Project-oriented Teaching Method for Computer Simulation of Automatic

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Abstract

The new engineering department represents the latest development direction of industry and business, referring to the new engineering discipline that is being formed or is about to be formed. The talent cultivation of colleges and universities is the most important core task for the new engineering construction to meet the current and future development needs of the industry. It is necessary to cultivate and bring up a group of cross-composite engineering and technology talents with innovative and entrepreneurial abilities and cross-border integration capabilities in high quality. In order to satisfy the training objects of Emerging Engineering Education, a new teaching pattern is needed. As a heuristic teaching method, project-oriented education is to organize students to participate in the whole process of project design, implementation and management, and complete the teaching tasks in the project implementation process. By this way, the students may acquire not only the solid theoretical knowledge but also the experience in application of this knowledge in professional field. Therefore, project-oriented teaching method is effect and competitive teaching mode for Emerging Engineering Education. For the course of computer simulation of automotive, the project-oriented teaching method is adopted. Corresponding implementation program is proposed and analyzed.

Key words: computer simulation; teaching reform; project-oriented; Emerging Engineering Education

Introduction

In response to the new demands of national strategic development, the new situation of international competition, and the new requirements of strengthening morality education, China's engineering education has established the reform direction of Emerging Engineering Education (3E). New engineering is cross-integration and multidisciplinary, leads the frontier of engineering, and guides innovative cross-border development [1]. Therefore, the construction of Emerging Engineering Education courses requires an innovative talent-training model and a curriculum system that spans the boundaries of various industries. At present, there are three main types of teaching methods in colleges and universities. One is to teach knowledge and skills in teaching language such as giving lecture and examining through questioning and answering; the other is the display method of visual perception such as experiment, demonstration and visit; the third is heuristic teaching method of “student-based, independent learning” in which the teacher is supplemented by the guidance [2]. The former two as traditional pattern have been widely used in

engineering education, and heuristic teaching methods are becoming increasingly popular.

In fact, heuristic teaching method has existed in ancient times. Confucius proposed that one would not explain unless he is desperately anxious to learn and effective learning is knowledge migration. Up to now, heuristic teaching methods are diverse, including discussion methods, research methods, case methods, project-based teaching methods, research-based teaching methods, academic-oriented teaching methods, problem-based teaching methods, participatory teaching methods, and working directed methods, etc. Professionals such as medicine [3] and management [4] often use project-based teaching and achieve good teaching results. How is the project-oriented teaching method implemented to teach engineering courses? How does it meet the needs of new engineering development? This paper focuses on the project-guided teaching method and discusses its application in the course of computer simulation of automotive.

Project-guided Teaching Method

The idea of the project-oriented teaching model came from the famous educator, Dewey, in 1986. He put forward the idea of "designing teaching method" against the disadvantages of traditional teaching pattern. The basic connotation of the concept is that there is a practical solution to be solved in the actual process of teaching. Students can grow and develop while they take advantage of opportunities and personally implement meaningful and purposeful unit activities to solve problems and gain practical experience. [5]

The project-guided teaching method firstly appeared in the United States, and is popular in Germany which has been widely used and has achieved good results in elementary education, vocational education, and higher education. The students trained by colleges and universities not only have the theoretical knowledge necessary for the future workplace, but also have practical experience in the project, so they are favored by major enterprises. .

Boehm defines project-oriented teaching mode as a teaching method that is achieved by students engaging in a complete practical work or developing a teaching theme design by themselves" [6].Simply, the project- oriented education is to guide students who study theoretical content in the form of project while teachers divide the application of course content. Then, the students are guided to develop the project, carry out the summary of theoretical knowledge, design the scheme of the project, realize the project and take the final evaluation.

In the implementation process of the project teaching method, since the teacher clearly defines the project tasks covered in the assessment at the beginning of the course, the students are more purposeful in theoretical study, and the application of theoretical knowledge is more concrete. Compared with the traditional passive acceptance teaching pattern and the disconnection between knowledge and practice, the project-oriented teaching method highly improves learning efficiency [7]. At the same time, in order to complete the set project tasks, students need to set up teams, work together, and collect project-related information in various ways. Brainstorm is good way to resolve solutions. Finally, form the schedule and implement schemes. This process effectively cultivates students' ability in independent innovation, active learning, and teamwork.

