Teaching path of Java programming course based on students' ability training

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Abstract: In the teaching process of Java programming course, the traditional teaching method of "theory + program demonstration" may reduce students' ability of self innovation and independent practice, and can not cultivate their independent innovation and creative ability, which is unfavorable to students' development. To solve this problem, teachers should change the original teaching method, Abandon the traditional teaching concept, take ability training as the core content of teaching reform, reform students' teaching and introduce computer thinking into the curriculum, so as to promote students to learn knowledge, use knowledge, cultivate ability and improve quality, and raise the teaching quality to a higher level.

1. Introduction

After the Ministry of education put forward the concept of "new engineering" at the seminar on the development strategy of Engineering Education in comprehensive colleges and universities in 2017, the discussion on "new engineering" has intensified. The proposal of new engineering includes the expectation that higher engineering education will continue to adapt to and lead the deep-seated reform of new economic development, and puts forward new requirements for the cultivation of higher engineering scientific and technological talents. The construction of new engineering aims to cultivate outstanding engineering and scientific talents at all levels and types, change teaching methods and assessment methods around students' interests and personality, and update teaching process, teaching content and curriculum system. Pay attention to students' learning effectiveness and future development, increase students' choice space, make full use of online open courses, facilitate students' interdisciplinary and inter school learning, enhance teacher-student interaction, promote students' all-round development, form a "student-centered" engineering education concept, and innovate engineering education methods and means.

2. Characteristics of Java programming course

2.1 Many teaching contents

Java programming is a professional basic course for computer and related majors. The course pays equal attention to theory and practice. It requires students to master the ability of software development and engineering thinking using java language on the premise of fully understanding the basic ideas and basic knowledge of object-oriented programming. However, due to the strict and complex syntax requirements and more knowledge points of the Java language itself, it is not easy to understand and remember, so it is more difficult to combine these knowledge with object-oriented ideas and apply them flexibly[1]; In addition, at present, many teaching materials strengthen the explanation of knowledge points and grammar, which makes it easy for many teachers to fall into the phenomenon of paying attention to explaining various concepts and grammar and requiring students to complete confirmatory experimental contents such as examples in the teaching materials, that is, Java Teaching falls into the teaching mode of "emphasizing knowledge points and grammar, neglecting thinking and ability".

2.2 The course is highly practical

Java is a course that pays attention to practicality and practical ability. The purpose of practical course is to cultivate students' practical ability and comprehensive application ability. After years of

development and practice, the teaching content of the course has been relatively mature and the experimental content is relatively rich, but the experimental content is mostly modular, that is, it is limited to the verification of a single knowledge point and lacks new ideas and the systematicness of engineering practice[2]. Although students have no problems in completing these confirmatory experiments on single knowledge points, they still have no way to start when they encounter comprehensive experiments that need to comprehensively use multiple knowledge points (Fig. 1).

Figure 1 Java programming course

3. Problems in the teaching of Java programming

3.1 Students lack interest in the course

Students generally have the problem of "sound clear, look fuzzy and make up confused" in programming. Especially non computer majors are afraid of programming and always feel too difficult and boring[3]. Some students lack interest in the program design course and invest little time, resulting in weak programming ability and unable to keep up with the progress of course learning. The more they learn, the more difficult they feel.

3.2 Backward classroom teaching methods

As there are many knowledge points in the course and the teaching time is limited, in order to complete the teaching task, teachers mostly adopt the "full classroom" teaching method of "taking teachers as the leading and students passively accept knowledge". The teaching methods and means are single, lack of interaction, students have poor initiative, high fear of difficulties and lack of interest[4].

3.3 Insufficient cultivation of students' ability

Traditional teaching pays too much attention to grammar and focuses on the teaching of theoretical knowledge, which leads to students' inability to form a complete and systematic understanding of the knowledge they have learned and to flexibly apply these knowledge to solve practical problems. Many students are good at reading programs and taking exams, but they can't write a program independently, let alone use their knowledge to develop programs to solve professional or life problems[5]. In addition, students are used to the passive learning mode of "full house filling" led by teachers, have no awareness of active learning and lack the ability of innovation. Many students are helpless when they encounter problems that are not mentioned in textbooks or teachers, and will not take the initiative to seek ways to solve problems by means of help documents or networks.

