Research on the Application of System Theory in Traffic Engineering

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Abstract. Traffic engineering is a subject of systematisms, comprehensiveness, intersections, sociality, advance and dynamics. Therefore, system theory is particularly important in the study of traffic engineering. The main task of system theory is to take the system as the object, to study the relationship between the system as a whole and the elements that make up the system as a whole, and to explain its structure, function, behavior and dynamics in essence, so as to grasp the system as a whole and achieve the optimal goal. The systematic analysis methods such as graph theory and operations research are applied to the analysis of traffic engineering problems, so as to meet the needs of the development of "New Engineering" in traffic engineering.

1. Introduction
In order to adapt to the implementation of national major strategic policies, such as “Made in China 2025”, “Internet +”, the “Belt and Road Initiative” and so on, higher education is facing a great revolution, the “New Engineering” is emerged. Since February 2017, the Ministry of Education has clarified the basic features of innovation, foresight, intersectionality, diversity, responsibility and guidance of the “New Engineering” [1]. On the premise of new economy and new industry, the “New Engineering” requires to train high-quality compound applied talents with practical ability, innovation ability and international competitiveness [2].

2. New construction of course system
Under the new situation, the undergraduate education of traffic engineering should focus on training students with solid basic theory, broad professional knowledge, strong practical ability and innovative ability goal; train the needs and adaption of socialist modernization and integrated development of moral, intelligence, physical, beauty and work, master the basic theory and knowledge of traffic engineering, obtain basic skills training, solid foundation and wide knowledge for engineers, high level applied talents with social responsibility, innovative spirit and practical ability. The applied talents in the field of new traffic engineering should have comprehensive "knowledge", "ability" and "accomplishment" and the relationship among these three parts is shown in Figure 1.
Therefore, the training of applied talents in the specialty of traffic engineering should break through the difficulties of mismatch between the existing training goal and needs of the industry [3], unreasonable courses, professional barriers, and the gap between schools and enterprises [4], and establish a "New Engineering" applied talent training course system to meet the development needs in the new period.

2.1. Public basic course of “Platform of University of Science and Technology + Individuation”

The basic socializing courses contain ideological and political courses, mathematics courses, college physics courses, college computer courses, college English courses, military sports courses, public elective courses, etc., adopt the mode of "Platform of University of Science and Technology + Individuation", and set up a common general education curriculum platform and personalized selection of levels and modules.

The development trend of modern technology mutual differentiation and mutual integration promotes the development of engineering activities in large-scale, complex, comprehensive and systematic development. As a result, it is very important to set up "great engineering view" in the process of training applied talents of the “New Engineering” by setting up the platform of the University of Science and Technology, breaking the barriers between professional subjects, helping students to form a broad knowledge system, and realizing the "trinity" of science, technology, engineering and humanities.

The "individuation" of basic socializing courses is mainly reflected in the fact that students can make exclusive course plans under the framework of traffic engineering professional training program according to their personal preferences [5]. Students complete the study and examination of the corresponding courses by selecting courses on MOOC platform.

2.2. Double promotion courses of “basic theory” and “application ability”

The training of traditional undergraduate talents in traffic engineering is usually divided into traffic management and planning, road and bridge, rail transit and so on. The division of professional direction strengthens the pertinence of talent training, but it also deepens the barriers between different directions, which is not conducive to the training of "New Engineering" applied talents.

The course system of “basic theory + application ability” focuses on the target orientation of traffic engineering talents training; sorts and integrates the principle of “practice what you learned” promote the reform of the course system, trains. In addition to considering the logical structure of knowledge itself, the choice of course content is more oriented to train students' application ability. The course focuses on the training of industry ability, introduces new knowledge, new skills and new technology in the field of enterprise industry in time, and realizes the effective connection between teaching content and social demand.
"Basic ability" is mainly embodied through professional basic courses. The basic courses reflect the basic theory, knowledge and skills of the most basic subjects in the field of traffic engineering, and are the first courses to improve the application ability. The "applied ability" is embodied through professional education. Professional education courses focus on the core application ability of traffic engineering specialty, highlighting the requirements of applied talents training, docking professional post requirements including the content of qualification certificate examination reflecting professional ability, school-enterprise cooperation training course, cross-composite course module, postgraduate examination course module and so on. The course system of basic theory + application ability” is not divided into specific professional directions. The course covers traffic planning, roads and bridges, rail transit and so on. After completing the professional basic courses and professional education courses (required), students can take professional education courses in any field (optional) and complete rated professional education courses (optional) before meeting graduation requirements. By eliminating the gap between professional direction and professional courses, a comprehensive and complete knowledge system framework is formed to enhance students' basic theoretical knowledge and professional application ability.

