Research and Reform of Data Structure Curriculum Base on Task-driven Approach

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Abstract. This paper propose a teaching method of data structure curriculum base on task-driven, to the question of traditional teaching on data structure, which contribute to understand and master the methods of analyzing problem and solving problem, improve abilities of data modeling and design and implementation of algorithm. The result shows that this teaching method can improve initiative of studying and expand students’ horizon to make up the shortfall of traditional teaching.

Introduction

Data structure course is the professional basic course of computer related professional, belongs to the core curriculum of professional curriculum system. Expounds the course looks at the basic data structure and the application of analysis, and interpretation of the basic data structure and introduced from three aspects, such as the basic algorithm of typical content are abstract boring, it is relatively difficult to master. Traditional data structure course teaching is given priority to with teacher's teaching method, adopt more decentralized case to explain in detail a kind of data structure. In order to let the students can grasp of the system methods and steps of solving practical problems, we design the data structure of task driven teaching reform, practice has proved that the teaching reform to fill the shortage of the traditional teaching process.

The Problem of Traditional Teaching

Lack the Ability of Control Global

Undergraduate sophomore computer modeling ability is weak, without the thought of software engineering, and lack the ability to control the global. Software engineering courses are generally open in data structure course, the teaching of data structure, students have the basic experience without analysis, writing larger programs, this kind of situation caused even after learning this course, students get problem al don’t know where to begin and how to plan the whole train of thought.

Apply the Basic Data Structure Mechanically

Data structure is the most primitive data structure in the textbooks, not to extend and modify basically can't be directly used to solve practical problems, and use a variety of data structure to solve the problem and compared to find the optimal solution is more difficult for the students.

Master C Language Badly

Algorithm implementation of data structure course is need to be written in a high-level programming language to students of the program language to master degree directly affect the solution actual problem the realization degree of common problems include: variable definition is not reasonable, function, functional division, poor code readability, read and write files to master is bad, the debugger ability is weak, and so on.
The Reform of Data Structure on Task-driven

Students lack the ability to control the global as well as blunt as the basic data structure is mainly is
the traditional teaching, the characteristics of each type of data structure, storage mode and algorithm
implementation tend to use different small examples to explain, and more emphasis on the integration
of knowledge to solve a practical problem, problem analysis and solving ability of the system of
training. And high level language program design master's degree from another aspect can reflect the
students' ability of arithmetic design and implementation. Therefore data structure teaching reform
will be taken from the selection of teaching content, the use of the overall design and teaching
methods and examination of several aspects to solve the deficiency of the traditional teaching way.

The Selection of Teaching Contents Based on Task-driven

To enable students to gradually understand and master the characteristics of each type of data
structure and algorithm of system, gradually improve the ability of solving practical problems, this
course content on the break original in each data structure in the process of interpretation, in the form
of dispersion of the sample for teaching basis will carefully selected to represent each data structure
characteristic of the classical practical problems as the basis of teaching cases. Such as linear data
structure of the linear table to select the typical student performance management or address book
management as a case to explain in detail on  the basis of,  such as numerical transformation to the
actual problem as the stack again this kind of case to explain in detail the main data structure.

Design Of Course Base on Student’s Cognitive

Students' learning process in a data structure that is learning, cognitive process, which is the concrete
steps and methods to solve the problem of reality, so on the basis of summarizing the data structure of
cognitive course has carried on the overall design. When given reality to solve the practical problems,
first of all, this paper analyses the feature of the data, and then select the appropriate data structure,
finally carries on the design and implementation of the algorithm. Students in the process is in
accordance with the steps to learn how to use knowledge abstraction modeling the process of solving
practical problems. Subdividing the whole course and is divided into seven units, each unit for 4 to 10
hours, the time needed for the target selection done for each unit is a typical task to design the teaching
activities of the specific course overall design as shown in table 1. Tasks in addition to the analysis
task of the characteristics of each unit, choose the appropriate logical structure and storage structure,
the task of teachers explain is a code level, define the specification, process clear, readable, have
reference value, it is to promote students to develop good programming habits. Teachers with
multimedia means of demo code debugging process, to make the students more familiar with
programming environment, the ability of using tracking, breakpoint debugging means such as
flexible, the development process of get twice the result with half the effort.

