

Research on the Teaching Reform of Java Language Programming Course Based on Combination of courses and competitions

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Abstract. In order to stimulate the students' enthusiasm for continuous learning of the Java language and improve their practical ability, this paper combines the "Blue Bridge Cup" software competition to reform the teaching of the Java language programming course through the integration of course and competition. The practice shows that "combination of course and competition" can significantly improve the teaching effect and is of great benefit to the cultivation of applied talents in applied undergraduate colleges.

Keywords: Combination of course and competition; Java language programming; course reform.

1. Introduction

Java Language Programming is a very important professional basic course for computer majors and a computer language that Java engineers must master^[i]. However, in the traditional Java language teaching process, there are still the following problems:

(1) The ability training of students to "apply what they have learned" has been ignored. The students' practical application ability is weak, and there is a phenomenon that "learning bully" can't write code.

(2) The existing practical teaching mainly focuses on verification, so students cannot master and innovate programming technology skillfully, and their team cooperation ability is also weak^[ii].

(3) In addition to classroom teaching, students' enthusiasm for independent learning is not high.

As a result, Fresh graduates are decoupled from the needs of employers. Enterprises cannot recruit the required talents. Most graduates need to be retrained by training institutions to successfully find relevant jobs. In order to improve students' practical ability, stimulate students' interest and enthusiasm in learning, enhance their employment competitiveness, and provide high-quality talents for enterprises, this paper proposes the method that based on the Blue Bridge Cup software program competition to reform and practice for the teaching of Java Language Program Design.

2. Teaching reform content

2.1 Synchronization of course arrangement and competition

The Blue Bridge Cup National Software and Information Technology Professionals Competition aims to promote the training of professional and technical talents in software and information fields, promote the innovation and reform of computer, software and electronics teaching in colleges and universities, provide high-end talents with innovation and practical ability to the software/electronics industry, and improve the employment competitiveness of college graduates. The competition set up software (JAVA, C/C++, Python) and electronics (SCM, EDA, embedded and Internet of Things) and other competition categories, adding topics with enterprise engineering value.

The "Blue bridge Cup" software competition is divided into two parts: provincial and national competition. The registration time for provincial competition is the fourth quarter of each year, the competition time is April of the next year^[iii], and the national competition is the end of May.

According to the Internet of Things professional training program of our college, data structure is the third semester, Java courses are arranged in the fourth semester. Most of the students participating in the competition are sophomores who only learned the C language. In view of this, Arrange java to the third semester and data structure to the fourth semester. Students finish learning the Java language in the first semester of their sophomore year. When registering for the competition, they can fully consider their own advantages, choose the type of competition, and prepare for the competition during the holidays. At the same time, we will teach data structures and algorithms in the second semester. Java can be used for teaching, and targeted guidance can be given to the students participating in the competition, which is of great benefit to improving the competitiveness of students.

2.2 Integration of course content and competition content

The cases of the Blue bridge Cup are mostly practical, which are used to solve some practical problems. They focus on the logical analysis and organization of the problem solving, and the description of the background is often interesting. The teacher can introduce some questions of the competition in classroom teaching, use the problem solving mode, guide and drive students to think and discuss the method of solving problems, analyze the implementation principle of the method, and gradually deduce and summarize the general ideas to solve such problems. This mode is similar to the task driven teaching method, which is often used in many practical and operational courses. Driven by a strong problem motivation, students can often achieve good teaching results by actively applying learning resources and conducting independent exploration and interactive and collaborative learning. Combining the contest questions with the relevant chapters of Java Program Design can not only integrate theory with practice, cultivate students' logical thinking ability, but also increase the interest of the teaching content, so as to improve students' enthusiasm for learning.

For example, the design of conditional statements and circular statements is as follows: first, introduce the basic syntax requirements of conditional statements and circular statements, and give examples of common conditional statements and circular statements. Without involving complex algorithms, introduce the Blue Bridge Cup software contest topic - Careless formula:

Xiao Ming is an impetuous person. When he was in primary school, he often copied the questions written on the blackboard incorrectly.

Once, the teacher gave the question: $36 \times 495 = ?$

He copied it: $396 \times 45 = ?$

But the result was dramatic, and his answer was right!!

Because $36 \times 495 = 396 \times 45 = 17820$

There may be many such coincidences, such as $27 \times 594 = 297 \times 54$

Assume that a b c d e represents 5 different numbers from 1 to 9 (note that they are different numbers and do not include 0)

How many kinds of formulas can meet the requirements, such as $ab \times cde = adb \times ce$?

