

Research on Teaching Reforms of Embedded System Course Under New Situation for IOT Speciality

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ABSTRACT

Facing the rise of international anti trade doctrine, China's science and technology development is facing more and more challenges. Under the new situation, how to play the role of educational reform in the development of science and technology is particularly important. The traditional teaching method has been unable to meet the needs of social development and does not meet the needs of personnel training objectives. Therefore, we should timely revise the traditional teaching ideas and reform the curriculum with new objectives. Embedded System Course, as a course closely combined with electronics, computer, communication engineering and Internet of things engineering technology, its teaching reform is urgent and very important. This paper studies and explores the problems in the teaching of embedded system course, and puts forward the corresponding reform measures. Its purpose is to comprehensively improve students' learning initiative, improve practical ability and problem-solving ability, and cultivate more practical and innovative engineering application talents for the country and society.

Keywords: *Embedded system course, Products case analysis, Promotion of projects and competition, Comprehensive evaluation.*

1. INTRODUCTION

At present, the traditional teaching system is still used in the teaching of engineering courses in Colleges and universities, which focuses on the teaching of theoretical knowledge and ignores the cultivation of practical innovation ability and quality. The teaching is out of touch with the actual engineering needs, resulting in students' forgetting of theoretical knowledge and weak practical ability. Embedded system technology is a very close combination of electronics, computer, communication engineering and Internet of things engineering technology. It involves all aspects of software and hardware. It is not only a huge knowledge system, but also comprehensive and practical. In the traditional teaching, more emphasis on theoretical teaching, experimental practices are often relatively simple, lack of systematic learning and exercise. In the process of learning, many students memorize painfully to complete the theoretical knowledge learning, not to mention the improvement of practice and comprehensive ability.

In this paper, the related teaching reform measures proposed are described for embedded system course of

Internet of things engineering specialty. The practice suggests that these measures greatly improve the theoretical level of students, improve the practical ability and innovation ability.

2. PROBLEMS IN TRADITIONAL TEACHING

As we know, embedded system has two significant characteristics: one is the combination of software and hardware, which can be said that any embedded system is the result of software and hardware collaborative design; the other is application-oriented. Embedded system improves product performance and reduces product cost by embedding into specific products. Embedded system as a course, it is a combination of software and hardware courses. It not only includes the more complex hardware composition and working principle, but also includes embedded software design also involves some engineering experience and field experience in embedded application development. In addition, there are many pre-teaching courses in embedded system, such as Programming Basis, Analogy Circuit, Digital Logic, Computer Composition Principles, etc. This requires teachers of embedded

system course not only to have a solid foundation of embedded software and hardware, but also to have rich embedded engineering experience and industry background. Embedded system course adopts the teaching mode of classroom teaching and experiment, which has the following problems in teaching and learning.

2.1. Knowledge Indoctrination Teaching Mode

Most of the traditional teaching methods adopt the way of knowledge indoctrination. The teaching goal of teachers is to pass on the knowledge stored by themselves to the students as much as possible, but they ignore the students' acceptance ability. The lack of interaction with students in the teaching process cannot arouse students' learning enthusiasm, and the final teaching effect is counterproductive.

2.2. Passive Acceptance Learning Model

Due to the teaching content too much, the opportunity for students to participate is relatively small, most of the time is passive acceptance of knowledge with no clear goal; there is no good way to attract students' attention in curriculum design, students' learning motivation is insufficient, resulting in low interest in learning and poor learning effect.

3. EXPLORING TEACHING BASED ON THE CASE ANALYSIS OF ENTERPRISE PRODUCTS

In the traditional teaching, as there's no vivid entity illustration, it is difficult for students to understand the theory and techniques of embedded system, and to grasp the key points when learning without the actual product explanation. Theoretical knowledge learning has become rote memorization. To solve this problem, we introduce enterprise products case analysis as the theoretical teaching content, and teach and lead students to research on the system from hardware to software with the ARM9 S3C2440 development board of Forlink Co., Ltd.

The relevant hardware manuals, software resources and documents, supported by the company, are not easy to digest for students. Therefore, in the teaching process, we should first sort out the basic concepts of the course, such as, for hardware layer, processor architecture classification, working mode, coprocessor, memory management unit (MMU), GPIO, DMA, serial communication interface(I2C, SPI, UART, etc.), RAM Chips, Flash Chips, and so on. For software, there are special important concepts such as assembly condition execution, software interrupt and software debugging, bootloader, internal Core, root file system, etc. After students have mastered the meaning of these concepts,

they will have a solid foundation for the relevant technical documents.

In addition, the product cases provides a wealth of experimental resources, teaching experiment design project is based on these materials, requiring students to carry out a more comprehensive design. Through the mature code learning of many small projects, students deepen the consolidation of important theory and technology.

