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Blended Teaching Practice of Linux C Programming for the Cultivation of Practice and Innovation Ability of New Engineering

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Abstract. According to the training goal of innovative talents in the new engineering, taking the cultivation of students' practice and innovation ability as the core, the blended innovative teaching mode of online and offline class and inside and outside class is constructed. Through the progressive training of theoretical learning, knowledge application, practical innovation and ability promotion, and the guidance and encouragement of diversified assessment and evaluation, it fully arouses the enthusiasm of students' independent learning, improves their practical application level and engineering innovation ability, and realizes all-round education with "knowledge" as the basis, "ability" as the center and "quality" as the goal. After the feedback of the teaching experiment in our college in the past three years, the teaching effect is remarkable, which can provide reference for the teaching reform of other programming courses.

Keywords: New engineering; blended teaching; practice and innovation ability.

1. Introduction

With the innovation and development of global science and technology and the continuous rise of emerging industries, the construction and development of new engineering has become an urgent need to promote the rapid development of economic society in the new situation. The new engineering majors take industrial Internet and artificial intelligence as the core, and have high requirements for computer programming ability. Therefore, a large number of programming courses will be involved in the teaching of new engineering majors in universities. The main teaching goal of the program design course is to help students establish software programming ideas, master the software development methods of various application systems, and have basic programming ability. The programming ability is the basic ability of problem analysis, scheme design, algorithm derivation and data processing in scientific research and engineering practice in the future. Therefore, to do well in the teaching of programming courses is not only a very important basic task of engineering education in universities, but also the key to the training of new engineering talents. This paper takes the teaching of Linux C programming course as an example to carry out research and reform practice.

2. Course Analysis of Linux C Programming

Linux C programming is a major main course with strong practicality. This course has higher requirements for practice links, and pays more attention to the training of students' programming thinking and practical ability. Linux C programming mainly studies Linux system calls, uses the interface functions provided by the Linux operating system to access the kernel and complete the user's related operations such as files, processes, threads, network communications and so on. Students are required to skillfully master the programming calling methods such as the format, function, parameter and return value of all kinds of interface functions, deepen their understanding of the idea of structured programming, improve their ability of software design and development and the ability to analyze and solve practical engineering problems, and lay a solid foundation for the study of subsequent professional courses. However, under the traditional single teaching mode with teachers as the main body, students only learn knowledge passively, lacking active thinking

and hands-on practice of the programming process [1]. It seriously affects the learning effect of the course and the improvement of students' innovative practical ability, which goes against the original intention of training applied talents in new engineering. Therefore, for this course, it is necessary to build a new teaching mode for the cultivation of students' engineering practice ability.

3. Construction of Blended Teaching Mode of Linux C programming

This paper makes full use of informationize teaching means to build an online and offline blended teaching mode to achieve student-centered active and participatory learning before, during and after class. Through problem discussion, scenario simulation, case explanation, task-driven and other ways to fully create student-centered participatory learning situation, and effectively integrate ideological and political elements, comprehensively enhance the interest, efficiency and education of curriculum teaching. On the basis of in-class teaching, we can further build an extracurricular ability promotion platform to achieve the dual cultivation of students' abilities inside and outside class. The structure of multi-dimensional blended teaching mode is shown in Fig. 1.

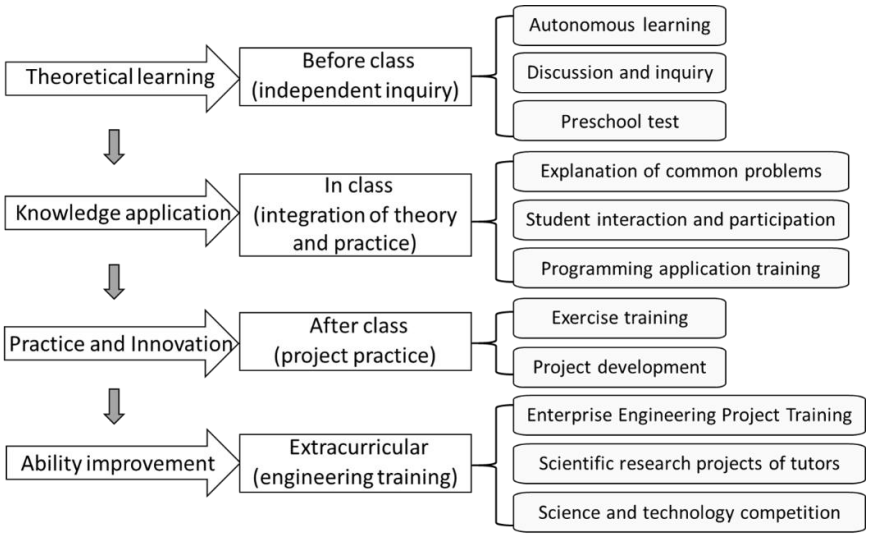

Fig. 1 Structure diagram of blended teaching mode

3.1 Autonomous Preview Before Class

With the continuous development and deepening of modern information technology, micro-lectures, MOOC, online open courses and other educational information means have become very important auxiliary means in college teaching. Therefore, make full use of online teaching platform before class, integrate different curriculum resources, and realize students' active learning and independent inquiry. Record the pre-class self-study content into a knowledge point micro-class, guide the students to complete the pre-class self-study tasks and pre-test online through the online platform, try to think independently and discuss in groups to solve the open thinking problems reserved by teachers, so as to cultivate students' autonomous learning ability.

