

Curriculum Reform of Microcomputer Principle and Application Experiment to Cultivate Innovation Ability under the Background of New Engineering

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Keywords: New engineering, Innovation ability, Microcomputer principle and application, Curriculum reform

Abstract: Based on the teaching concept of new engineering, this paper formulates a set of curriculum teaching reform plan with high feasibility, rationality, multi-angles and integration, and constructs a complete teaching reform framework. Taking the course of microcomputer principle and application as an example, this paper comprehensively explores the curriculum reform measures from different angles such as teaching hardware, teaching software, teaching practice and teaching assessment. With the help of the innovative achievements made by students in the process of the new curriculum reform, it fully shows that the teaching reform framework is highly effective.

1. Introduction

In order to actively respond to the development requirements and calls of the new round of industrial revolution and scientific and technological revolution, and ensure the effective realization of a series of national strategic development goals such as “made in China 2025” and “service innovation driven development”, we should strengthen the active exploration of the Chinese model of engineering education, cultivate a number of engineering and technical talents who can highlight Chinese characteristics and have strong innovation ability, so as to improve the level of higher education and implement measures to strengthen the country. The course of microcomputer principle and application is one of the basic courses of engineering majors in many colleges and universities. It plays an important role in the curriculum system of engineering majors and is a necessary basic skill for engineering students. Strengthening the optimization and improvement of teaching rules and regulations can constantly improve students’ autonomous learning ability and practical ability, ensure that the formulated engineering education curriculum plan is highly standardized, and always take the cultivation of students’ innovation ability as the direction of education and teaching reform, so as to effectively achieve the goal of curriculum reform.

2. Strengthen the Active Reform of the Teaching Software of Microcomputer Principle and Application Experiment Course

Through the detailed analysis of the problems related to the teaching software of microcomputer

principle and application experiment course, it can be found that among the many influencing factors, the lack of rationality of teaching content and teaching methods has the greatest impact. The textbook content of traditional engineering professional courses, such as microcomputer principle and application, has high complexity, and the knowledge points of each chapter are closely linked. In the actual teaching process, students do not have a solid grasp of basic knowledge, they can't fully understand the relevant content, resulting in students having no way to start when carrying out experimental courses.

In order to effectively solve this problem, a new educational concept of "old courses and new lectures" is put forward under the background of new engineering. The teaching group discusses the course content regularly, fully understands the use of the teaching content in the field of emerging technology industries, and constantly integrates the latest research results in this field with the teaching content, so that the teaching material content and courseware content are updated in time.

Formulating the teaching plan must ensure that the class hour arrangement is highly reasonable, always follow the ideological principle of layered teaching, and reasonably divide the teaching content in combination with the degree of difficulty and practicality, so that students can master more professional knowledge in the teaching process from simple to difficult, and lay a good foundation for the effective implementation of subsequent experimental courses. When the teaching plan is formulated, the content of the plan can be adjusted reasonably in combination with the actual acceptance of students, so as to improve the flexibility of the teaching plan.

For the personalized needs put forward by students in the teaching process, we can adopt the guidance teaching method, which is based on the real world and takes students as the core, guide students to combine the knowledge they have learned, put forward questions they doubt, and then take the initiative to find the answers to the questions in the process of collaborative analysis, collaborative discussion and collaborative design. It can not only effectively improve students' ability to raise, analyze and solve problems, but also further strengthen students' teamwork ability, knowledge retrieval ability, resource screening ability and resource matching ability, so that students' learning enthusiasm can be fully stimulated, and fully meet the training requirements of innovative talents under the background of new engineering.

3. Strengthen the Active Reform of Teaching Hardware of Microcomputer Principle and Application Experiment Course

When upgrading the teaching hardware required for the microcomputer principle and application experiment course, we can start with the classroom or laboratory environment construction, strictly follow the teaching idea of "decentralized classroom", carry out regular group teaching for students, divide the original large class public courses into different groups, and prepare the experimental equipment, desks and chairs, and experimental equipment in combination with the number of group members, so as to create a good environment for further improving the communication and interaction between students. In this process, in order to avoid individual students decreasing their requirements in group teaching, flipped classroom teaching activities can also be combined, in which teachers and students exchange identities and share their learning process with others.

According to the group system, corresponding teaching guidance rooms can be established, and teachers and teaching assistants can be organized to regularly carry out small-scale course guidance for students. In this way, even if all team members can't be present, a representative can still be assigned to summarize the problems existing in the recent learning process of the team, and solve specific problems through face-to-face communication with teachers. It can not only effectively eliminate the generation gap between teachers and students, but also enable teachers to get teaching feedback in time to ensure that students' personalized requirements are fully met. On this basis,

combined with the idea of “Internet +”, we will regularly make some MOOC content for students, upload professional literature and extracurricular books related to microcomputer principles and applications on the teaching platform, for students to extend extracurricular [1].

4. Strengthen the Active Reform of the Practical Link of the Microcomputer Principle and Application Experiment Course

In the traditional engineering system, experiment courses occupy a high proportion. Therefore, the project-based teaching version, task-driven teaching method and CDIO teaching method should be reasonably infiltrated into the microcomputer principle and application experiment courses, and the experiment teaching methods that can fully meet the requirements of the new engineering should be actively explored [2].

