



Reform and Practice of Teaching Mode in Transportation Engineering - Taking the Integration of Passenger Travel as an Example

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Abstract. In the context of comprehensive education in the construction of a strong transportation country, the teaching mode reform of transportation professional courses is constantly deepening to meet the needs of talent cultivation. This article takes the basic course of transportation engineering as the object of teaching mode reform, analyzes the pain points of traditional teaching mode, and carries out teaching reform from four levels: teaching content reconstruction, blended teaching subject, teaching method innovation, and course ideological and political integration. And demonstrate the practical reform of course teaching through specific topics on integrated passenger travel. After the reform, the teaching effectiveness of the curriculum has significantly improved, which has important practical significance for cultivating professional talents in integrated transportation.

Keywords: teaching reform, transportation, integration, teaching practice

1 Introduction

At present, we are in a period of rapid development in transportation construction. Against the background of "comprehensive education", the reform of university curriculum and teaching should continuously innovate in both content and form, in order to meet the new requirements of talent cultivation[1]. As a fundamental course for undergraduate majors in transportation, Transportation Engineering introduces five modes of transportation, enabling students to understand the integration of passenger and freight transportation in China and the future development trends of new technologies in the field of transportation, achieving the systematic training goal of professional talents. Given the fundamental supporting position and role of this course, extensive exploration of its teaching mode reform has also been carried out. Solve common pain points in the teaching process, form systematic, logical, and effective teaching reform measures, rely on specific innovative teaching methods, and fully utilize information technology teaching platforms. The course content not only focuses on the horizontal connection between this course and other disciplines and professional basic courses, but also supplements vertical knowledge such as the development trends and latest

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achievements of cutting-edge transportation technologies, integrating transportation ideological and political elements.

2 The Problems in Traditional Teaching

2.1 Wide Range of Teaching Content

This course covers the current five major modes of transportation, including roads, rail, air, water, and pipelines. The composition of each transportation system, the organization and management of various transportation modes, and the application fields of future new technologies all have similarities and differences. This also means that the course covers a wide range of majors and content, has strong theoretical significance, and updates quickly in practical application fields. There is a wide range of teaching resources for each mode of transportation, and when selecting and collecting teaching resources, higher requirements are also put forward for teacher teaching preparation and professional knowledge. At the same time, due to the excessive theoretical content and the lack of practical scenarios on campus, it is unable to stimulate the active interest of some students, directly affecting their understanding and mastery of basic transportation courses, and indirectly affecting the systematic construction of course clusters.

2.2 Single Teaching Method

The characteristics of the course content in transportation engineering determine the limitations of teaching methods. The traditional teaching mode, which is easy to operate, takes teachers as the main body for one-way teaching and indoctrination, which is less enlightening. Although multimedia and other Internet plus mode teaching explorations have been added recently, the central position of teachers has not changed. Students passively receive theoretical knowledge about transportation modes, which is often dull and not conducive to stimulating the motivation and interest of self-directed learning. For too much theoretical knowledge, they can only rely on mechanical memory, lacking connection with actual transportation scenarios, and the learning effect is poor[2]. The rapid iteration of practical cases and new technology development is closely related to real life. If we follow the traditional mode, it will inevitably be disconnected from the real-time scene of transportation, and it is also not conducive to the system's grasp of the integrated development trend of transportation.

2.3 Lack of Ideological and Political Elements in the Curriculum

The transportation engineering course involves five major transportation modes, and it contains a wide range of ideological and political elements in the transportation industry, including traffic safety, craftsmanship spirit in the transportation system manufacturing industry, traffic environmental protection, and sustainable development. Through the construction of ideological and political education in the course, the cultivation of moral character and talent in the transportation profession can be completed

in a closed loop. At present, some universities have limited ideological and political resources in their courses, and teachers lack the exploration of ideological and political elements and flexible integration into classroom activities[3]. If it is forcibly combined with theoretical content as a single content, it cannot stimulate students' awareness of the importance of ideological and political education in the course and their interest in learning.

3 Thoughts on the Reform of Curriculum Teaching Mode

3.1 Topic Integration of Teaching Content

In response to the rich content and professional positioning of the transportation engineering course, the traditional situation of indiscriminate teaching in chapter order has been changed. The course has been integrated and optimized through thematic integration, which is more in line with the theoretical foundation of undergraduate transportation majors and the teaching needs of actual transportation scenarios[4]. In addition to the necessary and professional knowledge system, moderate and advanced professional expansion provides support for the construction of subsequent course groups. The thematic division is shown in Table 1.

