On Introducing Academic Competitions into Single-chip Microcomputer teaching

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Abstract

First of all, this article discusses about general problems of current SCM teaching in most colleges and universities. Then it provides a reform plan of introducing academic competitions into SCM teaching. According to years of teaching experience, the scheme that bringing academic competitions into SCM teaching, which aims to cultivate students' innovation awareness and to train their engineering practice ability, has made great improvement in both traditional SCM theoretical teaching and experimental teaching.

Keywords

SCM, Discipline competition, Teaching reform, Innovate.

1. Introduction

In universities, many specialties have offered SCM courses, including electronics, communications and automations. This course is extremely practical, with a purpose of engineering application. It asks students to master not only SCM hardware structure, interface technology and related software programming methods, but also hardware's and software's designs, developments and debugging techniques in SCM application system. All these requirements improve students' practical applied ability of SCM. However, with rapid development in higher education, college enrollment has increased greatly, and the average lab resource for each student has also declined consequently. Such a phenomenon is more severe in non-key universities, leading to students' insufficient practical knowledge and training in the four-year study. On the other hand, it results in the loss of students' interest in SCM course and their worsening operational ability, let alone sense of innovation.

At the annual national university subject competitions, there are many questions about control theory and data-collecting involved with SCM knowledge, in electronic design contest. Only when students have a good command of SCM application, can they finish electronic task. The competition enhances students' comprehensive ability of design and operation, as well as creative ability and cooperation spirit, based on practical problems.

2. Problems in traditional SCM teaching

At present, university's SCM teaching system, to a great extent, is still a cramming type, which remains as teacher-oriented and textbook-oriented, thus, students have to receive it passively. During teaching process, the current system emphasizes on accumulating and memorizing, and ignores the importance of applying and thinking. Then students only know about final results but not the reasons.

2.1 Theoretical teaching.

While delivering SCM theory lecture, professors mainly depend on PPT and blackboard notes, and follow textbook's catalogue to teach basic knowledge about SCM hardware, assembly language instructions, assembler examples and internal resources applications. Although experimental contents are arranged when professors finish one third of theory courses, it is still unscientific for sites and time arrangement of experiment and theoretical teaching. For a comparatively abstract and practical course like SCM, it is unlikely to do both theory teaching and experiments at the same time

and links an abstract theory to the practical application in such kind of teaching model. Hence, it is hard to stimulate student's interest in SCM course, and makes them find it greatly difficult.

2.2 Practical teaching.

Though many universities have realized electrical major students are poor at practice, thus, they try to solve such a problem by updating experimental equipment and improving experimental environment when laboratory lessons are added into SCM's practical teaching, but ended in dissatisfaction. For example, SCM lab usually uses experiment box for teaching, however, since the box has immobilized those typical modular circuits, students only need to connect several wires to program, compile, download and observe results. Students are familiar with the whole operational process [1], but considering the lack of building experimental circuits experience, students rarely think about principles of such experiments. Besides, because of fixed SCM hardware and programs, plagiarism is particular severe among students. On the other hand, most of laboratory projects are replication experiments of fixed contents, hence, there are limited operational chances and creativity for students. After a semester, there is little improvement in students' practical ability, operational ability and grasp of principles.

3. Reform of teaching methods to promote students' creativity, with a combination of academic competitions and teaching

To raise students' practical levels and application competences of SCM, corresponding measures must be taken to lead them to master basic designing skills of SCM system and to have a clear picture of SCM system's R&D process. Therefore, it is necessary to set up a scientific, sound and systematic SCM theory and its practical content, which benefit electrical major undergraduates from this systematical practice. Based on characteristics of SCM courses, reforms of teaching methods to introduce academic competitions into SCM teaching are shown as below [2].

3.1 Reform of theoretical teaching.

(1) Establish a "student-oriented" guiding ideology during the teaching process: "student oriented", means that teachers take the lead to make students as the main body, starting point and ending point of all teaching activities, strengthen teacher-student interaction, and use all means, both in and out of class, to make students actively learn knowledge and skills. Besides, it also asks teachers to train students' scientific analytical thinking and creative ability, and to enhance their professional competence and innovative thinking.

(2) Use competition projects as cases to illustrate theoretical knowledge: it means that in classroom teaching, to illustrate theories by introducing SCM's projects in electronic design competitions, which are related to teaching contents. Moreover, professors should pay attention to the integration of courses' scientific nature, systematic feature, inspiration and interestingness, by modernized multi-media teaching means, as to enhance the teaching effect. Under such circumstances, teachers can avoid being bored while giving theoretical instructions, and they raise student's interest in study and encourage their learning enthusiasm. As a result, students become more active to participate in science and technology competitions, therefore, competitions and classroom teaching steadily support and promote each other forward.

3.2 Reform of experimental teaching.

For the mastery of designing and operational skills of SCM application system, experiment and practice together, is a necessary key part of teaching process. The best way to improve student's operational ability is to let them participate in the research and development of projects, however, because of limitations in reality, students are rarely exposed to R&D of enterprises projects. The annual academic competitions are established to evoke students' innovative ideas, to cultivate their team spirit and creative practical ability, and to explore students' interest and potential in scientific research. Such a competition exactly offers a great chance for students to master their SCM course knowledge and to enhance SCM designing and development skills through R&D of real projects.

(1) Scientifically design experimental programs in reference to academic contests' subjects: a lot of students have gained in-depth understanding and great interests in related theories after they competed in several electronic design contests. Furthermore, students finally understand why they need to learn such courses, how to learn and what this knowledge can be used for. It inspires us to conceive and design appropriate experimental projects, which is related to academic contests and can combine the knowledge required by those contests with basic experiments. Also, in reference to electronic design competitions, teachers should think about relevant comprehensive experiments, not only to strengthen students' understanding of basic theory, but also to let them know about the application of knowledge in those specific projects, raising their study interest [3].

(2) Make differentiated requirements for comprehensive experimental projects: it refers to dividing students into different groups, including those students with strong hands-on skills who have competed or plan to take part in contests, and the other ordinary students. Then arrange different practical contents for each group based on their members' acceptance ability. In this way, it satisfies different students' needs and makes them endeavor to finish their targets. Thus, students experience a sense of success and are confident to continue their study with interests.

(3) Take advantage of current experimental equipments to build a practice platform for students: to support students for designing science and technology contests' projects, teachers should take advantage of existing experimental equipments adequately with efficiency, prolong the open period of laboratory and provide full-time faculty advisor to guide and help students with design and development. Furthermore, teachers ought to raise money for some electronic components and development boards, to build a good SCM research platform for students.

3.3 Reform of assessment methods.

Assessment principle is to combine theory with experiments, and according to SCM course's strong practicality, teachers should raise the proportion of experiment section in total scores. For instance, theoretical knowledge assessment occupies 60%, and experiment assessment takes up 70% with a regular performance covering 10%. Experiment scores depend on lab reports and actual experiment results, and the experiment results ought to be scored on the spot. Also, there should be detailed descriptions about requirements for lab report's content, format, result and creativity. Through such a reform, students are encouraged to foster study interests and self-study ability, and to improve their innovation capability.

4. Conclusion

"Practice is the best teacher." To scientifically bring contests' subjects into SCM theoretical teaching and experimental teaching, results in a win-win consequence of mutual promotion. It deepens students' understanding of theories, enhances their abilities of operation, development and application towards SCM, and cultivates their capabilities of self-study and innovation [4].

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