Research on Curriculum Innovation Teaching Method Based on Multi-curriculum Cross-integration

Xu Liang

Beijing Jiaotong University, Beijing 100044, China

Abstract: This paper focuses on the real "problems" in the teaching and practice of "Electromechanical Control Technology" course. Through the reconstruction of course content, the innovation of teaching methods, the reform of teaching evaluation, and so on, the innovation of teaching mode can be realized to cultivate high-level technical talents. Traditional teaching methods are relatively boring, and students are easy to form the subconscious mind of "learning from books for tests". Mind mapping is used to help students establish knowledge framework and avoid knowledge discretization. At the same time, the teaching form of "competition helps teach, competition helps learn" and the display of robot research results are introduced into the class of "Electromechanical Control Technology" to help students quickly understand knowledge difficulties, clean up knowledge blind areas, and put what they have learned into practice. In addition, this paper also proposed to integrate the knowledge of "Robotics", "Computer Control Technology", "Principles of Microprocessors and Interfacing Techniques" to guide students to digest relevant professional knowledge.

Keywords: Multi-curriculum cross-integration; Teaching method; Teaching evaluation

Cultivating high-quality talents is the main goal of higher education, which is conducive to the reserve of outstanding talents and contribute to the national economic construction, social and scientific and technological progress. How to train high-quality talents is the key and difficult problem that higher education faces. In addition, how to enhance the teaching quality and improve the teaching effect requires educators to carry on teaching exploration and practice continuously. This paper aims to explore multi-level and all-round teaching reform and exploration methods from different perspectives of teaching evaluation.

For ordinary colleges and universities, China's Ministry of Education has put forward a five-in-one evaluation system, which is an undergraduate education evaluation system with Chinese characteristics. Teaching quality can be improved effectively through teaching evaluation, but there are still some problems that are difficult to detect and difficult to improve and break through by traditional methods. Guided by the following problems, this paper tries to solve part of existing problems in the traditional teaching quality monitoring and teaching system.

（1）It is difficult to improve the teaching effect. The teaching effect in most colleges and universities is not very ideal. Although the teaching of traditional textbook knowledge is standardized, some contents are too abstract, which is relatively boring and difficult for students to understand. As a result, students do not understand the boring and unconnected knowledge, can not learn basic theories and professional knowledge thoroughly, and lose interest in learning related professional content, which leads to fear of learning related professional content. Hence, it is difficult to achieve good teaching effect.

（2）Students' feedback is not timely and incomplete. At present, the traditional teaching system allows students to evaluate the whole course at the end of semester, which makes the feedback of students untimely, and it is impossible to revise the teaching progress and teaching focus in real time during the whole course. Students can be asked to conduct teaching evaluation of relevant content in the classroom, so that the relevant contents of the lectures can be revised in time. However, this method can only understand the situation of a small parts of students, and it is difficult to understand the learning situation of the majority of students. There is a lack of real-time, effective, comprehensive and objective feedback from students on teaching.

（3）Incomplete application of evaluation results. The course teaching time is relatively short. Due to the shortage of relevant

materials in the early stage of the course, the continuous improvement effect for students and course can not been reflected.

In view of all kinds of problems encountered in the above teaching process, this paper actively seek solutions. Through a multi-level and multi-angle comprehensive analysis of various aspects including course content, teaching method, teaching evaluation, the author hopes to achieve the improvement of teaching effect.

1. Innovative Teaching Method

1.1 Reconstruction of course content

To improve the teaching quality, the course content is analyzed and studied at first. The whole teaching content of "Electromechanical Control Technology" is reconstructed. In the first lesson, the overall teaching route of this course is summarized, that is, the main content of this course is presented to students in the form of mind mapping. Each part of the course is introduced to students in a modular way, so that students can understand the interrelationship between different modular of the course, clearly know the knowledge and skills required to master in each module, and what engineering problems can be solved by integrating all modules together. In each lesson, a mind mapping is used to review the content of the previous lesson and indicate the role of content of this lesson in the overall curriculum framework.

"From the book, out of the book." This course is called "Electromechanical Control Technology". It can be integrated with the course content of "Robotics". For example, the input and output interface of "Electromechanical Control Technology" can be used to design the input and output module of robot. The ideas of numerical control interpolation in the course of "Electromechanical Control Technology" are similar to those of trajectory planning in robot technology. It is beneficial for students to have a deeper understanding of the relevant knowledge by explaining the two courses thoroughly, comparing and contrasting them horizontally and vertically. The control methods in the course of "Electromechanical Control Technology" can also be used in robots, and the contents of two courses can be combined. The integrated explanation of relevant content is conducive to deepening students' understanding of different courses in this expertise field.

