

Application of Project-based Teaching Mode in Algorithm Analysis and Design Course

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Abstract

Closely focusing on the national major strategic deployment on the implementation of innovation driven development, in order to effectively promote the school's innovation and entrepreneurship training plan, in view of the shortcomings of the original teaching mode of algorithm analysis and design course, the teaching content and mode are reformed, and the discussion mode of project-based teaching is adopted for teaching. Projects are more refined than more. Appropriate projects can not only strengthen students' mastery of basic theoretical knowledge, but also help students better understand relevant knowledge and make them think positively. Through project-based learning, students' ability to analyze and solve problems, improve their ability of autonomous learning and enhance their self-confidence in learning. The interesting project-based teaching method also mobilizes students' innovative thinking ability and plays a certain role in improving teaching quality.

Keywords

Algorithm Analysis and Design; Project-based Teaching; Teaching Model; Project Design.

1. Introduction

Teaching is composed of teaching and learning. Efficient teaching requires the interaction between teachers and students. Learning guidance includes both teachers' guidance and students' self-study. In fact, it realizes the classroom with students as the main body and teachers as the leading role. Mr. Zhang chuting once said: "teaching, fundamentally speaking, is thinking teaching, which guides students' thinking and enables thinking students to promote teachers' thinking." project-based teaching can turn boring classroom teaching into a lively and harmonious classroom. "Project-based teaching" is a teaching strategy based on the basic law of students' cognitive development - the process of knowledge construction is essentially a cognitive process of problem solving, Students make correct problem orientation, form problem awareness, and develop the ability to think and analyze problems independently, solve problems and find problems. Such construction is a meaningful knowledge construction process, and such teaching is an efficient teaching that helps students develop [1-4]. At the same time, "project-based teaching" can better stimulate students' interest in learning and reduce the difficulty of learning.

2. Current Situation and Analysis of Algorithm Analysis and Design Teaching

At present, most students have just freed themselves from the heavy high school homework and entered a relatively relaxed university to study. Some students think they should relax. Some students have great problems in their learning attitude, learning methods and learning ability. It is difficult to control the teaching content of multi information class, and it is more difficult to learn the course of abstract algorithm analysis and design. For simple problems, you

can write code to deal with the past, but for slightly more complex problems, you often have no way to start and have no ideas. The main problems in classroom teaching are as follows:

(1) Lack of vitality in the classroom: some students lack initiative in class. Teachers, as the protagonists, have been teaching content continuously without the active participation of students, resulting in Teachers' lack of passion for classroom teaching, dull atmosphere in the process of classroom teaching and no interactive communication between teachers and students.

(2) The teaching goal is not clear: classroom teaching generally has no goal, the teaching content is comprehensive, lacks a certain level, and does not focus on explaining according to the actual situation of students[5].

(3) Lack of real teaching feedback link: students only study to pass the exam, their interest in learning is not high, very few students actively study algorithm analysis and design, the teaching significance of algorithm design is not reflected, and the cultivation of students' innovative ability is impossible[6].

3. Practice of Project-based Teaching Mode

In order to adapt to the school's "training program for excellent engineers" of computer specialty, strive to improve the cultivation of students' innovative and entrepreneurial thinking, provide a certain platform, guide students to explore actively with specific project analysis as a clue in the classroom teaching of algorithm analysis and design, gradually cultivate students' learning interest and improve their cognition of algorithm analysis and design learning.

3.1. Principles of Project Selection

The project is the core of classroom guidance. Selecting the appropriate project is an important work, and the selection and compilation of the project is an important work. The selection and compilation of the project follows the following principles:

(1) The project should be combined with the actual teaching content, which is the expansion and extension of the teaching content.

(2) The project should consider the individual differences of students, and students can gradually conduct in-depth research and implementation[7].

(3) The project should be difficult, easy, appropriate, simple and complex, and achieve the integration of prior knowledge and new knowledge.

3.2. Implementation of Project-based Teaching

In the actual teaching, the project is designed into three types:

The first kind: the design of classroom citation project, which is mainly taught by teachers, focuses on the explanation of knowledge connection, analysis process and analysis conclusion, so as to improve students' understanding ability.

The second is the design of classroom discussion projects, which focuses on students' discussion, supplemented by teachers' guidance, focuses on application, and improves students' application and analysis ability.

The third kind: extracurricular practice project design, focusing on students' self-research, focusing on application and improving their comprehensive ability.

The specific implementation process of project-based teaching based on the above is given below.