The full integration of project-based teaching methods, microcomputer principles and application experiment courses can not only enable students to fully understand the principles and key points of each experiment link, but also actively cultivate students' autonomous learning ability and inquiry spirit. As one of the basic courses of engineering, microcomputer principles and application play an important role in high-tech industries such as robots, embedded systems and computers. Therefore, in the process of experiment teaching, scientific research projects should be reasonably introduced as practical cases, from which key practical parts should be selected, and students should be guided to use the relevant knowledge of microcomputer principles for analysis, and students should be encouraged to independently ask, analyze and solve problems. It can not only actively cultivate students' engineering consciousness and innovation thinking, but also further improve the quality and efficiency of microcomputer principle and application experiment teaching [3].

Fully integrating the task-driven method, microcomputer principle and application experiment course has more specific teaching requirements. The “task” involved in the task-driven method is no longer limited to reproducing the microcomputer program according to the specific teaching materials or building the corresponding circuit according to the connection diagram, but to provide the reference cases related to the experiment and the final goal to students. Students are encouraged to independently compile and design circuit diagrams in combination with their actual cognition and learned knowledge. We should not only change the classroom teaching content, but also fully integrate extracurricular competitions and experiment courses as much as possible. The types of electronic engineering competitions related to microcomputers have diversified characteristics. The knowledge of engineering competitions can be popularized to students in the experiment course of microcomputer principle and application, so that students' enthusiasm to participate in competitions can be cultivated, and even simulation competitions can be carried out regularly by using the environment and equipment of the laboratory. The microcomputer principle and application experiment tasks that enable students to participate in have high systematization and definiteness characteristics, which are of positive help to improve students' engineering practice ability, and can deepen students' understanding and memory of the knowledge of microcomputer principle and application experiment courses [4].

As the latest achievement of engineering education reform in the international field in recent years, CDIO education mode attaches great importance to the full integration of theoretical knowledge and practical training, and always follows the idea of “mastering knowledge in practice”. Fully integrating CDIO education mode, microcomputer principle and application experiment course can improve the course quality in a systematic way. In the process of conception, we should reasonably adjust and constantly upgrade the content of the experiment textbook of microcomputer principle and application in combination with the specific teaching objectives and the actual learning situation of students, so as to consolidate the experiment foundation of students. In the

design process, the experiment framework designed by students themselves should be reflected as much as possible, and similar teaching methods should be reasonably integrated in combination with specific needs, so that the characteristics of CDIO teaching mode with strong inclusiveness can be fully demonstrated. In the implementation link, we should strengthen the active training of students' practical ability, encourage students to find problems in the experiment process through careful analysis, and combine the knowledge content learned to solve relevant problems independently. In the operation link, it is necessary to integrate the course assessment, scientific research competition, cognitive practice and other processes, so that students can truly master the ideas of microcomputer principles and the teaching knowledge points of application experiment courses, have the awareness of drawing inferences from one instance, be able to troubleshoot engineering faults in time, and provide active help for further strengthening students' information literacy ^[5].

5. Strengthen the Active Reform of the Examination Link of Microcomputer Principle and Application Experiment Course

In order to ensure that the requirements of the new engineering education concept are fully met and its guiding role is fully played in specific teaching, in the process of assessing students, it is necessary to continuously refine and adjust the examination contents and assessment methods in combination with the actual situation ^[6].

Generally, the written examination of microcomputer principle and application experiment course accounts for about 40% of the total final score. In the process of designing the examination content every year, the teaching and research group of relevant courses should carefully select the examination questions, carefully identify the alternative questions, and design the questions with different difficulties in combination with the learning situation of students at different levels, so as to ensure that the distinction between the questions and students is significantly improved. Starting from the root cause, it is necessary to avoid directly choosing the examination questions of previous years. In the process of changing the examination questions, teachers should try to avoid simply changing the numbers or insignificant minor modifications, but should combine the latest technological development in the computer field to make the background significance of the questions fuller, and fully highlight the era-leading nature of the engineering discipline through the questions. When setting questions, it is necessary to fully examine the important knowledge points of each chapter, combine the way of breaking up into parts and asking more questions, integrate and examine as many detailed contents as possible in limited questions. In the program compilation part, students' ability to design process framework and practical thinking of the project are mainly investigated, and students' programming ability should be reflected as completely as possible in the experiment process ^[7].

The experiment part usually accounts for about 60% of the proportion, and makes a comprehensive judgment on the students' operation ability, design ability, innovation ability, troubleshooting ability, task completion degree and independence ^[8].

6. Conclusion

Under the background of the continuous improvement of China's modern education level and the comprehensive and in-depth educational reform, the teaching of microcomputer principle and application experiment has played an irreplaceable role in cultivating students' information literacy by virtue of its own diversified advantages. Colleges and universities should constantly reform and optimize the traditional engineering education and teaching mode in combination with the actual situation and development goals, and always take the cultivation of students' innovation ability as

the focus of education to achieve the goal of curriculum reform.

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