Computer Simulation of Automotive and Its Teaching Issues

The course of computer simulation of automotive is the application of computer simulation technology in the field of automotive industry. To build a simulation model on the computer, the engineer and the researcher can imitate the response of the actual system and its changing process with time. Through the observation and statistics of the simulation test process, the simulation output parameters and basic characteristics of the simulated system are obtained to deduce the actual parameters and real performance of the actual system, so that the performance and long-term dynamic characteristics of actual system can be fully realized by computer in a very short time. Computer simulation technology is the core technology of digitization and intelligence which make the vehicle design and production process more intelligent and efficient. Undoubtedly, the course is important, but there are many shortcomings in teaching.

Many teaching methods to impart knowledge ignore the development of students' intellect, and neglect encouraging students to learn creatively. In the overall structure of teaching methods, there are many teaching method used in a single. It is rare, especially in joint use of methods that are conducive to independent learning of college students. In particular, the use of self-learning methods, independent experimental methods, discussion methods, and research methods is less. In classroom teaching, there are more perfusion types, less heuristics, less discussion styles, and low student participation. The forms of individualized teaching are ignored, such as group discussions, research classes, self-learning activities, etc. Some teachers use modern teaching equipment such as multimedia, but do not use reasonable teaching methods. Teaching method reform is needed now.

Project-oriented Teaching Method for Computer Simulation of Automotive

The course of computer simulation of automotive based on engineering practice can comply with the talent training objectives of Emerging Engineering Education, which pay more attention to cultivate students' strong ability of engineering practice. Meanwhile the course is helpful to develop independent engineering design ability. Then, students are supposed to have capability of engineering innovation.by training. Due to its theory as important as practice, the traditional teaching methods cannot meet the needs of the curriculum. For this reason, projects are introduced in the teaching process. The teacher provides project-oriented training and guides students to learn independently [8]. To do a project is comprehensive training for students so that the teacher should carefully design and select every project that is an open-end one. Usually, it is better to be a practical application or research topic. Because there is no standard answer, students need to use professional theoretical knowledge to solve it gradually. To start with quantitative data, they apply mathematical modeling thought and then complete research tasks through calculation, analysis, and reporting. The training provides them with opportunities for challenging and autonomous research.

The specific implementation is as follows.

1. Projects release. In the early stage of the course, students will be able to understand the overview of titles and the teaching effect. Due to the teaching objects, a list of projects for automotive and transportation professionals is provided. At this stage, students should have clear project objectives. Based on the same point of interest, students build their own project team and each team should consist

of 3 to 5 members. The leader of each group should be elected by members, and responsible for management. Relying on the teacher's assistance, students independently decompose the projects into different stages and set the work goals for each stage. Additionally, the teacher ensures that each team member clearly understands his or her own work tasks. Everyone in a group should take responsible for their own tasks and cooperate to complete the project actively. When giving lectures, the teacher briefly introduces this knowledge point corresponding to the questions of projects.

2. Guidance of implementation process. Students arrange project execution plan according to the content of the syllabus. At the same time, everyone collects materials needed for projects through networks, databases, books, etc. The group summarize the materials, discuss issues that are decomposition sub-problems of project and work out solutions to the problems. When encountering an unforeseen problem, the scheme and schedules should be timely re-arranged. Teachers carry out the stage check and take process supervision according to the teaching log which is good for detecting problems timely and correcting them in time. To guide on key issues and make recommendations is the guarantee of success of the project.
3. Project evaluation. Each group member must participate in preparing these assignments. The assignments are team's efforts and not a copy or download of any literature resource. Team members must be divided to write different functions of each assignment and coordinate efforts. There are a large number of random interviews in the classroom, which can greatly reduce the speculative psychology of students on the final exam. The reports must be printed and should not be more than 8-10 pages for the final report. Each team will only have 10 minutes for the PPT presentation and 5 minutes for questions and answers.

Additionally, the practical and operational character of the project-oriented teaching model requires that the relevant teachers not only have the professional knowledge of the discipline, but also have the practical experience of completing the relevant projects. The teacher also have to change how they work and increase the communication and cooperation with engineers in the field. Only in this way can the professional knowledge be more scientific and practical to the students, so that students can be more competent at the future work and study. In addition, reflective teaching is necessary for the teacher to learn from experiences in the project implementation process.

Conclusion

The project-oriented teaching has obvious advantages, and it is more suitable for the cultivation of students' practical ability than the traditional teaching method, which is easier to meet the requirements of "new engineering". Engineering majors such as vehicle engineering have a significant background of industry and a large number of practical cases, providing a wealth of materials for project-oriented teaching. The combination of the two provides a good way for practical talent training. By the course reform of computer simulation of automotive, students improve their practical ability. Meanwhile they are familiar with search tools and may independently solve problem to some extent.

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