2.3. Practical teaching of cooperation between schools and enterprises
Practice teaching is an important link in training high-quality applied talents, including experiment, practice, curriculum design, graduation design (thesis), practical training and so on. In order to enable students to have a deeper understanding of engineering practice, the setting of practical links is closely combined with enterprise engineering projects. Through the establishment of a good partnership with local or surrounding enterprises, practical teaching establishes a cognitive practice, production practice base, so that students can enter the enterprise to engage in specific engineering projects; establish a school-enterprise cooperation to educate outstanding engineers class, enterprise engineers and practical training resources into professional teaching, students follow corporate mentors, combined with engineering projects to complete graduation design. Practical teaching makes full use of high-quality resources, strengthens the integration of industry and education, and forms a good mechanism of cooperation between schools and enterprises.

3. New measures for the teaching method
Under the background of “New Engineering”, the training of applied talents in traffic engineering requires teachers to study and improve the teaching methods in the teaching process, to help students master the basic professional knowledge, and have a strong engineering practice ability. The teaching of professional courses is widely used in case teaching, OBE teaching mode, CDIO teaching mode, etc. Through case selection, case analysis, task decomposition, relying on cases or engineering projects, teachers guide, students independently complete cases or projects in accordance with engineering specifications. In teaching, students are trained to analyse and solve problems.

3.1. “Mind mapping” teaching method
The mind mapping was proposed by British psychologist T. Buzen in 1970 [6]. For students, mind mapping can enhance their interest in learning, enliven classroom atmosphere, cultivate students' consciousness of innovation and enhance their ability of innovation, improve sorting and inductive ability, and form systematic professional knowledge. For teachers, using mind map teaching method can optimize teaching design, innovate teaching methods and improve teaching quality.

The teaching method of mind mapping requires teachers to consciously highlight the key points in the class, grasp the "head-word", and carry out the classroom content layer by layer around the head-word, so as to help students to clarify the internal logical relationship between knowledge points and form a complete knowledge system. Through the "mind mapping, teachers help students to clarify the relationship between the core courses of traffic engineering, clarify the logical relationship between each chapter of each course, and construct the framework of professional knowledge structure; structure
"chapter" mind map, “section” mind mapping (as shown in fig.2), “problem” mind mapping; add the experiment link in class, so that students can master the drawing method of mind mapping.

3.2. Comprehensive Course design reform

In order to improve students' engineering practice ability, integrate theory with practice and enhance the effect of theory teaching, the course system of the specialty of traffic engineering includes a large number of practical links of course design. However, it is often matched with the corresponding theoretical courses in the course of course design, and the hours of each course design are less, which can only complete the core part of the course, and cannot effectively help the students to set up the concept of "big project".

When selecting the topic, the comprehensive curriculum design should connect and systematize the scattered multiple courses, so that the students can get comprehensive applied training. For example, the comprehensive course design of road engineering requires students to carry out comprehensive road design from the aspects of road planning, road route selection, surveying and lofting, road construction, traffic signal setting, etc. It covers the main contents of many courses, such as traffic planning, engineering survey, road survey and design, subgrade and pavement engineering, traffic management and control, and combines engineering practice to enhance students' understanding and application of professional knowledge and enhance engineering practice ability. It mainly includes four parts: traffic survey, traffic status analysis, scheme design and program evaluation. Through the comprehensive training of the four parts, students can enhance their understanding and application of professional knowledge, improve their engineering practice ability, and contribute to the cultivation of new engineering application-oriented talents.

3.3. Scene case teaching mode

Scene case teaching mode is based on the case teaching, by constructing the real scene, the knowledge system and the actual case integration, enhance the students' classroom participation degree. While solving problems, students can also think about and explore other related problems, so as to improve their practical ability and innovation ability.

The implementation of scene case teaching should follow the process of "preparation - application - assessment - feedback" and pay attention to each link to improve the teaching effect.

3.3.1. The selection and design of scene cases

The key to scene case teaching lies in the selection of cases. An excellent scene case can not only reflect the teaching content of the course, but also follow the development trend of the traffic engineering industry.

Taking the scene case teaching of "traffic planning" course as an example, the teacher should reprocess the traffic planning engineering case according to the course content and key points of knowledge when selecting the scene, and carry out teaching according to the steps of traffic investigation, demand prediction and planning application.