Table 1. Special Topic on Teaching Transportation Engineering

Teaching chapter	Teaching topics
1 Introduction	Overview of Transportation Development history of transportation
2 Road Transportation	Highway transportation Urban road transportation Automobile Road traffic flow theory
3 Rail Transportation	Railway Transportation High speed railway transportation Urban rail transit transportation
4 Waterway Transportation	Channel Facilities Port facilities vessel
5 Air Transportation	Aircraft Airport Airspace system Air traffic management
6 Pipeline Transportation	Oil Pipeline Gas pipeline Solid slurry pipeline
7 Integrated Transportation	Passenger Travel Integrated Transportation Integrated transportation of goods New technologies and trends

3.2 The Background of Blended Learning

Since the connotation of hybrid teaching was proposed, with the rapid development of the Internet plus era and the development of teaching hardware tools, hybrid teaching has achieved new breakthroughs in application and technology. The teaching mode of the "Transportation Engineering" course is based on blended learning[5]. Firstly, it is

necessary to utilize the advantages of data to create a transportation course teaching resource platform, optimize the quality of multimedia courseware, and integrate rich hot topics such as transportation industry regulations, transportation tool innovation, and transportation technology application. Secondly, before class, students independently preview online knowledge and conduct pre tests. During class, teachers understand students' mastery of key and difficult knowledge based on pre test data, and selectively strengthen and supplement them. After class, they complete online assignments and teaching evaluations. The overall goal is to stimulate students' self-learning initiative and improve teaching quality[6].

3.3 Innovation in Teaching Methods

In the context of blended learning, actively explore innovative teaching methods suitable for this course. According to the characteristics of the course topic content, students are the main body and consciously adjusted and optimized to form a complete and systematic teaching process[7]. The first widely used method in this course is task-based teaching, which guides students to actively participate in the course scenario by assigning tasks to them both inside and outside of class, and stimulates their independent interest and ability to think and cooperate. Such as issuing optimization tasks for traffic instructions on highways in road transportation, which enables students to independently innovate and think about the current pain points of highways after fully mastering the content of highway channelization and technical requirements. The second innovative method for teaching is group teaching, which is an organic combination of task-based teaching methods. Due to the individual learning characteristics of students, conscious differentiation in grouping allows students to feel the power of teamwork. At the same time, competition and comparison between groups also enhance the learning atmosphere, resulting in better course teaching effects[8]. Finally, project-based teaching is suitable for learning about the development and trends of new transportation technologies. Every traveler feels the convenience and service brought by these technologies every day. Through common application software, mobile devices, etc., project-based teaching guides students to complete transportation works or practical operations within a specified time, and its essence remains a task-based teaching method, But it focuses more on practical scenarios and is more targeted for the application field of transportation.

3.4 Course Ideological and Political Construction

Based on the background of comprehensive education, utilizing the strong driving force of data advantages, we adopt a data-driven approach to establish a smart course ideological and political resource library, break through the pain points of course ideological and political education, and enhance the scope of course ideological and political education. Collect resource libraries on infrastructure construction planning and layout, safety emergency management, sustainable development of transportation, and hot transportation events contained in the five modes of transportation, and accurately

match teaching knowledge with the spirit of being a great transportation country. Enable students to actively participate and stimulate their sense of mission in the transportation industry through blended learning, online platform promotion, and ideological and political themed activities organized by courses[9]. At the same time, when preparing for teaching, teachers also have evidence to follow, and can find elements related to the course content in the massive amount of ideological and political elements for organic integration, improving the ideological and political construction and educational effects of the curriculum.

4 The Process of Practicing Teaching Modes

The topic of integrated passenger travel is the last chapter of the reconstruction of the teaching content in Transportation Engineering, with an overall teaching allocation of 1 class hour. As an important way to serve the travel of residents, passenger transportation needs to consider exploring collaborative ways of multiple transportation modes, promoting the centralized layout of transportation integration, and creating an integrated travel environment throughout the time period. This is of great significance for improving passenger travel efficiency and service level. The practical process of reforming the teaching mode for this topic is shown in Table 2.

