power supply system. Stimulated sand-table presents the components of traction power supply system in a better way, which reflects the rules and effects of traction power substation and the setting of section line. Besides, the application of transparent tunnel model represents the setting up method of catenary in tunnel directly; between station and section control room, there are not only traditional 6502 signal control equipment, but also computer interlocking signal control equipment, as well as interlocking with outdoor signal device, point switch equipment etc., to constitute a completed station signal control system. The Shijiazhuang Tiedao University east station and west station are corresponded with computer interlocking system and 6502 signal control system. The section control between the two stations is corresponded with ZWP-2000 auto-block equipment.

During the three-phase railway training base project, there are railway bridge training field, high-speed railway exercise training base, railway signal physical stimulation training room, vehicle stimulation exhibition hall and bogie model exhibition hall etc., Railway bridge training field is consisted of 32m cable-stayed bridge and 24m arch bridge. On the bridge, ballast-less tracks are laid and sensor and support are built-in, which lays foundation for bridge safety monitoring test; high-speed railway exercise training room is consisted of high-speed railway sand-table and control center. Wuhan-Guangzhou high-speed railway is taken as an example in the construction. The sand-table part consists of 3 high-speed railway station and a motor car station. The hardware parts consist of computer interlock, train control, centralized traffic control, stimulate driving etc., equipment; in railway signal physical stimulation training room, the control of station signal is presented in physical forms and the working conditions of computer interlocking system, railway electric circuit and transponder are stimulated by mobile rail car; in vehicle exhibition hall and bogie model exhibition hall, it shows models of typical steam locomotive, diesel locomotive, electric locomotive, motor train unit, passenger car, freight train and bogies etc..

In the construction of railway practical training base, the preparation team employs experienced professional teachers as technology consultants to follow installation and commission of training equipment, monitor construction quality of railway lines and bridges, help solve technology problems encountered in construction and then ensure on-time delivery and high-quality of construction.

4. Application of Railway Training Base

As a public practical teaching platform for the whole university, in face of several kinds of practical teaching demands, engineering training center have delicate organization, active exploration from management, maintenance, teaching staff and teaching application aspects to make full use of railway practical training base.

1) Management and Maintenance. In order to make railway practical training base in good working condition and meet the practical teaching demands, engineering training center employs 2 teachers and 4 technicians to be responsible for daily management of railway practical training base and specifies clear job responsibility. Teachers are mainly responsible for the management and

maintenance of training equipment, as well as monitor the usage of equipment in practical training, while technicians are in charge of regular maintenance of railway lines and equipment and the cleanliness of training room. Because every position has its own clear responsibility, all training rooms in railway training base are tidy and clean and the equipment serviceability rate reaches 100%.

2) Teaching staff. Since practical teaching courses in railway training base cover various majors, instruction teachers shall have abundant field working experience. Current teaching staff from engineering training center cannot meet demands of practical teaching tasks. Therefore, the center employs front-line technicians from Shijiazhuang Railway locomotive maintenance section, energy section and power feed section as teachers. With their participation in the construction of railway practical training base and teaching of internship courses, the practical teaching is much more close to field practice and the practical capacities of teachers from engineering center are also improved.

3) Teaching application. In order to make full use of railway practical training base, the application of the training base is greatly prompted through four teaching aspects. The first is the level cognitive. The training base not only provides cognitive internship from various teaching institutes, but also adds teaching module of “railway technology recognition and practical training” in “Engineering Practical Capacity Training” course for all students; the second is production internship and graduation internship. It is opened for civil engineering, transportation, electrical engineering and mechanical engineering etc., and provides internship content such as railway line adjustment, catenary adjustment and maintenance, railway signal overhaul etc., the third is professional courses experiment. The training base provides traction power supply, railway signal, train control, centralized traffic control etc.; the fourth is graduation design and scientific research aspect. The training base cooperates with professional teachers and provides services for students’ graduation design and teachers’ scientific researches. Besides, railway practical training base also provides for interns from Shijiazhuang Tiedao University Sifang College, Shijiazhuang Institute of Railway Technology and Shijiazhuang Vocational Technology Institute. In 2015, the number of interns having internship in railway practical training base reached 5500 and it has achieved good teaching effects. Besides, the railway practical training base is modern rail transportation technology popularization base in Hebei provides and there are over 1000 students and teachers from primary and high school and social workers visiting the training base.

5. Conclusion

After the application of railway training base, various leaders from railway industry and colleges, as well as well-known experts in railway industry, have visited the railway training base and think highly of the influence of railway training base. Besides, several news media have reported this news, such as Hebei Daily, Hebei Television, and People’s Daily Online. The construction of railway practical training base has greatly improved the hardware of railway internship for students in our university. The quality of railway internship has been obviously improved and the engineering practical capacity of students is also strengthened. The construction of railway practical training base is a successful trial in our university’s development into a well-known featured university. Railway practical training base has become a unique gorgeous scenery in our campus, which manifests our university’s characteristics and will contribute to the cultivation of featured talents in railway industry.

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