3.3.2. The application of scene cases in teaching

In the process of scene case teaching, we should pay attention to the comprehensive application of professional knowledge, break through the limitation of traditional teaching mode, and get rid of the shackles of textbook content. In class teaching, teachers guide students to find problems in scenes and cases, analyze problems with relevant professional knowledge in and out of class, and solve problems through group discussion. In addition, it pays attention to the cultivation of students' critical thinking,
reflective thinking and innovative thinking, and evaluates, summarizes and explores the existing theoretical directions when applying the professional knowledge learned to analyze and solve practical problems.

3.3.3. Assessment method
The implementation of scene case teaching mode facilitates the implementation of a comprehensive assessment and evaluation system. The assessment result can be composed of classroom discussion, research results report, professional software operation and application, and final examination. The course result is no longer determined only by class attendance rate and examination result. It can guide students to actively participate in classroom teaching and eliminate the original "surprise before examination" test-taking idea. In addition, the proportion of comprehensive analysis questions and open questions should be increased in the final examination, so that students can change their fixed thinking into divergent thinking, and realize the goal of cultivating talents of new engineering traffic engineering.

3.3.4. The implementation of feedback
In the implementation process of scene case teaching, students' curriculum feedback should be obtained in time to improve the deficiencies in the teaching process; Education experts, business leaders and project engineers are regularly invited to evaluate teaching case Settings, teaching effects and other contents to improve and enhance teaching methods.

4. Entrepreneurship and innovation education model

4.1. Innovative personnel training mechanism
Deeply investigate the current situation of local and surrounding economic and social development, and further improve the discipline and professional structure. We should carry out the "Excellence Plan" in depth, establish a new mechanism of cooperative education among schools, schools, places, schools and international cooperation, and actively attract social resources and foreign high-quality educational resources to invest in the cultivation of innovative and entrepreneurial talents. We should actively promote double-degree education and train compound talents.

4.2. Improving the course system for entrepreneurship education
Further improve the progressive, organic convergence, scientific and reasonable innovative entrepreneurship education special curriculum system and into the content of innovative entrepreneurship education professional curriculum system. We develop and offer general courses for all students, such as research methods, subject frontier, entrepreneurial foundation, employment entrepreneurship guidance and so on; fully tap the innovative entrepreneurship education resources in traffic engineering courses, offer professional courses with industry characteristics and are closely related to innovative entrepreneurship and employment; and offer innovative courses to enhance students' comprehensive practical ability to incorporate credit management.

4.3. Strengthening the practical education of innovation and entrepreneurship
Carry out the innovative entrepreneurship training program for college students, expand the coverage and promote the transformation of the project. The school organizes students to participate in transportation science and technology competition, university intelligent transportation innovation and entrepreneurship competition, challenge cup, “Internet+” competition and other science and technology competitions. Relying on innovative entrepreneurship colleges, entrepreneurial clubs and other associations, we carry out practical activities, hold innovation and entrepreneurship lecture forums, further complete in student patent education and cultivation, college students’ summer social practice and other work.
4.4. Improving student innovation and entrepreneurship guidance
Strengthen the publicity and implementation of various national and provincial preferential support policies for innovation and entrepreneurship, and guide students to familiarize themselves with and use good policies. We strengthen the guidance of entrepreneurship, complete the system of institutions, personnel, venues, funds, bases, and provide continuous support, full-course guidance and one-stop service to self-employed students.

4.5. Strengthening the construction of innovative and entrepreneurial teachers
Make clear the main responsibility of all teachers' innovative entrepreneurship education, and integrate innovative entrepreneurship education into the whole process of teacher education and teaching. We strengthen the evaluation of innovative entrepreneurship education, and regard teachers engaged in innovative entrepreneurship education as an important index of professional and technical job evaluation and performance appraisal. Strengthen the training of full-time teachers, will improve the awareness and ability of teachers' innovative entrepreneurship education as an important part of pre-job training, curriculum rotation training, backbone training, organize traffic engineering teachers to regularly go to the industry and enterprises to train the system.

5. Conclusion
Under the background of "New Engineering", the demand of traffic engineering professionals is comprehensive, innovative and diversified. It is urgent for educators to deeply study the training mode of applied talents in traffic engineering majors, explore the education and teaching methods that accord with the improvement of students' training quality, and cultivate high-level applied talents with solid foundation of traffic engineering specialty, excellent engineering practice ability and excellent innovation accomplishment for the society.

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