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Mathematics Teaching Methods in High School

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Abstract **– High mathematics is a main course in High schools. And it is an important course for the students in many majors. Mathematics is mainly the study of the quantitative relations and spatial forms in the real world. It is very important for the study on the follow-up course. In this paper, the teaching methods for high mathematics are discussed. And the way to promote the teaching effectiveness is given. These skills are useful for modern mathematics teaching.**

Keywords **– Teaching Technique; High Mathematics; Improvement; Promotion.**

I. INTRODUCTION

The study of elementary mathematics [1-3] is constant and uniform, and the study of higher mathematics is a non-uniform variable. Higher mathematics is an important basic subject in science and engineering universities. It is also a required mathematics course for students majoring in science and engineering, and a compulsory course for other majors.

As a basic science, higher mathematics [4-7] has its inherent characteristics, and it is a high degree of abstraction, strict logic and extensive application. Abstractness and computability are the most basic and significant characteristics of mathematics [8, 9]. If we are highly abstract and unified, we can reveal their essential laws in depth, so that they can be widely applied. Strict logicality means that in the induction and arrangement of mathematical theories, no matter the concept and expression, or the judgment and reasoning, we must use logical rules and follow the rules of thinking. So, mathematics is also a way of thinking, the process of learning mathematics is the process of thinking training. The progress of human society is inseparable from the wide application of mathematics, the science. Especially in modern times, the emergence and popularity of computers make wider application fields of mathematics. Modern mathematics is becoming a powerful driving force for the development of science and technology, and is also widely and deeply penetrated into the field of social science.

II. TRADITIONAL TEACHING

The traditional teaching way of mathematics is teaching in class and taking many exercises. And it has two advantages. Firstly, this way has the benefit of information feedback. On the other hand, classroom atmosphere is active all the time, this method is conducive to promoting students positive thinking and developing the students' capacity. However, there some disadvantages. Teaching organization and controlling teaching time also are difficult. Here are the shortcomings of the talking.

Some aiding methods are always used, such as the demonstration and discussion.

Demonstration. As the name implies, demonstration is a teaching method in which the teacher teaches the content of the teaching material with a kind or teaching aids or makes a demonstration experiment to illustrate or confirm the knowledge of the grant. In mathematics teaching, the demonstration is mainly used for concept or proposition teaching.

Demonstration can be divided into four kinds. The first one is picture presentation; the second is real object presentation; the third is recording, video, film presentation and slide show; the last one is experimental demonstration.

Using the demonstration for teaching has the following specific requirements for teachers.

Demonstration should highlight the theme of the teaching, the irrelevant factors which can interfere with the learning content during the demonstration process.

In the demonstration, with the teacher's explanation and conversation, through the teacher's language inspired, students do not stay in the external appearance of things. It can take their cognitive capacity a whole new level.

Real object presentation should be timely and appropriate.

The purpose of the demonstration is to lead student comprehension the content of the concept, master the knowledge. Therefore, demonstration is just right; excessive dependence on educational equipment is not conducive to the development of students' mathematical thinking.

Advantages. First of all, students get rich emotional materials, deepen the understanding of the nature of the concept, and are conducive to cultivating students' image thinking ability. Next, demonstration can arouse students' interest in learning and fully mobilize the enthusiasm and initiative of students.

Disadvantage. The scope of demonstration limited by the teaching content and teaching facilities is important shortcomings of the demonstration.

Discussion. Discussion is a kind of teaching method which the students should communicate with each other according to the questions raised by the teachers, to inspire each other and learn from each other. There are several main features of discussion. First, more different from the talking, discussion is a multi-exchange of information between the members. Second the classroom atmosphere is active.

Discussion has the same basic requirements as the above method.

Before the discussion, teachers and students should be fully prepared. In the beginning of the class, teachers suggest the discussion's topic, point out attention and assign some of the reference materials. Each student should be prepared to speak up in discussion as required. Discussion's topic must be concise and have specific goals. The depth and breadth of the discussion should be appropriate. During discussion, teachers should encourage students to speak boldly and to express their views. At the end of each discussion, teachers should make a summary.

The teaching process is as follows:

First of all, before the class, the teacher should specify a part of the content so that students learn this part by themselves in advance, and put forward the learning objectives, as well as the content of the key and difficulty.

Next, the content of discussion is divided into a number of units by teachers according to the concept, proposition, examples, exercises, etc.; the students divided into groups to discuss or together; it can elect the main speaker during the discussion, the speaker described the remaining members responsible for the supplement, the main speaker is responsible for the main content, the rest of the members responsible for the supplement.

Then, under the inspiration of the teacher, students discuss the results of the content of the speaker and the solutions of different problems with each other.

Fourth, after discussing with each other, teachers sum up the correct conclusion and make the unit summary.

Finally, after the discussion of each unit designed, teachers summarizes the contents of the whole course, arrange the corresponding exercises and assignments.

Advantages. Here are some of the advantages of discussion. The discussion activity is centered on the student's own activities, every student has an opportunity to speak, and this is useful for cultivating students' language skills. This not only cultivates the students' self-learning ability, but also mobilizes the students to learn the initiative and enthusiasm. The speech in the discussion should focus on the center of the discussion, but it cannot be limited by the teaching material. This is conducive to the students to play the independent thinking and creativity.

Disadvantages. Classroom teaching is not easy to control, and it is consume the teaching time. This is some of the shortcomings of the discussion.