The Implementation of Vary Teaching Method to Cultivate Student’s Ability

According to the characteristics of this course is to explain the theory of data structure, and to improve
students' ability of analysis and modeling and solving practical problems, therefore, mainly in the
teaching method driven by tasks, training task as the main line, in the heart of the task to explain in
detail the process of data structure of the three aspects of meaning is blended in among them, let the
students to solve practical problems in different data structure and analysis, induction and
characteristics of the implementation. At the same time, adopt the method of this data structure, a
custom fit for the tasks involved in data structures, the teacher will conduct a detailed analysis. Using
different data structure to solve the same problem, will differ in performance and functionality, and
students can interact with the teacher discussion to improve the understanding of various data
structures, and design for data structure to solve practical problems, and even can use a variety of
solutions.
The Evaluation of Diversify Examine Characteristic by Discipline Competition

Examining ways of design should not only diversity also reflects the appraisal of students' ability, which achieves the objective of the required skills, and achieve. Data structure course is of theory, practice and data abstraction and problem solving ability request is higher, so on the appraisal way design should make full use of the periodic evaluation to achieve the purpose of diversification and procedural, reflect both diversified evaluation. For mastering the basic theory of the inspection and test of practical ability, at the same time will discipline into the evaluation system of competition. The diversity of specific assessment indicators are: assessment of three phase (30%) + subject contest (20%) (40%) + + final theory learning attitude (10%). Assessment of three stages including the 7 units in the design of curriculum content, the first and second phases for the verification of examination, mainly inspects the student ability of algorithm design and analysis of the characteristics of the data, the third stage appraisal into comprehensive evaluation mainly inspects the data modeling and mapping ability of the students, analyzing the characteristics of the data and algorithm design and implementation ability. Course contests for design examination, the main algorithm design and implementation of the assessment of students, data mapping and modeling, analysis, data characteristics and learning ability. Aiming at design way of the appraisal way and the way in which the inspection of code to write normative proportion is large, and so will guide students for programming exercises, to further develop the students' ability of high-level language to write and develop good programming habits.

A Case Study

In order to further illustrate the specific implementation of task driving method, this section will be your turn management system by patients. Patients with a noise management system's mission is to belong to a queue characteristics of practical problems. The objective of this lesson is: to patient wait management system as an example to let the students can use queue data structure to the actual problems, such as modeling, data mapping and algorithm design and the implementation capability, and can according to the problem of data processing in specific requirements to choose the appropriate storage structure, so as to realize efficient processing of data.

First review knowledge, which leads to the data structure contains three aspects: meaning, also runs through the whole course of clues. Review in data structure, logical structure, physical structure and the characteristics of various data structures, especially the characteristics of the queue and related operations, designed for subsequent courses do bedding, so as to put forward questions, why want to remember the data structure of three aspects: meaning, Why do you want to know the characteristics of each type of data structure and the characteristic of the storage structure, what's the purpose? Inspired to lead students to learn the purpose of the data structure analysis is based on the analysis of the demand for practical problems in write efficient program, and efficient program measures have two: time and space, time is decided by the selected logical structure and algorithm time complexity, space is determined by the choice of storage structure. On the basis of the analysis of efficient program implementation and then puts forward how to implement patient wait efficient management system, also need to be considered from the three aspects of data structure.

Then the student report according to the situation of the TABLE I: The design of unite on data structure research group. Report content includes:

1) Choose a hospital, give the name of the hospital and take pictures, if there is a station to station system or existing waiting system can see please photographed;
2) The level of hospital, the patient, the attribute of each patient;
3) Analysis of station data relationship between characteristics of systems or patient wait, sure which one to use logical structure and the reasons;
4) According to the research results of the analysis research of hospital clinic system need to use what kind of storage structure and the reasons;
5) According to the survey results, please draw the patient wait required by the system function module.

Table 1.

