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Teaching Design and Practice of First-class Undergraduate Courses based on ADDIE Model—— Taking the Course of "Traffic Management and Control" in Local Universities as an Example

Dan Zhou

Guilin University Of Electronic Technology, Guilin, Guangxi, China

Abstract: In order to meet the development needs of enterprises and industries, the teaching design of "Traffic Management and Control" course in local undergraduate colleges and universities aims at "imparting knowledge, training thinking, cultivating ability and improving quality," continuously implementing the OBE concept of engineering education, and adopting a three-combination model, that is, the combination of traditional teaching and flipped classroom, the combination of theoretical knowledge and engineering practice, and the combination of ability improvement and problem solving. Optimize the course content, develop curriculum resources, reform teaching methods, implement diversified formative evaluation and continuous improvement. The teaching design reform ideas and methods of this course can be applied to the continuous improvement of undergraduate course teaching of traffic engineering specialty, and promote the high-quality construction and development of the specialty.

Keywords: teaching design, gender, practical ability, curriculum resources

Introduction

With the orderly advancement of the transportation power strategy, the development of the transportation industry has new requirements for the training of transportation talents in colleges and universities. In particular, new requirements are put forward for the comprehensive quality, practical ability and innovation ability of transportation talents. Therefore, the traffic engineering specialty of local undergraduate colleges and universities should pay attention to the deep integration of theoretical teaching and practical teaching from the reality, analyze the development characteristics and trends of the transportation enterprise industry, and change the traditional teaching mode, which leads to students' emphasis on concept understanding and knowledge mastery, lack of engineering practice training and application[1]. Actively adapt to the social needs of talent training, continuously optimize the teaching mode of course theory teaching and practice teaching, lay a solid foundation for the cultivation of students' engineering practice ability and innovation ability, and provide strong support for the transportation of high-quality transportation talents.[2]

1. Teaching design of traffic management and control based on ADDIE model

1.1 ADDIE model of "traffic management and control" course teaching

Combined with the characteristics of the "Traffic Management and Control" course, the requirements of the first-class undergraduate course teaching for "gender one degree" are implemented to lead students to break through from primary knowledge learning to advanced practical application[3]. The ADDIE model is constructed from five aspects: students' learning situation analysis, teaching mode design, curriculum resource development, curriculum teaching organization and teaching implementation evaluation[4-5]. The details are shown in Table 1.

Table 1 ADDIE model link

Analysis	Before the course teaching, the students' knowledge experience, learning ability and ideological state were investigated and analyzed.
Design	With 'autonomous learning' as the core, the advanced teaching of 'integration of engineering practice and application' is adopted, and the teaching mode of 'online resource self-study + difficulty analysis + case analysis + engineering practice and discussion' is carried out.
Development	Construction of 'Traffic Management and Control' project case library and course test database, at the same time, the construction of intersection signal control virtual simulation experiment platform and road traffic control program practice training base.
Enforcement	The "offline" or "online + offline" course teaching method is adopted, and the advanced teaching mode integrating engineering practice and application is adopted. The theoretical knowledge is integrated into the engineering case for analysis, supplemented by the engineering application site observation learning and design scheme engineering application practice.
Assessment	After the end of the course, a questionnaire survey was conducted among the students, and the improvement plan of the next round of course teaching was formulated based on the feedback of the students, and the teaching discussion within the team was carried out. At the same time, the normalized continuous improvement of course teaching was carried out every academic year.

1.2 Analysis of students' learning situation based on ADDIE model

According to the professional foundation, learning characteristics and hobbies of the teaching objects, the investigation and analysis of the learning situation are carried out, mainly including:

1.2.1 Analysis of students' knowledge and experience

Students have a certain basis for traffic engineering analysis, and have a basic understanding of the main problems existing in urban road traffic, traffic travel and operation characteristics, but they do not understand the design ideas, methods and implementation feasibility of urban road traffic control schemes.

1.2.2 Analysis of students' learning ability

Students generally have a strong desire for knowledge, treat learning tasks more seriously and responsibly, and have certain autonomous learning ability; students have insufficient training in the deep thinking and understanding of knowledge, and the ability to combine theoretical learning with engineering practice needs to be strengthened.

1.2.3 Analysis of students' ideological state

Students' thinking is more active, but they can not maintain a high degree of concentration in learning, and prefer practical activities; the understanding of engineering practice and application is not deep enough, and professional communication is not paid much attention to.

1.3 Design of teaching ideas based on ADDIE model

This course constructs knowledge goal, ability goal, quality goal and value goal. Based on the concept of "knowledge as the foundation, ability as the center of gravity, literacy as the guide, value as the guide," with "autonomous learning" as the core, the teaching mode of "online resource self-study + difficulty analysis + case analysis + engineering practice and discussion" is carried out. Among them:

(1) Knowledge objectives: to enable students to master the basic principles and design methods of traffic management and traffic control.

(2) Ability objectives: to enable students to have the ability to skillfully use traditional and intelligent traffic management methods, measures, and modern traffic control methods and technologies to solve complex engineering problems.

(3) Quality objectives: to be able to traffic management and control problem solving ideas, methods and other professional problem solving ideas, methods of mastery, and applied to solve the complex problems of traffic engineering.

(4) Value objectives: to enable students to have professional ethics and scientific and rigorous craftsman spirit, establish socialist core values and harmonious traffic concept, and have a good sense of social responsibility and mission.

