On the Application of Task-driven Teaching Method toward the Teaching of C Program Design

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Abstract—The basis of the traditional task-driven teaching method based on the proposed use of Agile task-driven teaching method in the C programming classroom. Combining teaching practice, the specific implementation process of the agile task-driven teaching method is explained, and it is demonstrated that it helps to improve the efficiency of teachers in organizing teaching activities, and is helpful to improve the initiative and enthusiasm of students in learning.

Keywords—C Programming; Task-Driven Teaching Method; Classroom Teaching

I. INTRODUCTION

In today's world, digital technologies represented by the Internet of Things, big data, robotics, and artificial intelligence are driving changes in social production methods. There is an urgent need for talents with high information literacy and strong programming ability in various fields to promote the development of the industry. This requires colleges and universities to strengthen the construction of programming courses for non-computer majors, and cultivate students' ability to use programming methods to solve practical problems. C language is a general-purpose computer programming language. It has powerful advantages in the fields of system programs and embedded systems. It is a required general education course for most colleges and universities in science and engineering. The key to learning programming is to apply what you have learned. Therefore, in classroom teaching, the use of task-driven teaching methods, facing practical application problems, the reform and practice of C programming teaching, is very important for improving the programming ability of non-computer students.

II. CURRENT STATUS OF C PROGRAMMING TEACHING

C language is a programming language with rigorous grammar, which has the characteristics of rich functions, wide application, high target program efficiency, and good portability. The teaching of traditional C programming courses revolves around basic grammatical knowledge and classic algorithms, often focusing too much on basic concepts and theories. For students with relatively weak programming foundation or no programming foundation, when learning C language, they often feel that there are many grammatical rules, abstract concepts, and difficult to understand. Compared with other courses, this course is more difficult to learn, the classroom is difficult to be lively and active, it is easy to cause students to lose interest in C language learning, and it is difficult to guarantee the development of programming ability.

The C programming course for non-computer majors is not the knowledge condensed of computer major courses. It should be through refined cases and project practice, so that students can quickly understand the application background and commotion of related technologies, and deepen the corresponding understanding through hands-on practice. Thinking method, you don't need to pay too much attention to the coverage of knowledge [1]. Therefore, it is necessary to pay equal attention to grammar and application in the teaching process, improve students' enthusiasm and initiative in learning, strengthen the cultivation of practical problem-solving ability, and focus on improving computational thinking.

III. TASK-DRIVEN TEACHING METHOD

The task-driven teaching method is based on the situation, the task is the carrier, and the teaching method that integrates knowledge and skills into the task completion process of the learner [2]. "Task-driven" closely surrounds the task activity center, creates contexts to stimulate learning motivation, evokes relevant knowledge, experience and representations in the original cognitive structure, actively selects and utilizes learning resources, conducts independent exploration and interactive and collaborative learning, and completes. While setting goals and tasks, guide students to complete certain learning and practical activities [3].

Task-driven teaching method is essentially a teaching method based on constructivist learning theory [4]. Constructivist learning theory emphasizes the student as the main body and the teacher as the leading factor. Learning is a process in which learners construct and understand goals. Students are the active constructors of the meaning of knowledge; teachers are the guides and assistants in the process of actively constructing the meaning of knowledge.

In the development of theory and practice research, task-driven pedagogy proposes unique teaching processes. For example, British linguist Jane Willis, in his monograph A Framework for Task-Based Learning, divides task teaching into three stages: Pre-task activity stage, task cycle, language focus [5].

Classroom teaching is the main battlefield of school education, which has the most direct impact on learning results. In classroom teaching, according to the teaching goals, adjust the traditional task-driven teaching method, and apply it to C programming classroom teaching in a relatively agile way. It is conducive to the efficient organization of the teaching process by teachers, and it is also conducive to the experience and harmony of students in the process of completing tasks. Mastering the methods and processes of computer problem solving, and transferring them to problem solving in other disciplines, is of positive significance for cultivating and improving students' practical ability and independent innovation ability.

