

Application of Multi-mode Teaching Based on Project and Case Driven in Java Programming Course

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Abstract.The Multi-mode Teaching based on project and case driven is established on the basis of constructivism theory. This paper discusses the teaching modes for Java programming course. Moreover, it elaborates the teaching philosophy, practical applications and the necessary attentions of the new teaching method. This teaching stimulates students' interest, increases the perceptual knowledge and improves students' analysis, summary and application ability.

Introduction

Java is a simple, object-oriented, distributed, robust, secure, platform-independent, portable, scalable, high performance, multi-threaded and dynamic programming language [1]. Java language is suitable for object-oriented software systems' development, and many features of it bring a new design concept to programmers. Currently, Java is as a core curriculum of programming in many higher teaching institutions.

During the teaching process of Java language, teachers are required to have a good standard and method of teaching, and students are required to have a good capability of logic designing. However, due to the knowledge of Java course is trivial, content is loosely and too difficult to organize. The theory and practice of teaching can't integrate closely. Moreover, students are lacking of enthusiasm and motivation. Therefore, how to change the concept of the teaching, adopt an advanced and reasonable teaching method to teach this course so that students can really apply what they have learned become an important research topic in various colleges and universities.

The problems of the traditional teaching mode of Java programming

At present, the Java programming course is as a professional elective for students of computer science in most universities. Due to students have learned C programming language, they have basis on the program design. The purpose of Java programming course is to help students to build object-oriented programming ideas, master the basic syntax of Java and to be equipped with certain procedures design capabilities. The traditional teaching mode begins with understanding the background, influence and development history of the programming language. Then, it puts forward the concept of object-oriented and starts the process of learning. Teachers make the learning of data operation, flow control, arrays, classes, packages, interfaces, exception handling, multi-thread, graphical user interface to the network, multimedia, and database programming as a sequence to explain, and then do some experiment on the computer to help students understanding what they teach.

However, the traditional teaching methods of the Java programming course are unity. Even the Java language teaches by multimedia, it is just reproducing the contents of the books on the screen and it doesn't fully mobilizing the initiative and enthusiasm of students. The traditional teaching methods are only emphasized the systematicness and integrity of the theory, they don't have enough attention to experiments, and resulting in the separation of theoretical and practical. Students in the learning process generally felt that the programming language is abstract and difficult to understand. They just complete the validation of the experiments in the classes, it lead to losing interest and confidence on the programming. This shows that the traditional teaching

methods are not suitable for teaching of programming languages. We need to reform and explore the teaching mode of Java programming.

The teaching philosophy of teaching method based on project and case driven

First of all, project-driven means that project development is a teaching goal in the professional courses. The project can be divided into a number of typical cases, the function and difficulty of the different teaching phase of the project is different. Case teaching divides the teaching content into some units, and guides students to master the knowledge with typical cases. Through the case teaching, students can combine theory and practical, and realize the practical application of knowledge clearly. It forms an integration of theory and practice which namely "3W1H (3W stands for What, Why and Where, 1H stands for How) "[2]. It is an iterative, cyclical process of case teaching, knowledge induction, practice case, summary and evaluation. What's more, it's an effective teaching method which can improve teaching effectiveness and train vocational skills. The project case is very important in the "project and case driven" teaching mode, students should participate in the entire project process. In this process, students should complement the knowledge any time, the interaction of teachers and students go throughout the whole process. In addition, students will learn with clear target and integrate theory and practice closely.

The application of project and case driven teaching mode in the Java programming course

During the design process of the "project and case driven" teaching mode, the subject of cognition is the student who actively constructs the sense of knowledge. Therefore, we need to follow some of the principles:

The first is project driven, the implementation process of the teaching method are divided into four stages, namely, project design, create learning resources and collaborative learning environment, guide students to complete the project and evaluate the project [3].

1) The project design is the key to learn. Project design is based on the content of teaching, which not only contains the basic knowledge, but also inspires students initially to find materials from around.

2) Teachers need do their best to provide a plenty of online resources to students, so that they can apply the knowledge in different contexts. As well, students should actively to create the study groups, so that they can take turns serving as the role of project managers, systems analysts, programmers, testers and documentation writer in the process of learning. What's more, the student can inspiring and sharing ideas each other.

3) During the implementation process of each item, students may encounter new problems in addition to original knowledge and skills. So they should think about how to achieve it and the related knowledge and technology after receiving a project. Then teachers need to give them some new knowledge or tell them how to acquire new knowledge, which can fully mobilize the students' intellectual curiosity.

4) Students should exchange the development experience and the difficulties encountered and solutions in each stage of the project development. The completion of project is the key to evaluate learning effect, because the teaching is expanding around the completion of the project design and the meaning construction.