3.4 Insufficient organization of practical teaching

Java experiments are mostly verification experiments, which should be completed according to the established operation steps. Students only need to fill in the missing code according to the prompt of the program template. Therefore, in the experimental class, students rarely preview before class. During the experimental operation, they just fill in the code according to the prompts, and don't think deeply about why they operate like this[6]. In the experimental teaching, teachers pay

more attention to the results made by students on the computer, but pay no attention to whether students know the operation principles and methods and really master the operation technology in the operation process.

4. Teaching path of Java programming course based on students' ability training

4.1 Cultivation of Computational Thinking Ability

We should pay attention to the method when doing anything, and the scientific method is based on scientific thinking. Scientific thinking can be divided into three kinds: logical thinking, Computational Thinking and experimental thinking. Computational thinking is the research direction of college teaching at present. It aims to cultivate students' interest in learning and produce new computational thinking, so that students can use computational thinking to solve professional problems and problems encountered in real life. In the process of college learning, we should cultivate students' Computational Thinking, so that computational thinking, logical thinking and experimental thinking become a basic thinking ability of every college student. Teachers adopt targeted and enlightening methods in the teaching process to cultivate students' Computational Thinking in the learning process[7]. Through the use of computers for knowledge abstraction, problem solving and formal description, so as to stimulate students' learning enthusiasm and interest. Through hands-on, they can put into practice to learn, so as to combine knowledge with practice and improve their programming ability, teamwork ability and self-coordination ability.

4.2 Cultivation of practical ability

Java language programming course itself is a highly practical subject. The first theoretical study is to flexibly use knowledge to complete the corresponding practical tasks in the later practical operation. Therefore, from the first class, while emphasizing the importance of theoretical knowledge, teachers should also emphasize the importance of practical ability to students. Let the students realize that if they want to learn programming well, they will not listen or understand it, but master it through continuous computer practice. It's not a terrible thing to encounter problems in the course. Every problem and error encountered on the computer is something the teacher can't talk about in class. If you make more mistakes in practice, you can better learn and master the course of programming design. Therefore, we should pay attention to cultivating students' practical operation and practical ability, especially for students who are not computer majors and love programming and design, more hands-on is also to cultivate their courage and self-confidence in facing mistakes. The tasks assigned by the teacher should go from simple to difficult, and guide the students to learn to solve various problems encountered on the computer, so as to obtain a sense of achievement and honor after solving the problems. Therefore, the process of programming and designing on the computer, debugging and solving problems correctly is the process of cultivating students' practical ability and computational thinking, which helps students explore knowledge, study and solve problems, and cultivate students' spirit of not afraid of difficulties and facing difficulties. Teachers should design the experimental content to be interesting and closer to life, so that students can learn deeply. In addition to leaving verification experiments and design experiments, students should be divided into groups. Students in different groups study different types of experiments. Students in the group divide labor by themselves, and students in the group work together to solve problems. When conducting experimental guidance, teachers should not directly answer students' questions or give answers, but guide students to explore and explore by themselves, so that students can consciously find new ideas, and let students answer through the found new ideas, so as to cultivate students' ability of independent judgment and independent learning. Finally, students can master all kinds of experimental learning tools independently, be good at discovering their own problems and loopholes in the experiment, judge and explore the problems in the experiment independently, and achieve the teaching purpose of knowledge discovery, knowledge sharing, knowledge dissemination and knowledge creation.

