Application of Task-Driven Teaching Method in Urban Rail Transit Course

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Abstract: The Task-driven Teaching method is a reformation to the traditional teaching method, and it is introduced into the teaching process of urban rail transit course. Based on the features of urban rail transit course, together with teaching practical experience of students' learning, the task design and concrete plan of the course are discussed in detail. It can help students understand the knowledge of this course deeply, cultivate innovative spirit, promote engineering quality and enhance professional competence. The effect of this teaching method on professional competence training is confirmed.

Introduction

Innovation education is the theme of the time in the 21st century, universities are the cradle that aims to spread knowledge and foster innovative talents. How to advocate and build innovation education, raise students' innovation ability, practical ability and entrepreneurial spirit, become the requirements for education in the economic and informational age. Traditional instruction system is designed by knowledge points and followed the principle of gradual improvement. Task-driven teaching mode is superior to conventional methods in playing student's main body role, under teacher's leading role guidance. Constructivism oriented task-driven teaching method, is a kind of interactive teaching mode that aims to solve the problem and complete the task. The teaching content is composed of a series of tasks. It adopts various teaching methods with audio and video, computer technology and network technology. So that the students' motivations are activated while completing the learning tasks and they become the autonomous learners. It is a process of problem posing and inquiring and solving. It has the function to cultivate students' ability of creativity and practice and also ability to solve problems independently. The teaching method is especially suitable for practical teaching of science and engineering courses in colleges and universities.

At present, the application of task-driven teaching method is focused on some interdisciplinary subject, such as computer and information technology teaching. A variety of skills and basic teaching course teaching also began to introduce the teaching mode. Deepening reform of specialized course teaching in colleges of engineering has not been studied in scale.

An Overview of Urban Rail Transit Course

The urban rail transit course is one of the compulsory courses for students of traffic engineering, civil engineering and vehicle engineering professional. The content of the course covers the basic knowledge of various components of urban rail transit system. The curriculum content involves: concept, classification and development of urban rail transit, line network planning and design basis, track structure, station, vehicle and car depot, the power supply system, the communication and signal system, environment control system, construction and operation management,
summarizing the new concept, new measures and new technology of urban rail transit. The course aims to develop students' specialized theory knowledge, and improve students' abilities to take the specialized theory knowledge into practice. So that graduates can meet the requirements of urban rail transit construction and operation management to technical personnel and management personnel.

With the rapid development of urban rail traffic in China, a large number of technical personnel and applied talents are in urgent need for construction and operation management of rail transit. At present, there are nearly one hundred colleges and universities in China have opened or ready to open urban rail transit or similar professional. Dozens of relevant enterprises nationwide have set up their own training center or training department. The professional basal knowledge can be learned through the study of urban rail transit course for undergraduate.

This course features covering a range of great value, and content updating quickly. In order to adapt the development of information age, we must carry out the teaching reform, improve the quality of teaching, and cultivate students' ability to analyze and solve problems independently. Task-driven teaching method is investigated and studied under this background.

**Research on Task-Driven Teaching Mode**

“Task driven” is a kind of teaching method based on the theory of constructivism, teaching design is composed of the specific operational tasks. To explore problems first arouse and then preserve the students’ motives of study. It develops the students’ ability to analyze and solve problems in process of completing the task. The implementation of task-driven teaching process is shown in Fig.1.

Task-driven teaching mode is applied in urban rail transit course, the knowledge points are concluded to an integrated system, then the integrated system is decomposed into different sub tasks, the system is realized finally after the students complete all the subtasks. This mode can cultivate students’ ability of system design, improve their engineering quality in the training process.

**Analysis of the Project System**

The establishment of the system concept is very important for engineering students. How to let the students establish the concept of the system in the learning process of Urban Rail Transit course, it is necessary to be considered in teaching organization. We take the completion of a project system as a general task, then decompose the total task into some sub tasks, guide students to carry out learning activities step by step driven by the subtasks, master the knowledge content of this course, understand the concept of urban rail transit system finally. To determine an appropriate project system should have these basic features as follows:

1. The project system covers all the core knowledge of this curriculum;
2. The degree of difficulty of the project is consistent with the cultivation of students;
3. The project system should be closely combined with actual life, easy to understand.

According to the above three conditions, the Shijiazhuang metro system is determined as the project system of this course, which involves all core knowledge including the concept of urban rail transit, line network planning, line design, system composition and operation management. The scope and complexity of the project system are in accordance with our teaching goal. But also students accept it more easily taking Shijiazhuang where they live in as an example.
Decomposition of the Project System

The Shijiazhuang Metro System task is decomposed into line network planning, line design, system constitution and operation management as shown in Table 1.

1. Network planning: The learning objective is to understand the basic structure and characteristics of Shijiazhuang metro network. The significance, principles, contents and basic methods of urban rail transit network planning are studied. Through the study of this part, students can determine the suitable structure type and reasonable size of Shijiazhuang metro network based on the basic information of Shijiazhuang City.

