

High School Mathematical Modeling Teaching Method Selection Take "Tea Tastes Best" As An Example

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Abstract

With the implementation of the new textbook, mathematical modeling as one of the six core qualities, how to carry out high school mathematical modeling activities in an orderly and efficient way is the problem that teachers are discussing. In teaching, the proper use of teaching methods directly affects the effect of the whole classroom. Therefore, this paper takes "the problem of the best taste of tea" as an example and starts from the characteristics of mathematical modeling to discuss the selection of teaching methods.

Key words: teaching method; mathematical modeling; tea taste

1 The introduction

Teaching method is the general term of the behavior activities taken by teachers and students in the teaching process in order to achieve the teaching objectives and requirements of teaching tasks. In practical teaching, the use of appropriate teaching methods is conducive to the students to grasp the knowledge of understanding, convenient for teachers to build a harmonious relationship between teachers and students and a positive classroom atmosphere. The topic of mathematical modeling in high school has always been one of the hot spots in the education circle, especially how to carry out the classroom teaching of mathematical modeling in middle school has been in the exploratory stage. Therefore, according to the characteristics of

mathematical modeling, choosing the appropriate method from the commonly used teaching methods is the breakthrough to develop modeling classroom teaching.

2. Question Raising

Select a case teaching of mathematical modeling activity on page 162 of compulsory Course 1 of New People's Education Press A.

Experience has shown that the best taste of certain green tea is produced by brewing it in 85°C water and drinking it when the temperature drops to 60°C. How long does it take for the freshly brewed tea to reach its best taste at 25°C?

3. Characteristics of mathematical modeling

Characteristic one, the problem of mathematical modeling is basically derived from the practical problems in life. Students are required to discover a certain mathematical phenomenon from the practical life, and then propose corresponding mathematical problems according to this phenomenon. Second, mathematical modeling emphasizes students' practical ability. Unlike ordinary mathematical application problems, it is more open and has no specific conditions. Therefore, students need to acquire corresponding data by themselves. The third feature is that mathematical modeling emphasizes participation, which is generally divided into 6 steps, that is, putting forward the problem, making reasonable assumptions, building the model, solving the model, testing the model and solving the problem. These six steps require students to participate actively and cooperate independently. Characteristic four, mathematical modeling needs to use the corresponding mathematical software, so in order to solve the model in the teaching will often use a lot of information technology means.

4. Selection of teaching methods for mathematical modeling

In the teaching of mathematical modeling, many common teaching methods are applicable, such as the most commonly used teaching method, discussion method, demonstration method and so on. However, due to its own characteristics of mathematical modeling, other teaching methods should be added to the ordinary teaching methods to improve the quality of teaching.

4.1 Situational Teaching method

Constructivism learning theory is that any knowledge has its existence and the development background, want to understand, master and use some knowledge, to understand the inner meaning, just from the external performance of knowledge to understand, it is difficult to grasp the real meaning, and this will need to understand

knowledge background to rely on to produce meaning, also is to be in a certain situation to learn and understand the knowledge. In the classroom teaching, in order to let the students truly understand, master and flexibly apply a certain knowledge, we should create the corresponding learning situation according to the characteristics of the knowledge, that is, to create the classroom teaching situation.

A based on the characteristics of mathematical modeling, the problem is the result of daily tea infusions, so can discuss tea in the tea art is involved in the video texture and temperature related video, to tea culture as the starting point, to cultivate students' cultural self-confidence, the tea taste as the key, then natural vividly brings research topic of this lesson: tea drinking taste best.

Suitable situation creation helps students understand the concept of context, experience which contains the method of mathematical thinking, let students experience the objective reality of mathematics in the life existence, can through the situation of mathematical objects, feel the nature of the object properties, feel mathematical objects are depicting a mathematical model of the real world, experience the process of mathematical objects abstracted from the situation.

4.2 experimental method

High school mathematics experiments are generally divided into two categories. One is that after analyzing the problem, hands-on experiments are needed to verify and solve the problem. The other type refers to the use of mathematical software under the guidance of teachers to make some mathematical models, or the design and implementation of some inquiry questions. For the experimental modeling class, the experimental teaching method is undoubtedly the most important teaching method.