4.3 Cultivation of innovation ability

In addition to cultivating students' practical ability and computational thinking ability, we also need to cultivate students' independent innovation ability. After all, all practical operations are not fixed, and the application of students' independent innovation ability is also needed in the study of other courses. Therefore, in the teaching form of Java programming course, teachers can also choose more teaching methods that help to cultivate students' innovative ability. For example, teachers can use heuristic teaching methods to guide students to think independently, make full use of students' autonomy in learning, make it the main part of teaching, and let students fully participate in teaching activities. This is conducive to cultivating students' innovative ability and independent thinking ability, and maximizing students' potential. We can also teach and analyze real cases and real projects in class, encourage students to participate in discussions, and explore different methods for the same problem, so that students' thoughts are not bound, form an independent way of thinking, and form a good habit of in-depth and independent research, so as to improve students' Innovation ability. In experimental teaching, teachers should encourage students to fully express their ideas. The process and results of all innovative, research and comprehensive experiments are not required to be consistent with the standard experimental results. If students have their own unique ideas or unique ideas for the experiment, teachers should encourage and praise them, and can give additional points on the experimental evaluation report. For some designed experiments, the experimental topics should be close to life as much as possible to give students a certain creative space. Teachers can not give students reference steps and samples, so that students can play freely and create the whole experiment independently according to their own ideas. For experiments with large projects, the teacher can provide samples, group the students, freely assign tasks to the students in the group, complete the whole experiment through team cooperation, and answer each group[8]. This not only cultivates the students' ability of independent innovation, but also cultivates the ability of team cooperation, and promotes the students to express their ideas (Fig. 2).
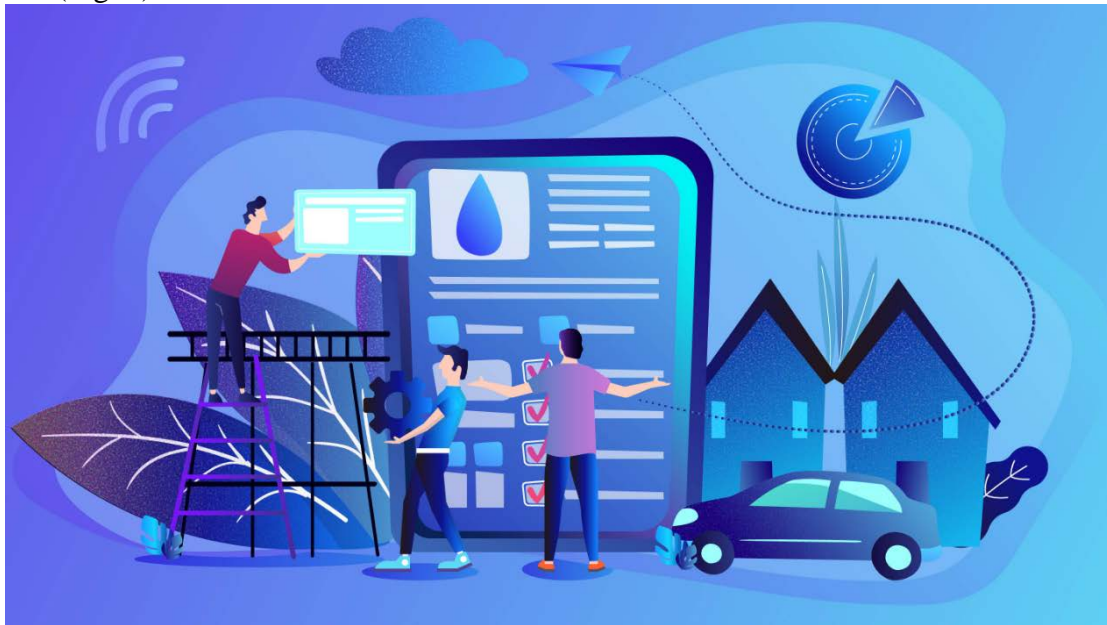

Figure 2 Java programming course teaching

5. Conclusion

Based on the possible problems in the teaching of Java programming course, this paper expounds the measures for the teaching problems of Java programming course and the exploration of Java programming course teaching under the cultivation of ability. Through the above reform scheme, some possible problems in the teaching process can be effectively solved, so as to improve the students' interest in learning, Encourage students to analyze and solve problems. For different

abilities, it can cultivate students' comprehensive quality, not only improve their personal computing thinking ability, practical ability and innovation ability, but also improve students' overall cooperation ability, which lays a solid foundation for the later learning and development of programming with Java language.

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