1.4 Curriculum resources development based on ADDIE model

Based on the teaching objectives and teaching mode of the course, the teaching resources of the course are systematically developed. The main resource construction of this course includes:

(1) Construction of 'traffic management and control' project case library, including: traffic organization optimization design, traffic information and control scheme design, traffic engineering project and other four modules.

The construction of course teaching video library is applied to online teaching and students' online self-study in the teaching cycle.

(2) Build a rich curriculum test database, divided into two categories: classroom test questions and final questions. The system supports the knowledge content of each teaching module, and focuses on the evaluation of knowledge and ability.

The virtual simulation experiment platform of key knowledge modules such as intersection signal control and coordinated control is constructed, and the engineering practice teaching of the course is docked.

(3) Construction of urban road traffic control program practice drill base. Relying on the traffic control platform and traffic data of Guilin Traffic Police Detachment, the implementation and application of the design scheme are carried out.

1.5 Teaching organization and implementation based on ADDIE model

The "offline" or "online + offline" course teaching method is adopted, and the advanced teaching mode integrating engineering practice and application is adopted. The theoretical knowledge is integrated into the engineering case for analysis, supplemented by engineering application site observation learning and design scheme engineering application practice. The teaching organization of the course is shown in the figure (taking the teaching content of the intersection as an example). The main teaching links and contents include:

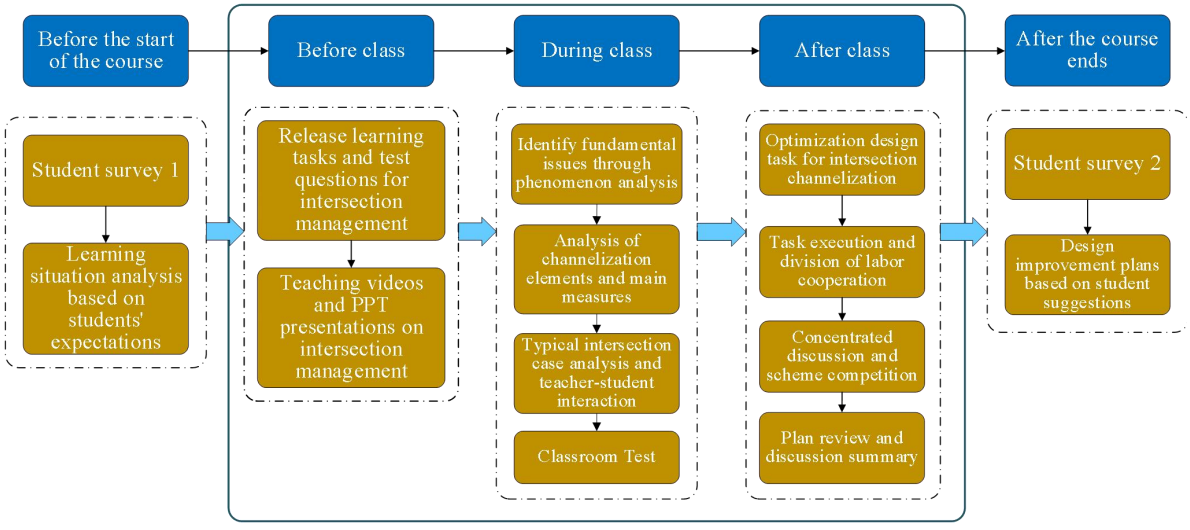

Fig.1 Teaching organization process

(1) Before the beginning of the course, teachers investigate the students' learning situation, characteristics and

expectations, and summarize and analyze the students' learning situation.

(2) Before the beginning of each class, teachers push course video resources and learning requirements for students to learn independently before class and consolidate learning after class.

(3) In the classroom, teachers analyze the core knowledge, analyze and discuss engineering cases, train students' engineering thinking, properly carry out classroom tests, and form an objective evaluation.

(4) After class, teachers arrange and organize students to carry out complex design work. Teachers organize students to carry out thematic discussions in the smart classroom, and make comments, summaries and reflections, which improves the high-level and challenging nature of the course.

(5) After the end of the course, the teacher again carried out a student questionnaire survey, combined with students' feedback and teaching reflection to formulate the improvement plan of the next round of course teaching and conduct teaching discussions within the team to achieve continuous improvement of teaching and improvement of teachers' ability.

1.6 Teaching analysis and evaluation based on ADDIE model

Construct the continuous improvement mechanism of the course, and carry out the normalized continuous improvement of the course teaching after the end of each teaching cycle. Integrate the continuous improvement of the course teaching into the continuous improvement of the profession. Form a closed loop between evaluation and continuous improvement, realize the measurable, controllable and traceable evaluation of the course, and effectively improve the teaching quality and teaching effect of the course.

2. Conclusion

Based on the characteristics of students in local undergraduate colleges and universities, this paper carries out the teaching reform of "traffic management and control" course, draws on the ADDIE model, establishes a course teaching design model based on five links of analysis, design, development, implementation and evaluation, optimizes the teaching organization mode, carries out effective theoretical teaching and engineering practice and innovative training, so that the course teaching can truly achieve high-level and innovation. It has a good reference significance for the core course teaching of traffic engineering and the improvement of the quality of personnel training.

Conflicts of interest

The author declares no conflicts of interest regarding the publication of this paper.

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