

Research on Experimental Teaching Reform of Data Structure Course based on Online Test System

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Abstract

Aiming at the common problems in data structure experiment teaching, such as it is difficult for students to judge the correctness of the program in real time, and it is difficult for teachers to track students' learning situation, this paper puts forward an experimental teaching reform scheme based on online test system. This paper discusses how to redesign the teaching plan and assessment methods around the online test system, and how to organize the classroom and instruct and answer questions. And put forward solutions to the problems of dishonest answer and effective discussion.

Keywords

Online test system, data structure, experiment teaching, reform in education.

1. Introduction

Data Structure is a basic course for computer and related majors, with a large number of learners and wide influence. However, in the process of experimental teaching of data structure, the following problems generally exist: students' interest is not high, learning content is boring and old, and learning purpose is unclear; When students experiment on the computer, they often copy the program codes in teaching materials or problem sets into the compiler. Then submit it to the server in the computer room, even if you finish your homework, you don't know whether it is right or wrong or completely correct, let alone thoroughly understand the program; Because of the huge workload of teachers, it is impossible to review all students' procedures, and it is difficult to fully understand the learning situation of the class, and the problems in the experiment can't communicate with students in real time.

All the above problems have directly affected the learning effect of data structure, resulting in low pass rate of data structure course, more complaints from students about programming course, and teachers generally feel that the teaching effect is poor. In order to change this situation, the data structure research group of Chongqing University of Science and Technology put forward a data structure experiment teaching reform scheme based on online test system. It has been put into practice in class 2020 and achieved good results. This paper discusses the specific content, application effect, existing problems and solutions of data structure teaching reform by using online test system.

2. The Online Test System

2.1. Brief Introduction of Online Question Judging System

The online test system is used to check the correctness of the program source code online. The online test system can compile and execute codes, and test these programs with preset data. The submitted code will generally run in a limited environment, including time limit, memory limit, security limit and so on. After the answers to the questions are submitted, the scoring system will evaluate the instant scores, The judgment result submitted each time will be notified in time, including whether it is correct or wrong; The online question judging system will also

rank users, based on the number of answers submitted by users or the execution time of a certain question.

2.2. The Advantages of Online Test System

There are many advantages in the experimental teaching of data structure aided by online test system: (1) Stimulating students' interest in learning. The questions in the question bank are well designed and generally interesting; The system has ranking incentives and incentive modes similar to game clearance, for example, balloons will float after the program completely passes the test. (2) Immediate feedback results. Students can get their own code review results and error feedback in real time, and scoring is objective and fair. It is very easy for teachers to count their scores and know the distribution of students' scores, which greatly reduces the workload of teachers. (3) The questions in the question bank can help students to establish programming ideas and master programming ability. The topic is comprehensive and difficult, and the result is completely correct. But also meet the limitations of memory usage and running time, requiring students to have stronger thinking ability, stronger program realization ability and more comprehensive consideration.

3. The Experimental Teaching Reform Scheme based on the Online Test System

If the experimental teaching of data structure is carried out around the online test system, it will easily form an unsupervised teaching situation, which will lead to the out-of-control of experimental teaching, because of the automatic feedback of results and the reduction of teachers' involvement. Therefore, we must do a good job of "process control" in the teaching plan, assessment methods, classroom teaching and tutoring. Guide students to use the online judgment system in an orderly way.

3.1. Teaching Plan

In class, the traditional teaching mode is no longer used, and students are required to watch the video of the teacher's lecture before class, while in class, the teacher no longer transmits the course knowledge in one direction, and the focus is on organizing students to discuss important and difficult points and a large number of computer programming exercises.

The traditional teaching plan consists of theoretical lessons and experimental lessons, while the new teaching plan consists of discussion lessons and computer lessons, which are interspersed with five tests of programming ability, so as to conduct process assessment. The five tests are all centered on the teaching content, and after learning the theoretical lessons of sequence structure, branch structure, loop structure, array and function chapter respectively, Ask students to complete the chapter title in the question bank.

3.2. Classroom Organization

The protagonist in the class changes from teacher to student, and all discussions and interactions are centered on students. Teachers can divide the whole class into groups, sit in groups in class, encourage members of the same group to help each other, and discuss the topics in the online test system interactively in groups. Encourage students to actively think about problems, design algorithms, write programs, Share your thoughts with others and create a good learning atmosphere.