IV. TEACHING CASE

Teaching activities are based on the tasks designed by the teacher, the students are the main body to achieve the task, and the teacher is the role of the guide and assistant. In the classroom teaching practice of C programming, the task-driven teaching method is used in an agile way, which mainly includes the following teaching links: preparation tasks, design tasks, analysis tasks, realization tasks, summary and expansion. Taking the basic knowledge of learning structure as an example, combined with practical application problems,
explore the teaching effect of agile task-driven teaching method applied to C programming.

### A. Preparation tasks

In the preparatory task stage, teachers start from the two aspects of students’ academic conditions and teaching goals, and prepare tasks from two levels of overall planning and specific details. With the support of modern information technology for teaching, a variety of teaching methods such as Mooc teaching and online testing are widely used, so that teachers can quickly and accurately grasp the learning situation of students and adjust the teaching plan in time. The teaching goal is the baton of teaching, including the overall goal of the course and the goal of the knowledge unit. At this stage, around the teaching objectives, combined with academic analysis and practical application needs to design cases, and prepare relevant learning materials. Teachers need to be as thorough as possible about the framework and details of the entire task, as well as possible unexpected situations.

### B. Design tasks

Teaching objectives: understand the connotation of structure types, master the methods of defining structure types, using structure variables, and structure arrays to write programs.

Scenario design: After the test, the test scores of the class (30 students) are statistically processed. The data structure is shown in Table 1.

**Specific tasks:**
- Input each student’s student ID and grades of four courses from the keyboard.
- Calculate the total score of each student.
- Sort by total score from high to low.
- Output the situation of each student according to the ranking, including: student number, grades of each subject and total score.

**Table 1: Data structure table**

<table>
<thead>
<tr>
<th>Student ID</th>
<th>Language</th>
<th>Math</th>
<th>English</th>
<th>Computer</th>
<th>Total score</th>
</tr>
</thead>
<tbody>
<tr>
<td>20101</td>
<td>96</td>
<td>84</td>
<td>82</td>
<td>96</td>
<td>100</td>
</tr>
<tr>
<td>20102</td>
<td>88</td>
<td>96</td>
<td>85</td>
<td>98</td>
<td>100</td>
</tr>
<tr>
<td>20103</td>
<td>86</td>
<td>79</td>
<td>97</td>
<td>86</td>
<td>100</td>
</tr>
<tr>
<td>20104</td>
<td>75</td>
<td>86</td>
<td>90</td>
<td>85</td>
<td>100</td>
</tr>
<tr>
<td>20105</td>
<td>………</td>
<td>………</td>
<td>………</td>
<td>………</td>
<td>………</td>
</tr>
<tr>
<td>20106</td>
<td>………</td>
<td>………</td>
<td>………</td>
<td>………</td>
<td>………</td>
</tr>
</tbody>
</table>

### C. Analysis tasks

In the analysis task stage, arouse the relevant knowledge and experience in the students’ original cognitive structure, guide students to actively use learning resources, carry out independent thinking and interactive collaboration, and explore ways of thinking and solving problems. The learning principle of C programming for non-computer majors is to pay equal attention to grammar and application, cultivate students’ ability to solve practical problems, and improve computational thinking.

First, students use their acquired C programming knowledge to find methods. By observing the data structure in Table 1, they find that the amount of data in this task is relatively large, and there are more data of the same type. For a large number of data of the same type, the data can be processed through arrays. Therefore, 6 arrays can be designed to store data. The definition of the array is as follows:

```c
int studentId[30];
int scoreLanguage[30];
int scoreMath[30];
int scoreEnglish[30];
int scoreComputer[30];
int scoreTotal[30];
```

The memory effect produced after assigning a value to the array is shown in Figure 1.

![Memory effect diagram](image_url)

If arrays are used to store the data of the whole class, the memory allocation will not be concentrated, which will reduce the addressing efficiency. When assigning values to each array, data misalignment is prone to occur. Moreover, it is difficult to sort the information of each person based on the total score standard. After analysis and thinking, students design an ideal data structure as shown in Figure 2.

![Ideal data structure](image_url)

In this data structure, each person’s data information is allocated in continuous memory, which can improve addressing efficiency, has a compact structure, and is easy to operate and manage data. As a result, students must have expectations for the way the structured data is processed.