The second is case teaching. Java programming course focuses on the practical problem-solving ability. The case provided by teachers should have practical value; it can simulate the real application environment. And students can mix the case and knowledge together during the process of case analysis and problem solving. Moreover, resolving the complex problems can break the students' original range of knowledge and broaden their eyes. The students can use comprehensive knowledge and skills neatly to deal with all kinds of problems, and improve the project's actual operation ability. In this process, the students can contact and study some different types of practical problems in the short term in school. What's more, the student can make up for the lack of practical experience and the actual operation ability, combine theory and practice to learn as much as possible [4].

In the past two years, we have reformed the teaching mode to students in computer science, and implement the “project and case driven” teaching method in the Java programming course. The Survey shows that new teaching mode is more suitable for this practical curriculum. The contrast effect of two different teaching modes is shown in figure 1.

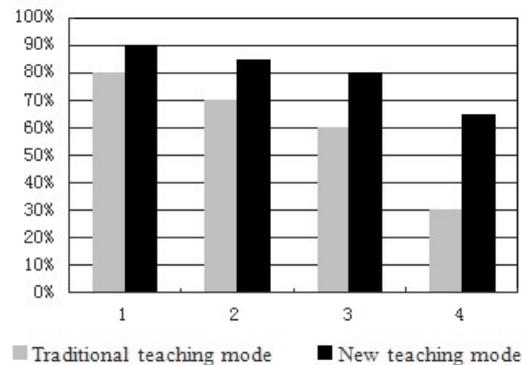


Figure.1 The contrast effect of two different teaching modes

The figure.1 shows us the teaching effect contrast of the two teaching mode.

“1” means the basic knowledge which including data type, procedure structure, operator, expression and so on. Using the traditional method of teaching, 80% students can acquire theoretical knowledge well, for new teaching method, 90% students can master this part of knowledge.

“2” means the designing of class and the applying of object. Using the traditional teaching method, 70% students can understand these knowledge, but there are many difficulties in the practical. For new method of teaching, 85% students can master the part knowledge thoroughly in practical learning, and use them flexibility.

“3” means the exercise of instance. Using the traditional teaching method, 65% students can finish example verification, using new teaching methods, 80% students could finish their example verification.

“4” means complete projects designing. Using the traditional teaching method, 30% students can write the code yourself, but there are still difficulties in implementing a complete design, for the new teaching method, 75% students have the project design experience, and can complete whole project design by team.

By contrast, the new teaching method in program development and design has the obvious teaching effect than the traditional teaching method. A new teaching method can improve students' ability of analysis problem and solving practical problems.

The related issues of the teaching mode based on project and case driven

The related issues during the implementation of the "project and case driven" teaching mode is as follows:

The first is the project settings. The main problems are as follows:

1) Project design should be feasibility. The project should be departure from real life, and be interesting and familiar with students. It should be easy to understand and can arouse students' thirst for knowledge. At the same time, the project should cover the basic knowledge.

2) Item's difficulty should be moderate in order to ensure that most students can complete after thinking and attempting. If the project is too difficult, students can't understand and accept easily, and may be "daunting" in the subsequent learning. In contract, easy project will reduce teaching quality, and affect the students' enthusiasm and motivation.

3) The design of the project should allow students to inquire materials, and to complete the design by themselves, rather than the teacher gives source code to them. If so, the ability of students to solve practical problems can't be train.

4) The completion of the project should have concrete results. When the project is completed, students will have a sense of achievement by their efforts, thus stirring up the students' enthusiasm of learning.

The second is the case settings. It needs students to complete the task in the real situation, and to improve the ability of analysis and solving problems. The case settings should be considered the following aspects:

- 1) Cases should be targeted at a specific knowledge points;
- 2) Case should be representative, so that students can draw inferences about the case and expand to other areas;
- 3) Case should be relative with each other. They set up based on the completion of the former project and can't out of line;
- 4) Cases should be practical rather than from abstract imaginary;
- 5) The difficulty of case should meet the students' cognitive law. It designs from simple to complex progressively, which will help students to mobilize the enthusiasm and understand the project's decomposition. And it's good for grasping the core idea, architecture and development steps of the entire project [6].

At last, the explanation and summary of the case. Explanation is the guidance of the case's implementation. It can help students to understand the implementation process and situations which students may encounter during the process. Summary is the induction of the case. It can improve students' development experience.

Conclusion

The "project and case driven" teaching mode is a new teaching mode based on constructivism theory. It is a more effective teaching method for learning the Java programming course and it breaks through the traditional teaching mode. Students have a sense of achievement and the spirit of exploration during the process of learning. Through the guide of case, students not only learn much in project development process, in order to master the knowledge, but also improve the ability to solve practical problems. Meanwhile, it plays a positive role in promoting students' teamwork, innovation and practical ability.

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