3.2.1. Classroom Guidance Project

Linear table is the most basic algorithm analysis and design. The exercises after class are mainly to add several member functions on the basis of their own classes. What we are familiar with

are: the connection of the table, the inverse of the elements in the table, the division of the elements in the table, or used to store the basic information of students. In addition, there is the addition operation of univariate polynomials. Through the exponential comparison of the first item, if they are equal, the coefficients are added and the exponent remains unchanged, If the exponent of the first term of the first polynomial is less than the first term of the second polynomial, move the first polynomial backward and store it. Similarly, perform the same operation on other terms.

In view of this, the following questions are raised:

Suppose there are three weights with masses of $1g$, $2g$ and $3g$ respectively. Ask what kinds of mass objects can you weigh with only these weights once at most? How many different weighing schemes are there for various objects with determined mass? (a familiar mathematical problem to improve students' attention)

First, the possible weighing conditions obtained by analysis, and then Guide students to further analyze:

(1) If there is a weight with a mass of K_1 , the actual weight can be $m : \{M_1 = 0 \text{ or } M_2 = K_1\}$, and the number of weighing schemes for each mass is $p : \{P_1 = 1 \text{ and } P_2 = 1\}$. Observe the relationship between M and P ?

(2) If there are two weights with masses of K_1 and K_2 respectively, and $K_1 \neq K_2$, there are four kinds of weights that can be weighed according to (1);

(3) Inductive summary

The analysis of (1) can be expressed as: $1 + X_{K_1}$;

The analysis of (2) can be expressed as: $(1 + X_{K_1})(1 + X_{K_2}) = 1 + X_{K_1} + X_{K_2} + X_{(K_1 + K_2)}$;

Suppose n such weights can be expressed as: $(1 + X_{K_1})(1 + X_{K_2}) \dots (1 + X_{K_n})$;

Finally, how to realize the problem discussed in reality by computer, and use the single chain table in the current linear structure to store the representation of univariate polynomial $f(x) = a_0 + a_1x + a_2x^2 + \dots + a_nx^n$.

3.2.2. Class Discussion Items

Classroom discussion projects mainly reflect the integration and connection of knowledge points before and after, usually multiple projects.

First of all, when introducing the relevant operations of the stack, the project "converting decimal numbers into binary" and how to carry out the conversion (the pithy formula "removing the base and taking the remainder and reversing the row") are given. The teacher puts forward questions, students think, pays attention to the guidance of problem-solving methods, and encourages students to actively discuss, express different views and give full play to the main role of students.

Then, when introducing the relevant operations of the queue, the project "sorting problem" is given. Given several two bit shaping data are stored in a one-dimensional array, and the queue is used to sort the data. Tips: (1) create a queue array and put it in the corresponding queue according to the number of bits of the data; (2) Using the characteristics of the queue, the data in the queue is sent out of the queue and put back into the one-dimensional array; (3) Store the data in the corresponding queue according to the ten digits of the data; (4) The elements in the queue are out of the queue to get an ordered sequence.

Finally, considering the difference between the stack and queue structure and the linear table learned earlier, how to realize the storage of stack and queue? Then it leads to the actual project of parking lot management. There is a narrow passage for n cars and a gate for access. In the parking lot, cars are arranged from inside to outside according to the order of arrival. If the parking lot is full of N vehicles, the later ones are parked on the doorway. When a vehicle drives away, the vehicles behind the vehicle in the parking lot exit first, and then return to the parking

lot in turn. The vehicles on the sidewalk can enter. Let students program to simulate the above management process.

3.2.3. Extracurricular Practice Project

Extracurricular practice project design should pay attention to the application of comprehensive knowledge. After understanding the linear structure, tree structure and graphic structure in the course of algorithm analysis and design, the project "teaching plan arrangement" is given. A freshman has eight degree courses.

- (1) An effective topological sequence can be obtained;
- (2) In the directed graph, take "zero penetration" as the measure of "no precursor";
- (3) A "stack" is attached to the algorithm to save the current vertices with zero entry;
- (4) The operation of "delete vertex and arc with it as tail" can be replaced by "the penetration of arc head vertex minus 1".

3.2.4. Further Thinking

- (1) How to get all possible topological sequences? (study the adjacency table of directed graph)
- (2) Can we arrange the semester? (refer to relevant literature or books)

4. Conclusion

Project-based teaching combines abstract theoretical knowledge with life practice, and students' active learning with teachers' guidance and explanation, which not only promotes teachers' professional research and changes the original teaching methods, but also effectively monitors students' self-study process, which also has certain guiding significance for learning methods. This is like realizing the flywheel effect. In order for the stationary flywheel to rotate, you must make it very strong at first, but once it rotates, as long as a small force is applied later, it will rotate rapidly. Through the teaching practice of project-based teaching, students' learning interest and innovation ability are greatly improved.

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