In addition, it can also be integrated and permeated with courses such as "Principles of Microprocessors and Interfacing Techniques" and "Computer Control Technology", so that students can understand the similarities and differences between various systems easily. This requires teachers to have excellent relevant professional skills and knowledge, be familiar with the teaching content of different courses, and can analyze and summarize the links and differences between the relevant courses.

2. Innovation in teaching method

For the innovation of teaching method, the form of mind mapping can be used to help students sort out the teaching content. To solve the problem of "teaching effect is difficult to be improved", the knowledge can be combined with engineering practice. For example, the "Electromechanical Control Technology" course can be combined with robotics. In this course, it is found that students are easy to confuse the knowledge of upper computer, lower computer and human-computer interaction interface. The overall process of robot control can be recorded in video and shown in class to clarify the confusing concepts and their relationships. By concretizing abstract concepts, this teaching method is more conducive to enhancing students' mastery of relevant knowledge.

At the same time, it is necessary to make full use of multimedia to display the relationship between the content taught, deepen students' understanding, and then help students to better grasp relevant knowledge. Moreover, different course tasks can be designed according to students' future development direction, and task-driven curriculum learning can be carried out correspondingly for each student. For example, for students who want to work in the future, engineering practice-type tasks can be designed to motivate them to study the course with the goal of completing specific task.

3. The increase of teaching evaluation mode

Traditional teaching method simply asks students to give evaluation result at the end of semester. Teachers cannot improve teaching progress and teaching points in real time. Class groups can be created, and excel sheets can be can be filled in and shared anonymously in class groups for real-time feedback. At the end of each class, students can record the doubts and knowledge points that they do not understand. If a majority of students have the same question, it will be explained in the next class with more detail. Meanwhile, teachers may reflect on whether this presentation can be improved or explained in a different angle. The questions raised by a small number of students can encourage them to help each other. The content can also be summarized and prepared based on students' listening and doubts, which will facilitate independent learning by students and professional tutoring by teachers in the future. This method can make students' feedback in a timely manner, facilitate teachers to prepare lessons more effectively, and strengthen students' understanding of difficult points, which is conducive to creating a good learning atmosphere and healthy

competitive relationship. Moreover, understanding each student's problems can indirectly solve the incomplete application of evaluation results.

In addition, students are encouraged to compete in skills such as mathematical modeling and Robomaster. For example, when explaining software in class, we can explain how Matlab and its submodules are used in these competitions. Meanwhile, for students who actively participate in competition, professional explanations can be provided for them during preparation, forming the teaching form of "competition to help teaching, competition to help learning".

Conclusion

This paper proposes to associate the teaching content with hot research of robotics, and combine the theoretical knowledge with the robot technology for simulation and physical display, which can not only help students quickly understand the book knowledge, but also broaden their horizons. Moreover, this paper also proposes to use mind mapping to help students establish knowledge framework and avoid discretization of knowledge. The teaching form of "competition helps teach, competition helps learn" facilitate students quickly understand knowledge difficulties, clean up knowledge blind areas, and put what they have learned into practice. Through various skills competitions, students can not only improve their professional skills, but also cultivate their innovation awareness and teamwork ability. In addition, the proposed form of course evaluation in the student group can not only strengthen the real-time teaching feedback, but also create a good learning atmosphere, so that teachers can get feedback from students efficiently and timely. Relevant research content is conducive to improving teaching quality and effect, comprehensively training students' various skills, and cultivating comprehensive talents with excellent practical ability and theoretical level.

References:

[1]Zhiyi Li, Qingqing Li, Wenfei Gong. The Quality Culture in the New Round Audit Evaluation of Undergraduate Education Teaching [J]. Higher Education Development and Evaluation, 2024, 40(02): 19-29+120.

[2]Xinghua Qi. Quadrangle of Synergism: the Emerging University Governance Framework in China [J/OL]. Chongqing Higher Education Research: 1-19 [2024-05-17].

[3]Tingting Feng, Dejian Liu, Lulu Huang, et al. Digital Education: Application, Sharing, and Innovation-Overview of the 2024 World Digital Education Conference[J]. China Educational Technology, 2024(03): 20-36.