According to the second characteristic, in order to obtain the relevant tea temperature data in the case, students should complete the data collection through the temperature measurement experiment record. Before the beginning of the experiment, the teacher should design the experiment record sheet (as shown in Table 1), and group the students into groups of 4-5 people to conduct the temperature measurement experiment.

Through mathematical experiments, students can personally experience that mathematics comes from life, feel the connection between mathematics and reality, recognize the significance and value of mathematics learning in life, strengthen the connection between subjects and real life, and improve students' core mathematical literacy ability.

Table 1: Experimental record sheet

Team members name	Experiment Title
The experimental time	The experiment purpose
The experiment content	(Record the relevant equipment and other contents used in the experiment)
The experimental process	(Specific division of labor)
The experimental results	(Table of tea temperature measured at 1-minute intervals)

4.3 Task-driven Method

Task driven teaching method as the theoretical basis of the constructivism learning theory, emphasizes the students' study should be combined with a task or problem, based on the problems and tasks continuously explore to maintain learning motivation, so that the students can have the initiative to learn, can actively on the basis of the existing knowledge experience to construct their own knowledge and experience enrich and develop themselves.

For high school students, experience personally the entire modeling process is one of the requirements of mathematical modeling courses, so teachers should clear when preparing the teaching goal, subdividing the general learning tasks and into small tasks, students according to the task or problem under the guidance of teachers to explore independently, experience the whole process of modeling, and cultivating the core accomplishment of students and in the process.

According to the three characteristics, teachers should clarify the overall teaching objectives in the case, such as knowledge and skills objectives: 1) Ask questions by creating problem scenarios and organize students to collect relevant data. With the guidance of teachers, students can choose the appropriate function model, and solve and test the model. 2) At the same time, students will promote the model of similar problems according to the inspiration of this modeling class, so that students can fully experience the whole process and links of mathematical modeling. Process and method Objectives: 1) The teachers first adopt the situational teaching method to create the tea culture scene, and takes the tea taste as the key to elicit the teaching task, so as to cultivate students' cultural confidence. 2) Divide students into different groups, cooperate and explore within the group, collect data by hands-on experiment according to the tasks proposed by the teacher, and cultivate students' ability to collect and identify information. Objective: 1) Through the study of modeling, students learn to consciously express the real world with mathematical knowledge, and cultivate students' ability to refine realistic models and mathematize from practice. 2) Learn to

use mathematical models to solve practical problems and improve practical ability. 3) Be good at finding hidden mathematical problems in life.

In order to achieve the above goals, teachers can assign the following tasks: 1) Students work in groups to measure tea temperature and obtain modeling data; 2) Guide the students to analyze the data, use the scatter diagram to analyze the change rules of this group of data, let the students discuss in groups, and choose the model independently; 3) Under the guidance of the teacher, each group solved the parameters of the selected model and tested the feasibility of the model. In these three small tasks, teachers can continue to subdivide them to achieve the overall task teaching. However, the principle of subdivision is that students construct the knowledge framework through independent learning and collaborative learning, rather than moving textbooks. Only in this way can students feel the inner connection of knowledge under the guidance of teachers.

4.4 Teaching methods based on information technology

With the development of science and technology, information technology has gradually entered the classroom. In the classroom, teachers are no longer blindly teaching knowledge to students in the form of blackboard writing, but combining certain information technology means to enrich the teaching organization. At present, the information technology applied in mathematics teaching includes mathematics software (such as mathematical encyclopedia electronic dictionary, computer algebra system, etc.), mathematics teaching tools (such as geometry drawing board, Geogebra and other drawing tools, and mathematics problem system) and specific teaching content courseware (such as micro-class video, teacher presentation, etc.).

According to characteristic four, in the case, the teacher can prepare the ppt teaching of the relevant modeling class; Use the mathematical software Geogebra or geometric sketchpad to draw scatter plots for image fitting; Finally using Matlab to solve the model parameters and so on.

5 Conclusion

Mathematical modeling activities in high school is very test of teachers' professional ability, compared with common math class is different, so the teachers should do before conducting ready, choose appropriate teaching methods, achieve efficient and orderly in the activity, the student can from every modeling activity different experience, achieve the result of get twice the result with half the effort.

Reference

- [1] Gu Yuheng, He Bolu. Selection of high school mathematical modeling methods: A case study of "height and weight" [J]. Chinese Journal of Mathematics, 2021, 60(08): 52-55.