Table 2. The teaching process of integrated passenger travel

Content	Course Ideological and Political	Education Process
Background	Strong transportation country	① Online introduction Exhibition of Hefei-Weihai Rail Transit Travel Modes
Key tasks	Policy document	② Teaching In class International hub cluster and 20 international hub cities
Inter-modal mode	Hotspot cases People oriented	③ Online task-based teaching Publish four sets of travel tasks for starting and ending points ④ Group presentation in class Groups 01-04 present their summarized travel modes and match them with the four connecting modes in theory ⑤ Teacher supplement Introduction to the 5th new mode of intermodal travel
Key Technologies	Smart and green travel	⑥ Online resources A map of traffic information One ticket for passenger travel
Case	Driven by technological innovation	⑦ Project-based teaching in class The China Eastern Airlines/12306 air rail connection application

Summary	Sense of responsibility and mission	③Summary Summary of thematic content;Online homework and preview task assignments
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The course content included in this topic includes the background, key tasks, transportation modes and key technologies of passenger travel integration, project case analysis, etc. The focus is on transportation modes and new technologies, and the difficulty lies in reflecting on the application of new technologies[10]. In this special teaching topic, based on the above teaching reform ideas, and according to the key and difficult content, and the appropriate selection of teaching methods, using the China Eastern Airlines/12306 air rail connection application, the "Hefei Baotou" travel project is released. Students can independently use any APP to complete a practical exploration of booking a seat and a ticket to the end, and think and optimize the way of transferring passengers, At the same time, plan to improve the travel needs of the APP interface and complete the project concept. Simultaneously organically integrating ideological and political elements at all levels of the curriculum, achieving a closed-loop mechanism for all-round education.

5 Effectiveness of Teaching Mode Reform

When the teaching mode of the course "Transportation Engineering" was not reformed, traditional teaching methods were often used, with multimedia lectures and video and image materials as aids. Teachers took the lead in introducing the course and spent a lot of time on purely theoretical teaching. The implementation of student-centered teaching concepts was poor. The teaching process after the above teaching model reform has solved the pain points of traditional teaching, such as long theoretical space, teacher centered teaching, and low student participation. Based on the results of implementing the new teaching model, students' learning interests, grades, innovative training, teacher preparation, teaching competitions, and curriculum construction have all been improved to a certain extent.

5.1 Course Teaching Effectiveness

Through the reform of the teaching mode of this course, students have improved their learning initiative, with nearly 70% of the course time being student-centered, continuously stimulating their enthusiasm and interest in learning. Starting from the reform of teaching mode in 2022, the average score of students in the second semester of 2022-2023 and the first semester of 2023-2024 has increased from 79.53 to 87.81, and the excellent rate of students with scores above 90 has increased from 25.81% to 40.63%, both showing an upward trend. The teaching effect of the course has significantly improved. At the same time, the teaching evaluation and teacher assessment of this course have both given feedback as the top priority in the field of transportation.

5.2 Practical Innovation for Students and Teachers

Since the curriculum reform, students have actively participated in various innovation and entrepreneurship contests related to and extended by the content of this course, and won more than 10 awards, including the second prize of Anhui Province in the 9th National Undergraduate Statistical Modeling Contest, "Coupling Coordination and Temporal and Spatial Evolution of High quality Economic Development and Transportation System in the Yangtze River Basin", and the 9th "Internet plus" in Anhui Province. The research project on car door collision prevention in the college student innovation and entrepreneurship competition won a silver medal. At the same time, through the reform of teaching mode, continuous and systematic exploration of teaching methods, ideological and political education, and course objectives has been carried out in teaching. Actively participating in relevant teaching competitions, promoting teaching through competitions, such as winning the third prize in the 6th Anhui Province Youth Teacher Teaching Competition with the theme of "Transportation Engineering".

5.3 Course Construction Achievements

After carrying out the curriculum reform, with the curriculum teaching teachers as the main body and other teaching aids for professional construction, the curriculum team gradually became abundant, and the curriculum construction also achieved preliminary results. More than 20 scientific research and teaching projects have been applied for around this course and course group, covering topics such as autonomous driving evaluation, highway human factors, urban road capacity, and the cultivation of innovative talents in smart transportation. At the same time, the course of Transportation Engineering has also been recognized as a first-class textbook construction object at the school level.

6 Conclusion

In the context of comprehensive education, cultivating professional talents more suitable for the transportation industry is an important goal of teaching mode reform. This article analyzes the nature and status of the course "Transportation Engineering", analyzes the pain points and problems in the current teaching situation, and proposes targeted teaching mode reform points that are suitable for this course. Taking the integration of passenger transportation as an example, the reform practice process is introduced to further stimulate students' self-learning momentum and improve teaching and educational effects. At the same time, it also provides certain reference ideas for the teaching reform of other courses in the undergraduate transportation major course group.

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