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The Application of Case Guidance Teaching Mode in the Course of Data Structure

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Abstract

Closely around the major strategic that is the implementation of innovation driven development of the country, in order to effectively promote the school innovation and entrepreneurship training program, aiming at the shortcomings of the original teaching mode in the course of data structure, case guided discussion of teaching mode is applied in the paper to reform the teaching content and methods. Through the way of interesting case study, not only the students' interest in autonomous learning has been mobilized, but also the innovative thinking has been cultivated. To improve the quality of teaching has a certain role in promoting.

Keywords: Data structure; Case guidance; Teaching mode; Case design.

1. Introduction

Teaching is a bilateral activity of teaching and learning. Efficient teaching is the interaction of bilateral activities between teachers and students. There are both teachers and students in the guidance of learning, it realizes the students as the main body and the teachers as the leading class. Mr. Zhang Chuting said that, fundamentally speaking, teaching is the thinking of teaching guides students thinking, and the thinking of the students promotes teachers thinking. And the case guide can make the boring classroom teaching become a lively, atmosphere harmonious classroom. “case guidance” is a teaching strategy based on the basic law of students' cognitive development - the process of knowledge construction is the cognitive process of problem solving, students make correct problems, form problem consciousness, and develop autonomous thinking and analysis, solving problems and finding problems, so the construction is the meaningful knowledge construction process and teaching is an effective teaching to help students develop [1-4]. At the same time, “case guidance” can better stimulate students' learning interest and reduce the difficulty of learning.

2. Current situation and analysis of data structure teaching

At present, most of the students have just released from the heavy high school lessons, enter a relatively relaxed university to study. Some students think that they should relax, some students learning attitude, learning methods and learning ability are very big problems. Some students have a lot of problems in learning attitude, learning methods and learning ability. It is difficult to grasp the content of classroom teaching, and it is more difficult to learn the abstract data structure. For simple questions they can write code to deal with, but for a slightly more complex problem they often don't come, there is no thinking. But for a slightly more complex problem they often do not know how to start. The main

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problems in classroom teaching are as follows:

(1) Lack of vitality:

Some students sleep, do not follow the teacher's rhythm, which leads to a lack of enthusiasm in classroom teaching.

(2) Classroom role mismatch:

Teacher as “the leading role", students as "audience", the classroom teaching process is boring, and there is no interaction between teachers and students.

(3) Lack of real teaching feedback link

The psychological factors of the test are dominated, interest is not high, and the phenomenon of active learning data structure is very rare. The educational effect of data structure algorithm design is not reflected, the cultivation of students' innovative ability is more no way. The teaching reform of data structure is urgent, and the teaching reform is a systematic project. A front-line teachers should change from all aspects, and start from their own to innovate in teaching mode and teaching methods.

3. Practice of case guidance teaching mode

In order to adapt to the school software engineering major” the training scheme of excellent engineers”. Efforts to provide a certain platform to improve students' innovative entrepreneurial thinking. In the data structure classroom teaching with case analysis as a clue, that attracts students to explore actively, lets students be interested in the data structure course, and realizes the value of learning data structure.

3.1 The principle of case selection

The case is the core of the case study, and the selection of cases is important work, the selected cases follow the following principles:

(1) The case combines the actual teaching content, which expands and extends the teaching content

(2) The case should consider the individual differences of students, students can be gradually in-depth research and implementation

(3) The case should be is convenient and easy to combine the prior knowledge and the new knowledge

(4) Case should be combined with practical application to improve students' interest points

(5) Case should be comprehensive, that reflects the combination of multi - structure, multi - disciplinary crossing

(6) The case is fine, should select a characteristic case, but not general selection.

Good case can not only strengthen students' understanding of basic concepts, basic knowledge, basic skills, but also help students to become familiar with relevant knowledge, guide them to think actively, thus improve students' analysis, problem-solving ability, and further improve students' interest in learning and enhance their self-confidence.

3.2 Implementation plan of case guidance

The design of the case is divided into three levels:

The first kind: Classroom guidance case design. The teacher teaches the main, focuses on explaining the principle, gives the analysis process, and obtains the analysis conclusion, in order to enhance the student's understanding ability.

The second kind: classroom discussion case design, mainly by student discussion, teachers guide as

auxiliary, heavy in the application, improve the students' application analysis ability.

The third kind: Extracurricular practice case design. Mainly by students' self- research, heavy in the application, in order to improve the comprehensive ability.

The implementation process of case guidance based on three levels is given below.

3.2.1 Classroom guidance case

The linear list is the most basic data structure, exercises after class plus a number of member functions mainly on the basis of their own: the link of the table, the reverse of the elements in the table, the partitioning of elements in the table, or the basic information for storing the students. There is also an additive operation to achieve a unary polynomial, by comparing the exponential of the first item, if the equality is additive, the exponential constant, if the first of the first multinomial is less than the first item of the second, the first polynomial is moved backward, and stored, the same operation is done for other items.