<table>
<thead>
<tr>
<th>Unite</th>
<th>Time</th>
<th>Task</th>
<th>Teaching Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Contents</td>
<td>4 hours</td>
<td>Queuing system, Track and field match time calculation,</td>
<td>(1) To each unit selection of teaching task handed out to students</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Man-machine contest, The construction</td>
<td>(2) To analyze the questions according to the teaching task</td>
</tr>
<tr>
<td>Liner</td>
<td>6 hours</td>
<td>Mobile address book management</td>
<td>(3) Teachers through carefully designed problems in each task unit guides the student to think, speak, to express their views and ideas</td>
</tr>
<tr>
<td>Stack</td>
<td>3 hours</td>
<td>Number System Conversion</td>
<td>(4) For each task involving data characteristics were analyzed</td>
</tr>
<tr>
<td>Queue</td>
<td>5 hours</td>
<td>String operations</td>
<td>(5) Based on the analysis of the data characteristics put forward the method to solve the problem is to choose what kind of logic structure and storage way and how to implement the task of the specific problem</td>
</tr>
<tr>
<td>Tree</td>
<td>9 hours</td>
<td>Family spectrum management</td>
<td>(6) Sum up the characteristics of each task, on to other issues, let the students can achieve mastery through a comprehensive study</td>
</tr>
<tr>
<td>Graph</td>
<td>10 hours</td>
<td>Traffic map design</td>
<td></td>
</tr>
<tr>
<td>Sort and Search</td>
<td>8 hours</td>
<td>Student achievement management</td>
<td></td>
</tr>
</tbody>
</table>

Organize students to discuss the situation of the research and reviews, each group of students strength is the precondition of the realization of the efficient patient wait management system and related very closely to the actual demand, at the same time inspire guide students how to carry on the design for actual problem. to choose suitable storage structure. Teaching has been in the climax stage, students actively participate in the discussions, achieved the ideal effect of teaching. According to the analysis of the students, different groups (yourself) can be used to analyze the logical structure and storage structure to achieve, after the implementation, we can through the time complexity of what kind of method to detect more efficient.

On the basis of the analysis of modeling, is a concrete implementation of the algorithm, in the process to cultivate students' ability of program design and implementation. Train the ability of program design and implementation is also one of the important goals of this course, but because the student mastery of advanced language problems, directly affect the solution actual problem the realization degree of common problems include: variable definition is not reasonable, function, functional division, poor code readability, function call master does not reach the designated position, debugging, application ability is weak, and so on. In view of these reasons, the hospital station management system implementation will lead students step by step.

According to the students on the analysis of the actual research situation of the hospital, to determine the need to implement the system function, specific features, including: initialize records, gender, station to station, stopped several functions such as registered.

According to the students on the analysis of the actual research situation of the hospital, to determine the need to implement the system function, specific features, including: initialize records, registration, is a structure type is defined in the first place, according to student's analysis and summary of the patient's attributes are: name, gender, age, address, telephone, the registration
department. Specific definition is as follows:

From the task driven teaching method in the curriculum of data structure, you can see that in the case when the choice is also very want, especially the classic case, patient station management system, for example, not every hospital analysis after the results are applicable to the teaching, so in the process of choosing the cases also practical problems need to be extracted and trimmed to meet the teaching requirements. In patient station system, for example, the size of the hospital is not the same, so to choose a certain scale hospitals. Patient is usually the same properties, but the hospital under construction in the process of the medical record attributes demanding too much, teaching can be cut. In addition, the hospital will have triage, to facilitate the teaching will be dropped the triage, only for a department of a doctor, after being students will all function implementation, combined with more complex triage, so that students can step by step to complete the patient station management more perfect function.

Conclusion

In task driven teaching method reform, the key is the establishment of the students' problem solving ability. Teachers through the detailed analysis of the typical tasks, compare the advantages and disadvantages of different data structures, on the one hand to make the students more solid knowledge of data structure, on the other hand to let the students find of doors, stimulate interest in learning, improve the beginning ability, more important is to make students master the methods of analysis and problem solving, and achieve the purpose of autonomous learning, this it is helpful to learn other courses in the future.

References


