Exploration on the Key Issues of Teaching Reform of the Data Structure Course

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Abstract: The data structure course is a professional basic course for computer undergraduates. The educational and learning effect of this course is of crucial importance for computer software design and development. This paper analyzes and discusses the main problems existing in practical teaching of the data structure course. Based on talents training objectives of school and the thinking of training innovative software talents proposed by the ministry of education, the solutions to the key problems are proposed, that is, to optimize and perfect the contents, to adopt multiple practical teaching methods, and to form a diversified assessment method. In our educational practice, we find the enthusiasm of the students is aroused and the quality and the efficiency of studying are improved greatly.

Introduction

The data structure course is a professional basic course for computer undergraduates. The data structure course is a comprehensive specialty in Computer Science. It is the core course of computer science curriculum system. As a professional basic course, it plays an important role in the connecting link between the preceding and the following.

The data structure course focuses on the basic operation, various storage structures, algorithm implementation and performance analysis of various data. Through the learning and training of these knowledge, students can not only master these knowledge, but also choose reasonable data structure and algorithm according to the actual problem. And this improves students' ability to develop software. The data structure experiment course and curriculum design are designed to cultivate students' software practical ability and focus on cultivating students' creative thinking.

Problems in Teaching of Data Structure

On the one hand, the educational and learning effect of the data structure course is of crucial importance for computer software design and development. But the course has more content, more concepts and methods. And the teaching content is abstract and logical. The corresponding experimental requirements are higher. The programming workload is large, and many concepts need to be deeply understood and consolidated by the computer programming process. Thus some students find it is hard to understand the data structure knowledge and skills. And the course is also difficult to teach [1,2].

On the other hand, Students are not solid enough in leading courses C and C++. They are not fully aware of the two common types of data, such as the structure and the pointer. This requires the integration of knowledge related to programming in the process of teaching, stimulating students' interest in learning, combining inside and outside class, restructuring in space, so as to cultivate students' initiative and autonomy in learning.

Thus, how to integrate and optimize the contents and design the experiment projects suitable for different level students, and how to motivate the interest of students as much as possible, etc., these are problems that should be solved. As a result, it is necessary to reform the current teaching mode of the data structure course, so as to lay a solid basis for training software talents with engineering quality and innovation capability.
Reform of Teaching Mode of Data Structure

With the rapid development of information technology, how to teach the data structure course is a common problem that many colleges are facing. Based on the characteristics of the data structure course and the current problems existing in the data structure course teaching, through the experience on practical teaching in the past few years, I think the following aspects of the data structure course should be reformed first.

To Optimize and Perfect the Contents

Combining the basic knowledge with the ability application two aspects, this course has formed a set of double mainline teaching content organization form. The first main line is the learning and understanding of data structure, which is embodied in the process of simple data structure to complex data structure.

The second main line is the ability to solve the practical problems by using the basic knowledge and basic principles of data structure. This part of the course teaching is mainly reflected in the analysis of data structure application examples. The teaching methods can be flexible, such as curriculum analysis, classroom discussion, online discussion, curriculum design and so on.

For example, this course uses the problem oriented curriculum design teaching model, encourages students to propose the curriculum design topics, as much as possible the comprehensive application of sets, arrays, queues, charts and other data structures.

In the specific teaching process, the main line revolves around the first line, from the shallower to the deeper, from the top to the bottom, from the table to the inside, and gradually refined.

Through the summary of a large number of content, the teaching of the second main line guides students to gradually build the ability to solve practical problems according to the principle of data structure. Ultimately, the flexible application of knowledge will lay a solid foundation for subsequent courses, as well as future research and practical work.

To Adopt Multiple Practical Teaching Methods

Flipped Classroom Teaching Method. From 2015 spring semester, the course group set up cooperation with Tsinghua University data structure course based on the SPOC platform for hybrid flipped classroom teaching as the basis, to further explore the MOOC curriculum resources how to better landing at the Qinghai University.

Flip the classroom teaching method, emphasizes student development as the center, let students move to a harmonious, vivid and pleasant classroom teaching environment, enhance the students' subjective initiative, interpersonal skills, organizational leadership and effective to strengthen students' ability, teamwork ability, and expand the students social skills.

The Interesting Teaching Method. Good start is half of success, and interest is half of learning. In order to let the student feel "fun, pleasure", we make fun in the teaching classroom teaching into the data structure and algorithm, and to attempt to introduce classroom role-playing. This causes the student to learn in a relaxed, pleasant environment. So this stimulates the students' thirst for knowledge, and fully mobilizes students' learning enthusiasm, makes the student to understand and master the theoretical knowledge more profound and solid. This can also help students cultivate good study habits and develop a strong interest in learning[3].

The Case Teaching Method. In the course of teaching, we developed three cases. Through the analysis, discussion and practice of the case content, it can help students better grasp the theory and its practical application, and quickly enter the learning of data structure course.

The students of different levels of case teaching, especially for minority students in Qinghai, individualized training, to stimulate their learning enthusiasm, training their logical thinking ability, cultivate their innovation spirit and practice ability.

Carry out Second Classroom Activities. In the spare time, teachers organize students to hold the program design experience exchange meeting, and invite senior students to share the development experience.
The teacher hires senior students as teaching assistants, and regularly tutors students who have poor programming skills. In addition, in order to let students feel the MOOC brought about by the Internet changes, we hold "algorithm design micro video contest".

**To Form a Diversified Assessment Method**

This course is not "exam results", but depends on various circumstances to determine the course results of students. And the implementation is a diversified curriculum assessment.

At the beginning of the spring semester in 2015, the data structure course consisted of usual grades, experimental scores and final exam scores.

The usual performance (attendance, homework, classroom performance and test results based on the SPOC platform) accounted for 30%, the experimental results (experiment results and experimental test results of OJ platform) accounted for 30%, and final exam 40% (to exam mode).

**The Implementation Effect of Teaching Reform**

The blended teaching mode takes the students' development as the center, lets the students really "move", and creates a harmonious, lively and pleasant classroom teaching environment.

It improves the students' subjective initiative, effectively strengthens the students' interpersonal skills, organizational leadership and team cooperation ability, and then expands the students' social ability. Students' programming ability is improved rapidly, and the average course scores of students are greatly improved.

**Conclusion**

In the teaching practice of data structure, further research is needed, and the teaching content, means and teaching conditions are constantly updated, so that the teaching content is always connected with the development of the industry and the progress of technology.

Continue to take innovative and applied talents training as the goal, thus the students' knowledge system has the potential of sustainable development, and also has the characteristics of practicing skills.

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**References**