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In order to solve the problems existing in the teaching of embedded system, we take "useful, interesting, building students' confidence" as the guiding ideology, and actively explore the teaching method reform of embedded system. On the basis of the existing teaching materials, a large number of lively products cases and related engineering applications are introduced. Through these teaching cases, we can improve students' interest in learning and let them actively participate in the learning process, and resolve the teaching difficulties of the course and reduce students' frustration when learning the course. Besides, we emphasize the engineering application of the learned knowledge to cultivate students' practical ability and innovation ability. Through the knowledge points of the course above, we establish the overall concept of embedded system, and cultivate the comprehensive application of the knowledge learned ability. We strongly emphasize the connection between the courses, and laying the groundwork for the follow-up courses.

The above teaching method is a teaching method based on product cases analysis. According to the needs of classroom teaching objectives and teaching contents, teachers guide students to participate in analysis, discussion and practice, so that students can actively think and explore in specific problem situations, which cultivates students' comprehensive ability to analyze and solve problems, and improve teaching and learning effect.

4. PROMOTE THE COMBINATION AND IMPROVEMENT OF PROJECTS AND COMPETITIONS

Through the implementation of the innovative training program for college students, the government cultivates high-level innovative talents to meet the needs of the construction of an innovative country. Combined with the characteristics of Internet of things engineering specialty, we extend a lot of knowledge content in the

course design of embedded system as the basic knowledge of the project applied by students of this major. In terms of content organization, it introduces embedded Linux web server, embedded Linux QT, embedded Linux driver and so on.

The project and competition driven practical teaching embodies the concept of CDIO Engineering Education, focusing on "Learning while doing". The whole teaching process is carried out in the form of project, and the goal of integrating theory and practice, teaching knowledge and training ability, and "teaching, learning and doing" is achieved.

Through flexible and diverse teaching methods and means, teachers guide students to complete the learning task, give full play to the dominant position of students in practical teaching activities, change from experience teaching to inspiration guidance, and enhance the openness of practical teaching and stimulate students' learning initiative.

Project and competition driven practice teaching takes students as the main body, and the role of teachers is like project manager. In the early stage of experimental development, teachers make project plans, organize students into different development groups, assign work, expand and deepen the project; students are the main body of project implementation, students master project development skills, make project plans, allocate resources and control project implementation process. In the process of project development, the team leader should be responsible for the system: in order to stimulate the enthusiasm and initiative of students to participate, each project team regularly carries out skill evaluation on team members under the guidance of teachers.

In the teaching of embedded system, combined with the case of embedded system, we guide and encourage students to actively apply for innovation projects and various competitions. In the process of actual teaching, teachers combined more examples with more competitions and project cases to guide students to think. Embedded system teachers are responsible for organizing the team to participate in the competition and giving professional guidance. Through this method, students' practical and innovative ability of embedded system can be improved, and their understanding of knowledge systematization is also promoted.

5. COMPREHENSIVE CURRICULUM EVALUATION

The final assessment of embedded system is no longer limited to the traditional theory examination, but integrates the aspects of classroom participation, homework and experiment. On the basis of real-time understanding of students' learning situation, classroom participation can stimulate students' interest and

initiative through learning feedback and communication. In addition, we don't assign questions limited to finding answers in the book, but designed problems which can only be solved by looking for many books, reading materials after class. The examination of the experimental practice increases the inquiry and demonstration in the process of the experiment. At the same time, the design of the experimental project is also more comprehensive. Students are required to complete the relevant preview content before doing the experiment. Additionally, for the students who participate in the competition or projects, they will be given higher evaluation in the usual assessment part. Through these measures, we cultivate and improve students' comprehensive ability.

6. CONCLUSION

In terms of the characteristics of the undergraduate of Internet of things in our college, combined with the technical characteristics of embedded system course, These teaching reforms and measures are carried out for Embedded System Course through of "case analysis based", "project and competition" and "comprehensive evaluation". From the perspective of teaching practice, these reform methods effectively shorten the distance between students and practical application, and cultivate Students' learning ability to think independently, solve problems, innovate and develop. The teaching method based on product case analysis has systematically and concisely combed the knowledge architecture, and students have improved their mastery of knowledge structure. Taking "projects and competition" improvement method as the carrier can stimulate students' competitive consciousness, promote learning by competition, study in competition and grow up in competition, which greatly improves students' interest and enthusiasm. The "comprehensive evaluation" of the course makes the learning of embedded system course not limited to the memory of fragmentary knowledge points, but the evaluation of students' comprehensive ability, so as to achieve the goal of cultivating practical, skilled, innovative and engineering application-oriented talents.

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