Exploration and Reflection on the Construction of Embedded C Language Course

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Abstract. In the process of teaching embedded C language, we adopt the online and offline flipped teaching mode to design teaching cases that include both course knowledge and moral education. It can not only solve the problem of insufficient class time but also effectively combine "professional theory" and "moral practice".

Keywords: Online and offline; Ideological and political education; Professional theory; Moral Practice

1 Introduction

Embedded C language course teaching exists in the teaching mode of "teacher teaching-student memory-final exam", students lack internal motivation, low participation in the course, and insufficient practical and innovative ability. The traditional knowledge system and teaching resources are obsolete and can hardly meet the requirements of "new engineering" construction and collaborative education in the new era [1]. The traditional assessment method has the disadvantages of discreteness and singularity, which is not enough to support curriculum reform and continuous improvement [2]. Embedded C language is a professional basic course in science and engineering, with many majors and many students benefiting from it. After adding ideological and political elements, it can cultivate embedded programming talents with strong technology and high quality [3].

2 Reorganization of course teaching content

To solve the above problems, the first step is to reorganize the teaching content of the course and build a "competency-oriented, project-driven" teaching model. Form a four-level learning process of "task decomposition - knowledge internalization - design integration - project implementation" to achieve the progression of four compe-

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tencies of "knowledge acquisition - communication and collaboration - practical innovation - comprehensive literacy".

(1) Before class: Based on "engineering case resources", "competition project resources" and "online course resource platform", assign small engineering cases and competition projects → task decomposition → access to information → knowledge acquisition. Stimulate students' intrinsic motivation and focus on cultivating the ability of independent learning and independent thinking.

(2) In class: reduce theoretical knowledge lecture, implement the analysis of important and difficult points → project analysis → discussion → conclusion, etc. Improve teaching efficiency and accumulate process assessment data through auxiliary teaching platforms such as the Super Star platform, focusing on cultivating the ability of modern knowledge system construction, communication and collaboration and engineering practice.

(3) After the class: project demonstration and integration → modeling and simulation → optimization of implementation, strengthening the knowledge system, improving digital information literacy, communication and collaboration, project practice and critical thinking abilities.

(4) Precise curriculum thinking, and politics resources include five perspectives: patriotism, international perspective, professional norms, ethical safety, innovation and entrepreneurship. Through the mode of "presenting before class - internalizing during class - practicing outside class", we can realize the collaborative education of "explicit major + implicit thinking and politics".

3 Rational design of learning resources and activities

In designing the learning activities, the school can divide the course into several areas, which include theoretical teaching activities, online activities, and practical teaching activities. Teachers mainly assume the role of guide and organizer in blended learning and teaching, responsible for leading students to use online resources to start learning and control the whole teaching process more comprehensively, and also encourage students to solve problems related to knowledge learning on their own and promote the use of cooperative learning among groups to complete tasks more effectively. At present, how to combine online teaching and offline teaching is a problem that teachers need to think about, and they need to grasp the timing reasonably. Specifically, teachers can share and assign some learning tasks to students through a pre-class way, and then ask students to complete the learning tasks based on the online teaching platform. In the process of completion, teachers can make good use of their existing online resources and take the initiative to collaborate with other students to further enhance the efficiency of task completion. For problems encountered in learning that cannot be completed effectively through individual and group learning, teachers can be called upon to help. It is important to note that throughout the learning process, to better reflect the blended learning approach, teachers need to allow students to engage in collaborative learning based on independent learning so that collaborative learning is supported by independent learning. Therefore, teachers can let students complete

the tasks alone and then communicate with other students to promote the integration of independent and collaborative learning and provide better help for students learning.

4 Course implementation plan

4.1 Continuous optimization of teaching contents

The content of the course must be further optimized in relation to the development of technology, and the measures to achieve this are as follows:

(1) Project driven, highlighting the application. Further, optimize the actual engineering cases to project-based teaching.

(2) Competition traction to promote innovation. Integrating the outstanding cases of the Blue Bridge Cup National Software and Information Technology Professional Competition and National College Student Intelligent Vehicle Competition into the course teaching, actively organizing students to participate in various competitions, declareing innovation training projects as well as participating in teachers' scientific research activities and other measures to promote the cultivation of students' application innovation ability.