In view of this, the following questions are raised:

Assume that the existing mass is one gram, two grams, and three grams each, ask what kinds of qualities can you call with these weights once. And how many different weighing schemes are there for all kinds of quality objects? (A familiar mathematical problem, increasing the students' attention)

First, the analysis of possible weighing may be shown in the following table:

Table 1 Solution of weighing problem

Possession of weights	Number of weighing species		Weighing scheme	
	the number of the quality of an object ---n	The mass of the body of the object being weighed----m	Number of schemes weighed---P	Actual weighing scheme
3 pieces 1g 2g 3g	7	m_1=0	P_1=1	no
		m_2=1	P_2=1	1g
		m_3=2	P_3=1	2g
		m_4=3	P_4=2	(1+2)g or 3g
		m_5=4	P_5=1	4g=(1+3)g
		m_6=5	P_6=1	5g=(2+3)g
		m_7=6	P_7=1	6g=(1+2+3)g

Second, further analysis of the details (thinking)

If there is a weight k1, the weight of the weighing species is n = 2, the actual quality of the two objects is m = {m1 = 0, m2 = k1} each mass of the weighing scheme is p = {P1 = 1, p2 = 1}, and the relationship between m and p is found?

Third, assuming there are two weights, the mass is k1 and k2, assuming k1 ≠ k2, synthesizing (1) the quality of the weighing can be:

(a) 0+0=0；

(b) K1+0= K1

(c) 0+K2=K2

(d) K1+K2

Forth, analysis and summary.

According to (1) a binomial representation is available:

$1+x^{K1}$

According to (2) the corresponding polynomial can be obtained:

$(1+x^{K1})(1+x^{K2})= 1+x^{K1}+x^{K2}+x^{K1+K2}$

Next, get the general formula if there are n such weights:

$(1+x^{K1})(1+x^{K2})\ldots(1+x^{Kn})$

Finally, consider how to store the solution of the actual problem in the computer, by the order table or linked list. The representation of a unary polynomial is:

$f(x)=a_0+a_1x+a_2x^2+\ldots a_nx^n$

The test results display

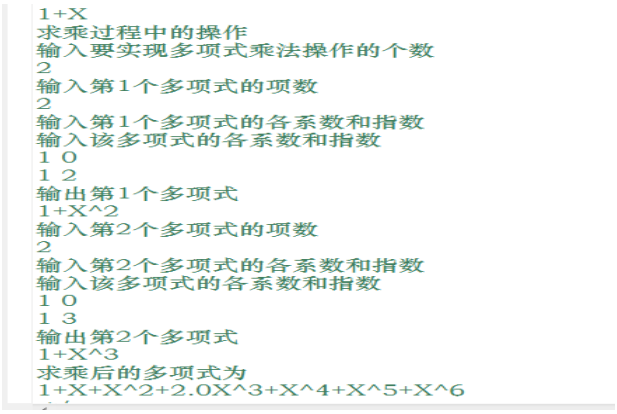

Figure 1. Polynomial multiplication test

Core code：

```
Node qa=la.getHead().getNext();//The first node of the first polynomial list
Node qb=lb.getHead().getNext();//The first node of the second polynomial list
PolyList ha=new PolyList();ha.getHead().setNext(null);
while(qa!=null){
qb=lb.getHead().getNext();
  while(qb!=null){
        PolyNode a=(PolyNode)qa.getData();
        PolyNode b=(PolyNode)qb.getData();
        PolyNode pf=new PolyNode(a.getCoef()*b.getCoef(),a.getExpn()+b.getExpn());
              try{ha.insertsame(pf);}
              catch(Exception e){
                    e.printStackTrace();
```

```
        }
        qb=qb.getNext();
        }
qa=qa.getNext();
}
```

3.2.2 Case discussion in class discussion

Classroom discussion cases mainly reflect the fusion and coalescence of knowledge points, usually multiple cases.

First, when the relevant operation of stack was introduced, the case “converting decimal number into binary system” was given. The teachers put forward problem, pay attention to the guidance of problem-solving methods, and encourage students to actively discuss and publish different views.

Next, the relevant operation of the queue was introduced, the case “scheduling problem "was given. Given a number of two pairs of plastic data stored in one dimensional array, use the queue to achieve the sorting of data. Tip: (1) create a queue array, according to the number of data in the corresponding queue; (2) with the characteristics of the queue, the data in the queue is Again back to one dimensional array; (3) the ten digit of the data are stored in the corresponding queue; (4) the element out of the queue is ordered sequence.

Finally, considering the difference between stack, queue structure and linear list, how to realize the storage of stack and queue? And then leads to the actual case of parking management. There is a long and narrow passage for n vehicles and a gate for access. In the parking lot, the cars are arranged in the order of arrival, arranged in turn from the inside out. If the car stops full n vehicles, and then parked in the doorway, when there is a car left, the vehicle behind the vehicle exit first, then return to the yard in turn, the car on the access road can enter. Let student program to simulate the management process.