Programming courses can't be read or listened to, so it's possible to learn them only if you write the program by yourself on the computer. The way of flipping the classroom is to let students learn programming through a lot of computer exercises. So all the 48-hour classes were completed in the computer room. In the programming test session, the topic of this unit is usually discussed first. Let the students clear their minds before writing the code. In order to

encourage students to actively engage in interactive discussions, set up a reward system for usual grades, and answer questions or share ideas to get corresponding usual grades.

3.3. Counseling and Answering Questions

Although the online test system can instantly judge whether the program is right or wrong and give an error prompt, sometimes students will still encounter unsolvable problems, and tutoring and answering questions are still essential.

Questions in the online question judging system are generally difficult, and the description of the questions is complicated. Some students will have difficulties in understanding the questions, and there are various problems in the programming process, so teachers' tutoring and answering work is very heavy. Teachers should try to do the questions in the online question judging system before class, so as to be aware of possible problems. On the basis of pre-topic discussion, common problems should be explained in a timely and unified manner. Graduate teaching assistants can also be hired to participate in counseling and answering questions. At the same time, teams should be encouraged to help each other.

4. The Use Effect of the Online Test System

In the teaching process of data structure course, we have conducted many questionnaires on the learning situation of programming based on online test system, from which we know that students have a high recognition of this learning method. Generally speaking, the learning method of programming course based on online test system can obviously improve students' learning interest and programming ability. Teachers are also very interested in this new teaching resource.

4.1. Improve the Learning Effect

In the previous experimental class, many students just copied the homework assigned by the teacher into the program, even if they finished the task. Once there was no answer to refer to, there was no way to start. Even if they wrote the code, there were many mistakes, and some grammar errors, especially logic errors, needed help from the teacher. After the programming training of the online test system, the students' learning effect has been obviously improved. In the middle of the course, most students can solve grammar errors independently or with students' mutual assistance, and they can also solve most logic errors, just asking for help for logic errors that are hard to find. The difficulty of the questions in the online test system is generally greater than that in textbooks and problem sets, the students' code quantity and program quality have been improved.

4.2. Improve the Ability of Computational Thinking

The questions in the online scoring system are all carefully designed, interesting and close to reality. The scoring and ranking mechanism is adopted, which virtually gives students an incentive. In the process of learning, students' interest in learning will naturally increase, and passive learning will become active learning, and active learning will have more positive thinking. In the process of programming, through the design of data storage and algorithm, the understanding of the basic composition and working principle of computer is increased, the understanding of computer science is increased, and the computational thinking is cultivated subtly, which is the purpose of requiring students to study this course.

5. Existing Problems and Solutions

We also found some problems in practice. In order to give full play to the auxiliary role of the online test system in the teaching process, we must solve these problems in the next exploration.

5.1. Dishonest Answer

One of the advantages of the online test system is that it can answer questions online anytime, anywhere, which also leads to the problem of dishonest answer. Although teachers all require students to be honest, they can't answer questions by copying classmates' answers, especially those on the Internet. However, it is inevitable that some students will adopt these methods when they encounter unsolvable problems and want to get grades.

To solve this problem, we must also use technical means, that is, we need to add a function similar to "duplicate checking" on the basis of the original judgment system, judge the programs submitted by users, and automatically determine whether there is plagiarism.

5.2. Effective Discussion

Although there is a need to discuss the topics in the online question judging system, most students are not used to this kind of flipping class, and they are unwilling to express their ideas in front of many people. Often, only some active students express their opinions, and the effective discussion does not go deep into every student. Therefore, how to organize effective discussion is a problem that teachers should think deeply.

To have something to say in the discussion, students should be required to make full preparations for the discussion in advance. First, they should read the topic, be familiar with the knowledge points and programming statements used, and design relevant algorithms. In the discussion, the group leader and the teacher know the problem-solving ideas of the team members in advance, and the teacher fully encourages each group to share their problem-solving methods in the process of organizing the discussion. Give every student a chance to express himself, especially to take care of the feelings of students who don't want to speak. In order to enable students to get more thinking training and knowledge gain in the discussion, students of different personalities can be encouraged to actively participate in the discussion by voluntary speech and name-calling speech.

5.3. Experimental Instructions

Most of the question banks in the online question judging system come from famous schools and famous teachers. There are few tutoring resources in the network, and there is a lack of problem-solving guidance for the questions in the question bank. Students often feel at a loss when conducting experiments. If there is an experimental guide to help them sort out the problem-solving ideas, it will be easier to achieve autonomous learning and reduce plagiarism. Therefore, it is necessary to compile the experimental instruction book for the question bank of the online test system as an auxiliary teaching resource.

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