2. Line design: The learning objective is to understand the design of the Shijiazhuang subway lines. The design stage, the basic form of the line, and the vertical and horizontal section design requirements of the line are introduced. Through the study of this part, students can determine the routes and ranks and technical parameters of six subway lines in Shijiazhuang.

3. System constitution: The learning objective is to understand basic composition and technical parameters of Shijiazhuang metro system. Based on study of the basic structure, function, kinds and performance parameters of track, station, vehicle, car depot, signal and communication system, power supply system and others, the students have a preliminary understanding of the type and technical characteristics of construction method, vehicle type, metro station, the power supply mode and the communication & signal system of Shijiazhuang Metro system.

4. Operation management: Through the study of operation management mode, operation plan, train operation dispatch manage, station operation organization and passenger management of urban rail transit, the students put forward the measures to strengthen the transport capacity of Shijiazhuang metro, and the learning goal set for students is achieved.

Through the application of task driven teaching method in urban rail transit teaching, students formed the concept of system and part. Specific examples of teaching greatly improve students’ learning interest, deepen students' understanding of the theoretical knowledge, improve students' practical ability, so as to improve the teaching effect.
Table 1. Task-driven teaching schedule of urban rail transit.

<table>
<thead>
<tr>
<th>Task</th>
<th>Requirement</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network plan</td>
<td>Study on the scheme of Shijiazhuang Rail Transit Net Planning</td>
<td>Master the significance, principles, contents and the basic method of urban rail transit net planning</td>
</tr>
<tr>
<td>Line design</td>
<td>Study on the scheme of Shijiazhuang Rail Transit Construction Planning</td>
<td>Master the design stage, principles, track alignment, route laying mode of line design</td>
</tr>
<tr>
<td>System constitution</td>
<td>Study on the main technical standards of Shijiazhuang Rail Transit (vehicle type, track structure, power supply mode, communication &amp; signal system, environment control equipment and ventilation mode)</td>
<td>Master the composition, type, technical parameters and design principle of vehicle, car depot, track, power supply system, communication &amp; signal system, and environment control system of urban rail transit</td>
</tr>
<tr>
<td>Operation management</td>
<td>Put forward the measures to strength transportation capacity of Shijiazhuang Rail Transit</td>
<td>Master operation management mode and the measures to strengthen transportation capacity of urban rail transit</td>
</tr>
</tbody>
</table>

Implementation Effect of Task-Driven Teaching Mode

It is of great significance to carry out the "task driven" teaching method: It can motivate students' learning interest and enthusiasm. Students enjoy achievement and their inner learning mechanism can be developed by means of both teacher and students' cooperatively finishing tasks. The teacher's approval of students learning, can stimulate students' learning enthusiasm and interest in learning, enhance self-confidence, so that students advance their profession in a good state of mind. It is helpful to cultivate students' ability of analyzing problems and solving problems independently. In order to teach students in accordance of their aptitude, teachers can put forward basic tasks and extended tasks in teaching design. The extended task leaves for the excellent students to complete.

In the process of task driven teaching implementation, a regular discussion is organized to improve the teaching content, teaching methods, and arrange the teaching progress, etc. The course adopts three-dimensional appraisal method, combining the task implementation and curriculum assessment. Some 70 percent of marks are awarded for task implementation and 30 percent of marks are awarded for course close examination. Task implementation evaluation refers to combining the results of process assessment and results evaluation based on the project system. Course close examination is assessment to understand and hold theory teaching knowledge. The comparison of students' achievement before and after the task-driven teaching method application is shown in Table 2. It is shown that application of task-driven approach to urban rail transit teaching stimulated the students' interest in learning, improved the learning effect, promoted the combination of theory and practice, and also cultivated the students' engineering ability.

Table 2. Implementation effect of task-driven teaching mode.

<table>
<thead>
<tr>
<th>score segments</th>
<th>Before reform</th>
<th>After reform</th>
<th>Growth Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>Percent (%)</td>
<td>Number</td>
<td>Percent (%)</td>
</tr>
<tr>
<td>90~100</td>
<td>14</td>
<td>22</td>
<td>4.8</td>
</tr>
<tr>
<td>80~90</td>
<td>35</td>
<td>36</td>
<td>0.3</td>
</tr>
<tr>
<td>70~80</td>
<td>70</td>
<td>69</td>
<td>-0.1</td>
</tr>
<tr>
<td>60~70</td>
<td>33</td>
<td>31</td>
<td>-1.2</td>
</tr>
<tr>
<td>&lt; 60</td>
<td>8</td>
<td>2</td>
<td>-4.0</td>
</tr>
<tr>
<td>Total</td>
<td>160</td>
<td>160</td>
<td>—</td>
</tr>
</tbody>
</table>
Conclusions
Task driven teaching mode is a task-based method to take the teacher as leading and the student as chief body, so as to mobilize the student's activities and initiative. After two years teaching reform and practice, teaching quality and effects have been improved. Due to the application of task driven teaching mode to urban rail transit wasn't long enough, in order to have a better effect, we need to go further to propose measures of strengthening the research.

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References