

Research on Project-driven Data Structure Teaching Reform

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Abstract: This paper proposes relevant solutions to the current problems in data structure teaching design. Introducing project-driven teaching methods into data structure courses, relying on actual projects, enables students to master data structure knowledge during the process of completing projects, and achieve the teaching purpose of data structure. Teaching practice has shown that project-driven teaching methods not only effectively overcome the drawbacks of traditional teaching methods, but also enhance students' comprehensive abilities and cultivate their comprehensive qualities.

Keywords: Project-driven; Data structure; Teaching methods.

1. Introduction

Data structure is one of the basic compulsory courses in computer science. The core of this course is to enable students to master the basic concepts, construction and operation principles, methods and application fields, development directions, etc. of data structure through the knowledge learned, and to cultivate students' logical thinking ability to use computer technology to handle practical problems. The ability to apply the knowledge learned to perceive data structure phenomena, analyze and solve general data structure problems, design processing algorithms for data structure problems, and analyze and dissect complex data structure phenomena. The traditional teaching method is mainly based on teachers' lectures and supplemented by students' listening, which may lead to a lack of thorough understanding of course knowledge among students and may not meet the requirements of cultivating applied talents in universities. Therefore, this paper explores a project-driven data structure teaching reform model for computer majors.

2. The Teaching Status of Data Structure

Data structure is a core course that lies between mathematics, computer hardware, and computer software. Its content is abstract and complex, with strong conceptualization and multiple application scenarios. Students' interest in learning is not high, and there are mainly the following problems:

(1) The teaching method continues the traditional teaching mode, with teacher lectures as the main focus, students listening as the auxiliary, classroom teaching as the main focus, and experiments as the auxiliary. The single teaching method leads to unsatisfactory teaching results, a lack of ability to apply existing knowledge to solve practical problems, and a lack of self-directed exploration ability.

(2) Teaching is not based on the cultivation of students' application ability. Course teaching is not combined with the construction of network course platform, and the old single model is still used. Experimental courses are attached to a

theoretical course, which is a whole. The correlation between experimental courses is low, and they cannot be organically connected. The content setting is detached from reality, and it is unable to cultivate students' ability to analyze and solve problems.

(3) The assessment and evaluation are single, and students with high grades may not have strong hands-on abilities, lacking a scientific experimental teaching assessment and evaluation system and specific methods.

From this, it can be seen that traditional teaching methods can only meet the needs of basic teaching and cannot adapt to the innovative needs of cultivating students in the new era. Moreover, this model has not significantly exercised students' comprehensive literacy, which is contrary to the teaching goal of improving the quality of talent cultivation.

3. Design of Project-driven Teaching Mode

In terms of teaching mode, project-driven teaching methods are adopted, with the promotion of projects to learn theoretical knowledge, focusing on solving practical problems, and transforming the teaching process into a process of raising, analyzing, and solving problems. The various modules in the project will be divided and integrated into the explanation of knowledge points, connecting the front and back knowledge points, so that students can learn during the problem-solving process. Before teaching knowledge points, assign tasks to students, allowing them to learn with tasks and questions, while paying attention to balancing the difficulty of the proposed tasks, teaching in a task driven manner, and stimulating students' interest in learning. Teachers, on the other hand, explain professional knowledge based on the teaching questions raised, helping students explore project issues and professional learning, ultimately cultivating students' ability to solve practical problems.

Table 1 lists the project cases of introducing various knowledge points. The following introduces the specific implementation process of adopting project-driven teaching mode in the teaching of Data Structure.

Table 1. Project Cases of Introducing Knowledge Points

Knowledge points	Project case
List	Joseph Problem Scheme Design
Stack	Design of Calculator Conversion Function
Queue	Partner pairing problem
String	Count the number of words in an English short article
Tree	Development case of Huffman encoder and decoder
Graph	Tourism Route Planning and Design Issues
Searching	Design of Address Book Query System
Sort	Design of Student Scholarship Evaluation System
Comprehensive case study	Design of New Student Information Registration System

3.1. The Instructional Design Process

1. Pre-class guidance

Teachers carefully analyze the relevant theoretical knowledge contained in the teaching content, clarify the learning objectives, and focus on cultivating students' ability of independent learning and independent thinking. With the help of network resources and teaching platform, the project to be solved will be broken down into several specific small tasks, the subject matter of course-related videos and materials will be released, and the discussion topics will be set up to guide the upcoming teaching content.

2. In class research

The teaching mode based on BOPPPS is adopted. Firstly, project cases are introduced to elicit learning objectives. Secondly, pre-tests are conducted on students' preview resources and questions raised in the preview tasks to cultivate students' autonomous learning ability. In the participatory learning, project analysis, group discussion and other methods are used to cultivate students' ability of unity and cooperation. Finally, the online learning platform is used to publish test questions to test students' learning effects and summarize knowledge points. Daily teaching content is infiltrated into each project, so that knowledge points can be reasonably distributed and run through all aspects of the project, and can be truly applied to practice, and enhance students' hands-on ability and innovation ability.