Discussion allows each student to show their own ideas and this can lead to the improvement of their cognitive structure. In addition, students can also show their own personality characteristics, boost their confidence and enhance their creativity. This method is widely used in foreign countries, but it is rarely used in China. It is worth in-depth study. This method is of great value. In-depth research is necessary.

III. Promotion Methods

3.1. *Discovery Method*

The discovery method is also called exploring method, research method, modern heuristic method or question teaching method. It refers to teachers that a kind of teaching method for students' learning concept and proposition, and just give him some facts (cases) and problems, then let the students to think actively, independent inquiry, and self-discovery and master the principle and the relevant conclusions. Its guiding ideology is to regard students as the main body and realize the process of cognition independently, and that is to say, under the inspiration of teachers, they can make students explore consciously and initiatively; Understand scientifically the methods and steps of solving problems; Study the causes and internal relations of the object, then find out the law, and finally form the concept or solve the problem.

The discovery method has a long history in terms of its intellectual context, but it arouses people's renewed concern about discovery method and the research, which originates from Bruner's advocacy in 1960s. Bruner believes that in order to train scientific and technological talents who have the ability of invention and creativity, not only to make students master the basic concepts and basic principle of discipline, but also to develop students' exploratory attitudes towards learning, and vigorously promote the widespread use of discovery method.

The teaching process of discovery method can be summarized as follows:

(1) Teachers should play a leading role, and create situations carefully, and guide students to find problems in a purposeful and step-by-step way.
(2) Students should play the main role, actively participate in the discovery process, and make full use of observation, experiment, association, analogy, analysis, induction and other methods, and actively put forward the conjecture, and then demonstrate.
(3) Teachers should stress and emphasize the thinking process of finding problems, and help students gradually master the mathematical thinking methods.

Advantages. The discovery method enables students to develop intrinsic motivation to learn and thus increase self-confidence; the discovery method enables students to learn a heuristic method of learning to find, and train students' ability to ask questions and solve problems, and create inventive attitudes; the discovery method is beneficial for students to systematize and structure their knowledge, and to better understand and consolidate knowledge.

Disadvantages. The discovery method costs too much time; the discovery method is limited by the level of students' thinking development, and many contents are not suitable for discovery method; the discovery method is more demanding for teachers. If the teachers do not have a higher level, then it is difficult to use the discovery method in teaching.

3.2 *Programmed Teaching Method*

The programmed teaching method comes from a machine designed for automatic teaching in the American Lu Laixi. He attempts to use the machine to free the teacher from the specific affairs of teaching, thereby saving time and effort. This assumption did not attract attention and popularize at that time. Until 1945, Skinner, an American psychologist, raised it again, which attracted the attention of many people in psychology and education.

The programmed teaching method is a kind of teaching method which enables learners to learn individually and

rely on the teaching machine and program materials to present the learning program, including the display problem, and it can give feedback to the students about their reflection and the correctness of their responses. There are mainly two kinds of program teaching methods, and they are linear program and branching program. The linear program was pioneered by Skinner. Its teaching process is to divide the learning materials into several small units, and arrange them in a linear way, and each small unit is written on a card and presented to students in turn. In each unit, students need to answer questions, if correct, the machine will show the correct answer, and then go to the next step, otherwise, continue to think about the answer. The patterns are ①→②→③→…→(n).

The branching program was created by Claude, an American psychologist. It is the development of linear programs that employ multiple choice reactions to accommodate individual differences. The content of the textbook is divided into several units and presented to students, and after they reading a module, test them immediately (multiple-choice questions with right or wrong questions). If you choose the right one, you can learn the new content and move on to the next unit. But if you choose the wrong one, you are directed to a suitable unit and continue to learn, or go back to the previous unit and learn it again, and then answer the question until you answer correctly and move on to the next unit.

Advantages. Due to students are required to use their hands and brains to complete their study tasks independently, it will help them develop their self-study ability and develop their habit of self-study. This helps to teach students in accordance with their aptitude. This can eliminate the influence of teacher's condition on teaching, so as to ensure the improvement of teaching quality.

3.3 *Example Teaching Method*

The example teaching method is a teaching method developed on the basis of the example teaching theory, which was founded by Wa Gunsul, a German educator in 1950s, and it's a teaching method which refers to the use of typical examples to achieve the understanding and recognition of the attributes of things. The example teaching method requires teachers to analyze the teaching contents in the following five aspects when preparing lessons.

(1) Basic principle analysis. Analyze what is the universal significance of the content in the textbooks and what it does for future teaching, and what examples do we need to choose? What principles, rules and methods do students need to learn by exploring examples?

(2) Analysis of intelligence function. Analyze the function of subject content in students' intellectual activities.

(3) Future meaning analysis. Analyze the significance of the subject content to students' future learning.

(4) Content structure analysis. Analyze the basic elements that make up the whole content, and the status of the relationship among these elements in the teaching material; analyze the overall structure of the subject matter.

(5) Analysis of features in content. Analyze what are the characteristics of the subject and what contents can interest the students? Through what intuitive means can lead students to ask questions? And what assignments can be applied to enable students to apply knowledge effectively?

Advantages. It is a cognitive process from individual to general and consistent with the cognitive rules of lower grade students; it can arouse the initiative of students; it is in favor of training students' summarize ability.

IV. Conclusion

Higher mathematics is very important in high schools. It is useful for the students. In this paper, we discuss the current teaching methods, and point out the disadvantages. Then we discuss some specific teaching methods for the higher mathematics. These methods can help the teachers improve their teaching effect.

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