(3) Examination to promote learning and enhance employability. Encourage students to apply for national computer level exams, first for national level 2 and then for national level 3.

4.2 Online and offline flipped teaching mode

The online part makes full use of China MOOC University and the school's Super Star platform to complete the process of video learning, post-class review, homework submission, problem feedback and discussion, and evaluation of learning effects after class time [4].

(1) Improve the online basic resource library, including class videos, lesson plans, presentations, teaching designs, program codes, unit knowledge test library, course test library, examination and certification simulation questions library, examination and certification real questions library and other resources, which can realize online self-study and self-test, and realize independent learning process evaluation.

(2) Construction of an expanded resource library, including project libraries, industry dynamics, occupational standards, job requirements, software product development processes and specifications, through cooperation with enterprises, under the guidance of "engineering learning integration" and "project-driven" concept, all resources are built around enterprise requirements and practical projects.

Specific realization measures:

(1) Fragmented teaching resources. According to the characteristics of mobile learning now, the construction of each resource should be designed as fragmented small materials for granular storage, so that it is convenient for users to retrieve and learn according to their needs anytime and anywhere.

(2) Structured design of teaching resources. The layout of the teaching resource library should be designed in a structured way to avoid the difficulty of finding resources because of the "huge amount" and to pay attention to teaching and applicability. Upload the pre-prepared teaching resources to the network gradually.

4.3 Improve teaching evaluation

Establish a diversified evaluation system, adopt a variety of assessment methods, improve the process of formative evaluation, and assessment to meet the requirements of the degree of challenge, and consistent with the course objectives, and professional graduation requirements [5]. Course evaluation should focus on the evaluation of the results and student behavior achieved after the implementation of the course, focusing on whether students' learning is engaged, rewarding and developing. Focus on the operability of the assessment.

Specific measures to achieve this are:

(1) Diversification of evaluation subjects: establishing a diversified evaluation system of student-student mutual evaluation, student self-evaluation and teacher evaluation.

(2) Diversification of evaluation objectives: assessment from various aspects such as knowledge, ability, quality and innovation, focusing on both the learning results and the learning process.

(3) Diversified forms of evaluation [6]. Separation of offline teaching and examinations at mid-term and end-term, online video learning, unit tests, course tests, practical operations, etc., giving full play to the resource advantages of MOOC master teachers' resources and Super Star teaching platform.

5 Designing classical teaching cases that contain both course knowledge and ideological education.

Introducing relevant stories of Civics sharing in the appropriate teaching sessions makes the effect of education reach a breathless feeling like a duck to water, like salt in the soup [7]. For example, in the early stage of the course, while teaching the basic knowledge of C language, the story of China's first programmer, Mr. Qubojun, is introduced. Through the sharing of his story about his schooling, entrepreneurial experience and the founding of Kingsoft Corporation, students are made aware of the importance of embedded C language courses and the necessity of continuous exploration and learning and are cultivated to develop a good sense of independent learning and continuous learning [8].

When learning the if...else if statement to implement the selection structure programming, we introduce the profound proposition of "choice" in life and the case of cryptographer Wang Xiaoyun, who chose cryptography for the sake of national security and to make China's cryptography at the forefront of the world and strived to take the path of science and technology for the benefit of the country and the people. The case of the cryptographer Wang Xiaoyun, who chose to work in cryptography for the

sake of national security and to make China's cryptography the world's forefront, strives to take the road of science and technology for the benefit of the country and the people, guiding students to make the right choice in their life.

6 Conclusions

This teaching reform solves the problem of insufficient classroom credit hours after integrating the content of Civic Education while the total number of course credit hours and course lecture content remains unchanged. In online and offline flipped teaching, students can use their free time to study online in the dormitory or library, saving a lot of classroom teaching hours [9]. Use MOOC and SPOC quality resources to learn the radiation knowledge of embedded C language by themselves [10]. The combination of online and offline can not only solve the problem of insufficient classroom hours but also effectively combine "professional theory" and "ethical practice". This not only improves the students' basic knowledge of C language but also improves their practical and innovative ability.

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