Idea: a can choose one from 1-9, b can choose one from 1-9, but cannot be the same as a

The idea of adopting programming language design is:

Each number 1-9 loops, which is the nesting of five layers of for loops. The if statement judges whether $ab \times cde$ is equal to $adb \times ce$ and each number is different. If the condition is met, $\text{cout} + 1$

1. How to ensure that they are different?

First a, then b, then c, then d, finally e

$A \rightarrow b$ is not equal to a $\rightarrow c$ is not equal to a and c is not equal to b $\rightarrow d$ is not equal to a and d is not equal to b and d is not equal to c.

This can be exhausted by using the computing power of the computer, and then find the equations that meet the conditions. Guide students to analyze problems and find solutions, and let students try to write code by combining circular statements and if statements to get answers. Finally, the teacher gives the code scheme and explains it. By introducing contest questions into classroom

teaching and changing the previous teaching methods verified by simple examples, it is helpful to cultivate students' learning interest, practical application ability and innovative thinking ability.

Integrate the knowledge points of the course content with the competition content. Through case driven teaching, take the previous competition questions of the Blue Bridge Cup as cases, and develop the teaching content with the problem solving as the main line. At the same time, we should strengthen the curriculum practice and training, stimulate the enthusiasm of students for continuous in-depth learning, and achieve the goal of promoting learning through competitions through the integration of courses and competitions.

Major innovation initiatives include:

(1)The two process examinations of the course will be changed from the traditional offline written test to online computer test. In the form of algorithm programming contest, the programming challenge will be held in public, the competition ranking will be displayed in real time, and the competition results will be taken as the usual results of the course. Through the form of competition, we can test the learning effect, stimulate the students' desire to win or lose and their thirst for knowledge, create a benign study environment, and promote the competition by learning, so as to improve the students' enthusiasm for continuous learning and enthusiasm for participating in the competition.

(2)Using the existing mature programming training platform, such as Leet Code, there are a large number of algorithm programming problems on the Blue bridge Cup preparation platform, and there are also various forms of challenge arena competitions, such as weekly competitions, thematic competitions, etc., after learning each knowledge point, competition tasks are arranged to strengthen practice, so as to promote students to carry out a large number of programming practices outside the classroom. At the same time, through participating in provincial and national competitions, appropriate competition and pressure will be given to stimulate students' potential, so that students can actively invest more energy in learning and application of the curriculum, and constantly improve students' programming ability.

2.3 Reform of course assessment methods

Combine the assessment of the course with the Blue Bridge Cup competition. Final grade (50%)+practice grade (50%) shall be adopted. Practice results: comprehensive student practice results, provincial competition results, etc. urge every student to ask for himself according to the standards of competition, so as to improve the enthusiasm of students and ensure the quality of teaching. In addition, students who participate in the national competition can apply for exemption from the data structure course and given A grade, so as to further promote the enthusiasm of students to participate in the competition.

3. Achievements of curriculum teaching reform

3.1 Remarkable teaching achievements

The author's department has successfully explored the teaching mode of "promoting learning through competition and promoting teaching through competition" since taking part in the "Blue bridge Cup" software competition in 2020, and its achievements have gradually improved. In 2020, 10 students participated in the competition., one won the first prize and two won the third prize; In 2021, 24 students participated in the competition, one won the first prize, two won the second prize, and five won the third prize. In 2022, 26 students participated in the competition, 7 won the second prize and 7 won the third prize.

3.2 Improvement of students' professional skills

Through the integration of lessons and competitions, students not only have a good theoretical basis, but also improve their practical skills. In the course of the competition, the students'

innovative consciousness and ability to solve problems independently were cultivated, and they gradually grew into talents needed by enterprises.

Judging from the employment situation of students in recent years, the winners have obvious advantages in employment. And the employment quality and salary are also significantly better than other students. This shows that the integration of courses and competitions can significantly improve students' ability to apply and practice, and cultivate talents that meet the needs of enterprises.

3.3 Significant improvement of teachers' teaching ability

While students gained both professional skills and high-quality jobs, the competition also improved the teaching ability and level of teachers and competition instructors. Teachers can guide more students to achieve greater success only by constantly exploring the methods of imparting knowledge, constantly increasing their knowledge reserves and improving their professional quality. Teachers learn together, promote each other and improve together in the process of guiding students, which promotes the continuous improvement of professional quality.

4. Summary

The practice shows that the integration of courses and competitions for applied courses can significantly improve the teaching effect and is of great benefit to the cultivation of applied talents in applied undergraduate colleges.

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