3.2.3 Extracurricular practice cases

Extracurricular practice case design should pay attention to the application of comprehensive knowledge.

After students understand the linear structure, the tree structure, the graph structure in the data structure course understanding, teachers gives the case " teaching plan scheduling problem ". One student has eight degree courses. See figure 2.

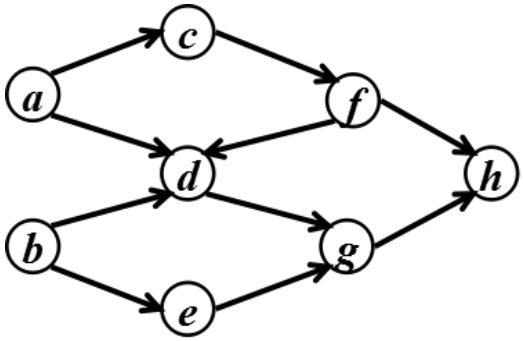

Figure 2. Teaching plan arrangement

1、An effective topological sequence can be obtained：

2、Solution hints：

(1) Measurement of “zero in degree” as “no precursor” in digraphs

(2) The algorithm attaches a “stack” to save the current vertex of the degree zero

(3) "The delete vertex and arc with its tail" can be replaced by “the degree of indentation on the top of the arc”.

3、Further think about the problem：

(1) How to get all possible topological sequences? As shown in figure 3.

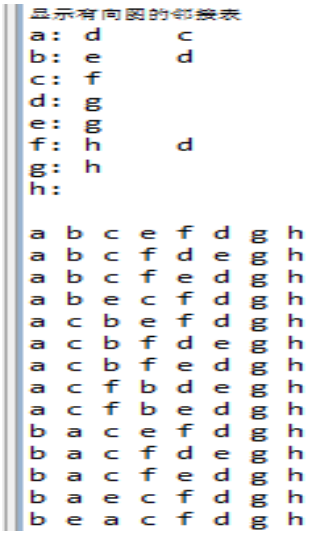

Figure 3. Full Topology sequence

Core code hints：

```
// Full topology sequence implementation with stack
  public static void topALLSort(int cd[],int cdlen,ALGraph G,TopTree T,LinkStack s) throws
Exception {
        int n=0,count = 0,i;
// N records the number of topological sequences, count records the number of nodes in a sort
        TopNode p=new TopNode();
        TopNode root=T.getTop();
        while (!s.isEmpty())
        {
            while (!s.isEmpty())
            {
                while (!s.isEmpty())
                {
 i = (Integer) s.pop();//Stack is not empty, take the top element of the stack
   p=new TopNode();
            p.setParent(root);
            p.setData(i);
```

```
                p.setVisited(0);
                p.setFirstchild(null);
                p.setNextsibling(root.getFirstchild());
                if(p.getNextsibling()!=null)
                    p.getNextsibling().setParent(p);
                root.setFirstchild(p);
                }//while
                root=root.getFirstchild();
                i=(Integer)root.getData();
                cd[cdlen++]=i;
                DefineTerm(i,s,G);
                    }//while
                cd[cdlen]=-1;
                if(cdlen<G.getVexNum()){
                    System.out.println("You enter a loop directed graph that cannot be processed ");
                System.exit(1);
                }
                else{
                    int k=0;
                    while(cd[k]!=-1){
                      int m=cd[k];
                      k++;
                      System.out.print(G.getVex(m) + " "+G.getVexs()[m].getPrenumber()+"
"+G.getVexs()[m].getBeginTerm()+"      ");
                    }
                    System.out.println();
                    n++;
                }//else
                while((p.getNextsibling()==null||p.getVisited()==1)&&p.getParent()!=null){
                    if(p.getVisited()==0){
                        i=p.getData();
                        addindegree(i,G);
                        --cdlen;
                    }
                    p.setVisited(0);
                    p=p.getParent();
                }
                if(p.getVisited()==0&&p.getNextsibling()!=null){
                    p.setVisited(1);
                    i=p.getData();
                    addindegree(i,G);
                    cdlen--;
                    root=p.getNextsibling();
```

```
                i=root.getData();
                cd[cdlen++]=i;
                DefineTerm(i,s,G);
            }//if
            }//while
        }
```

(2) Can you make arrangements for the term? (Relevant literature or books)

4. Conclusion

Case guidance combines abstract theoretical knowledge with life practice, students' active learning and teachers' guidance, which not only plays the role of students, highlight the process of self-learning, but also pays attention to the guidance of learning method, strengthens the cultivation of students' ability. This is like the flywheel effect that is to rotate the still flywheel, at first you must make a large circle of power over and over again, every turn is very arduous, but every cycle of effort will not be wasted, the flywheel will turn faster. After reaching a certain point, the weight and momentum of the flywheel will become part of the driving force, and you don't need to make more effort, the flywheel will still turn and rotate quickly. Through the teaching practice of case guidance, students' learning interest and innovation ability are greatly improved.

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