Then, guide students to explore ways to apply structural knowledge to solve problems. Through reading books and consulting materials, students understand that in C language, struct refers to a data structure, which is a type of aggregate data type in C language. Structures can be declared as variables, pointers or arrays, etc. to implement more complex data structures. The structure is also a collection of some elements. These elements are called members of the structure, and these members can be of different data types. The members are generally accessed by name [6]. The application structure can facilitate the management of data and enhance the readability, portability and maintainability of the code.

For this task, lead students to further explore the connotation and use value of structure types in groups. On this basis, each group will gather specific grammars for defining structure types, defining and using structure variables and structure arrays.

### D. Realize the task

In the realization of the task stage, each team thinks of a solution around the problem, finds a method, and then designs an algorithm and writes a program code. The members of the group consulted and understood the knowledge of the structure in a targeted manner and layer by layer. According to the knowledge acquired by individuals and the results of...
discussions within the group, the groups share design ideas with each other, and finally put forward a more reasonable algorithm:

1) The first step is to define the structure type and the array of this type.

```c
struct STUDENT
{
    int studentID;
    int scoreLanguage;
    int scoreMath;
    int scoreEnglish;
    int scoreComputer;
    int scoreTotal;
};
```

2) The second step is to define the function of the input data.
```c
input (struct STUDENT student [])
{
    for (i=0; i<30; i++)
        Enter each person's personal information other than the total score.
}

3) The third step is to define the function of the total score.
```c
total (struct STUDENT student [])
{
    for (i=0; i<30; i++)
        Add and sum the scores of each subject
}

4) The fourth step is to define the sorting function.
```c
sort (struct STUDENT student [])
{
    Bubbling or selection sorting.
}

5) The fifth step is to define the function of the output data.
```c
output (struct STUDENT student [])
{
    for (i=0; i<30; i++)
        Output all information of each person.
}

6) The fifth step is to define the function of the output data.
```c
int main(void)
{
    input (student);
    total (student);
    sort (student);
    output (student);
    return 0;
}
```

According to the thinking and design of the above algorithm, the members of the team divide the work and cooperate, write the program code for each step, test and run, and complete the total task.

### E. Summary and expansion

In the summary and expansion stage, for the completed task, teachers and students summarize the knowledge points acquired in this task, reflect on the problems encountered in the learning process, and inspire students to discover and explore new problems. For example: Question 1. The number of students in this task is a fixed value of 30. If you need to handle any number of student information flexibly, how do you need to adjust the program? Question 2. This task only involves finding the total score and sorting. If you want to perform more complex data processing, such as modifying someone's information, querying student information that meets certain or certain conditions, adding or deleting student information, etc., how to design? What about the program? By migrating from completed tasks to new problems, on the one hand, we can improve existing knowledge and stimulate students' initiative and innovation, and on the other hand, they can stimulate students' interest in exploring new knowledge—the linked list.

### CONCLUSION

The agile task-driven teaching method is based on tasks. Students are the active builders of knowledge, and teachers are guides and assistants. In the process of analyzing tasks and fulfilling tasks, students take the initiative to obtain learning resources, and members of the group cooperate with each other and collide with each other. Students have space for independent thinking and opportunities to communicate with each other. The thinking after completing the task can help students broaden the breadth of thinking, improve the height of cognition, and cultivate students' computational thinking ability and fusion innovation ability. In the whole process of task preparation, implementation, and summary, the teacher, as a guide, always controls the entire teaching activities to focus on the teaching goal. They must be good at capturing the bright points of students' thinking, actively encouraging students, and at the same time, as assistants to help students solve the problems and difficulties encountered in the process of constructing knowledge motivate students to continue their efforts.

Practice has proved that the use of agile task-driven teaching method in the teaching of C programming is of positive significance. On the one hand, students can experience the methods and processes of computer problem-solving, and experience the sense of accomplishment brought about by individual efforts and teamwork. Students are immersed in it, gain knowledge and happiness, have a high degree of motivation and participation in learning. On the other hand, it can streamline the complex process of teachers' organization of teaching activities, improve teaching efficiency, improve teaching effects, and enhance teachers' sense of happiness at work.

### References