3. Improving communication after class

With the help of online learning platforms such as Learning to receive students' free discussion, what kind of cognition has been increased through learning in class? Help students answer questions and solve doubts, guide students' existing problems, help students consolidate knowledge, and focus on cultivating students' ability to analyze and evaluate problems and solve practical problems.

3.2. Project teaching implementation

The goal of the course teaching based on project-driven data structure is to train students' ability to analyze and solve problems. Therefore, this paper takes "graph traversal" as an example to design project-driven case teaching method.

Before class: According to the content of this section of the figure, the project introduced is the problem of tourism route planning and design, and the use of online platforms such as learning to publish topics: When the students travel to do tourism route planning, assuming that from Huaian, want to travel each city in the figure, you are according to what route to play? How to reasonably plan the tour route?

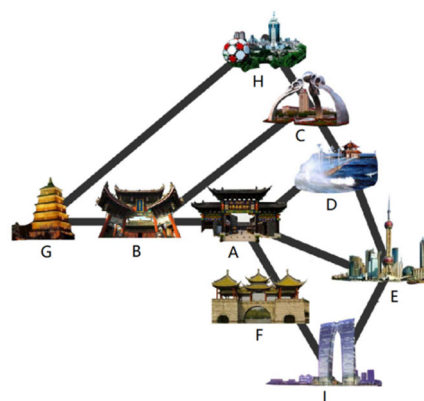


Figure 1. Tourism Route Planning and Design Issues

Lesson: Analyzing the specific requirements of the project, aiming at the planning and design of the tourist route, the route can be extended to more cities as far as possible according to the principle of depth first, or it can first travel to nearby cities, and then gradually expand the scope. Secondly, it analyzes the knowledge and course objectives needed in the process of project implementation, and master the traversal method of the graph. Group discussion, questions, flipped classroom and other methods are used to explain the traversal process and algorithm of depth-first search and breadth-first search, analyze the vertex access sequence obtained by depth-first search and breadth-first search, and cultivate students' spirit of not retreating and perseverance when encountering difficulties. Finally, the online learning platform is used to publish classroom exercises, test the learning effect of students, summarize the content of this course and introduce the next knowledge point.

After class: Students analyzed the project and determined the solution ideas through group discussion, programmed the depth first map and breadth first map of travel route planning, guided students to reflect on each other, and encouraged students to publish solutions or other knowledge expansion ideas on the online learning platform to help students develop their thinking and improve their comprehensive ability.

4. Teaching Evaluation and Reflection

4.1. Teaching Evaluation

Project-driven curriculum teaching evaluation and feedback, as well as continuous improvement of teaching methods based on it, are indispensable links of curriculum goal achievement evaluation and effective mechanisms to ensure students to achieve professional training goals. The teaching evaluation of this course focuses on the process assessment. According to the nature of the course, the evaluation indicators include the clarity of purpose, the

rationality of structure, the correctness of algorithm, the aesthetics of the interface, the standardization of documents, etc., so as to synthesize the students' ability to evaluate the knowledge level. Through the combination of self-assessment, group evaluation and teacher evaluation, the students' learning situation is assessed. When the project is completed, the members in the group will conduct self-evaluation and mutual evaluation, and then the teacher will ask questions for comments and scores. Each group member will exchange their tasks in class, analyze and summarize the problems and solutions encountered during the completion of the project, and finally, the teacher will analyze and summarize typical problems, allowing students to participate in the evaluation process of learning outcome quality, which is conducive to stimulating students' learning enthusiasm and innovation.

4.2. Teaching Reflection

In the process of the integration of information technology and innovative teaching methods, the major challenge for teachers is how to create a technology application situation that ADAPTS to teaching, so as to provide the necessary learning environment for the effective learning of students. It is necessary to constantly improve the teaching skills of applying innovative teaching methods, be good at using new technologies, and organize teaching flexibly according to the characteristics of disciplines, so as to overcome the shortcomings of traditional teaching modes and give full play to the advantages of innovative teaching methods. Through the scientific guidance of teachers, flexible design of innovative teaching activities, more practical cases of students' interest are introduced, and task-driven methods are used to gradually stimulate students' learning interest and creative enthusiasm.

5. Summary

This paper focuses on the problems in current computer course teaching and adopts a project-driven teaching method. In the data structure course, we always focus on "learning" and "teaching" for teaching design. By introducing cases and

projects that students often come into contact with in their daily lives, students can master theoretical knowledge during the process of completing projects, transform their previous passive learning into active learning, fully mobilize their learning interest and thirst for knowledge, and truly achieve a high degree of integration of theoretical knowledge and practical aspects. Enable students to fully utilize their theoretical knowledge for relatively complex application design, and improve their comprehensive abilities. There are still many shortcomings in the design and implementation, and further improvement and improvement are needed.

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