3.2 Integration of Theory and Practice in Class

In order to change the problem of non-synchronization between theory and practice in traditional teaching, we arrange the classroom teaching in the computer room and weaken the distinction between theoretical and experimental classes. Teachers' knowledge intensive teaching is synchronized with students' discussion, exploration and practical training, so as to achieve the alternate integration of teaching, learning and doing between teachers and students, and truly achieve the integration of theory and practice [2]. In class, the teacher explains around the important and difficult contents, guide students to think along the teacher's ideas by preset phased teaching goals, and then carries out practical operation training with students as the main body, so as to find

and discuss problems in the operation process, so that students can deepen their knowledge understanding and improve their practical ability. Finally, the teacher guides the students to summarize the programming ideas and steps in the form of mind map, enhance the logic of the knowledge system, and exercise the students' structured thinking ability.

3.3 Projectized Expansion After Class

After class, On the basis of knowledge consolidation and practice, we increase the expansion links and carry out project training, so that students can better understand the practical engineering application significance of the learned knowledge and improve their ability to comprehensively use the learned knowledge to practice [3]. The teacher can choose appropriate project examples from their own scientific research projects, authorized patents and all kinds of electronic design competitions topics in previous years for students to complete. We can set up process test and comprehensive test, and give corresponding evaluation and incentive according to the completion. Excellent achievement display links can be set up to provide students with an opportunity to share experience, communicate methods, and broaden thinking. It can also enhance students' self-confidence and sense of achievement though the display.

3.4 Integration of Capability Improvement

Guided by the cultivation of practical and innovative ability, supported by enterprises, scientific research and competitions, an extracurricular integration platform for students' ability improvement is further built on the basis of in-class teaching. Give full play to the advantages of school enterprise cooperation and collaborative education, integrate the concepts, technology and resources of local industries into the talent training system of universities. Both schools and enterprises participate in the development of teaching and practice projects to achieve a high degree of integration of the teaching environment and the enterprise environment [4]. Through enterprise project training and participation in tutor's scientific research projects, students can feel the engineering atmosphere, cultivate the ability to analyze and research engineering problems, and improve the ability of engineering application and practical innovation. In addition, with the help of scientific and technological innovation competition, it can stimulate students' enthusiasm for scientific and technological innovation, promote learning by competition, promote practice by learning, so as to cultivate students' ability of practical innovation and teamwork skills.

4. Establish a Diversified Assessment and Evaluation System

According to the characteristics of heavy hands-on practice of programming courses, the course assessment mode is no longer based on a single theoretical assessment form, but adopts a diversified evaluation mode integrated into the evaluation of various practical parts, so that the assessment can runs through the whole teaching process of the course. The assessment methods and evaluation standards adopt the appraisal system and skill quantitative index system jointly formulated by school and enterprise, and the students are evaluated according to the enterprise standards, so as to construct a three-in-one evaluation mode of school, enterprise and students. The assessment content is diversified, including the usual skills test, professionalism, teamwork ability, autonomous learning ability, innovative spirit and other factors. The evaluation subject are not only school teachers but also enterprise tutors. And there are many ways of evaluation, including other-evaluation, student self-evaluation and group mutual evaluation and so on.

5. Analysis of Practice Effect

This teaching mode has been continuously practiced, explored and improved in the Linux C programming teaching of automation (school-enterprise cooperation) major in our school, and has

achieved remarkable results in the past three years. The comparative data of teaching effect before and after adopting blended teaching mode are shown in Table 1.

Table 1. Comparative Analysis of Teaching effect

	Learning interest	Autonomous learning ability	Practical application ability	Engineering innovation ability	Average score	Excellence rate
After adopting the new teaching mode	A	A	B	B	84.2	25.8%
Before adopting the new teaching mode	D	C	C	D	75.9	14.6%

（Notes：A：excellent；B：good；C：medium；D：poor）

The implementation of the blended teaching mode breaks through the time restriction of traditional teaching, realizes omnibearing teaching before class, during class and after class, and achieves good teaching results. As can be seen from Table 1, the average grade and excellence rate have improved greatly. By creating the student-centered participatory learning situation, the students' initiative and enthusiasm are fully mobilized, and the learning atmosphere of the whole class is greatly improved.

The integration of theory and practice teaching realizes the synchronous mutual promotion and dual strengthening of theory and practice, and improves students' practical innovation ability and ability to analyze and solve practical engineering problems. The analysis data in Table 1 shows that students' autonomous learning ability, programming level and innovative ability have achieved significant improvement across multiple levels after adopting the new teaching mode. More students are actively involved in scientific and technological innovation, participate in various subject competitions, achieve excellent results, and cultivate their innovative thinking and team spirit.

6. Summary

In view of the many problems existing in Linux C programming course under the traditional teaching mode, combined with the course characteristics and learning situation analysis, this paper makes an innovative design for the whole teaching process on the basis of blended teaching mode. It emphasizes the cultivation of students' practical ability and professional skills, and realizes the all-round education of knowledge, ability and quality. After nearly three years of course teaching reform in the school-enterprise cooperation undergraduate major of our college, students' interest in learning has been greatly aroused, and remarkable results have been achieved in the aspects of course teaching effect, students' programming level, innovative and practical ability, academic competitions, etc. However, the reform of teaching mode is a long-term process. In the future teaching process, we should continue to explore and improve it, so as to better train high-quality applied engineering and technical talents for the society to meet the needs of economic development.

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