

The Infiltration of Model Thought in Middle School Education

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Abstract

Model thought is one of the three basic ideas of mathematical thought, and mathematical thought is the essence and soul of mathematics. The use of model thought to guide students to learn modeling, the problems in life abstract into mathematical problems, solve the students "what is the use of mathematics" question, stimulate students' interest in learning, develop students' thinking, cultivate students' creative ability and innovative spirit, really do life mathematics, mathematics life. Both the new curriculum standard and the vigorous development of core literacy require teachers to cultivate students' thoughts imperceptibly in the classroom. After a brief introduction to the idea of model, this paper will point out how to infiltrate the idea of model in the mathematics classroom, aiming at conic curve and centering on the "four energies".

Keywords: model thought; Mathematical modeling; Teaching in Class.

Mathematics is one of the main subjects in primary and junior high education stage. Learning all kinds of difficult knowledge often leads students to question-"What is the use of learning mathematics". Indeed, with the development of science and technology of The Times, even go out to buy things with mobile phones, basic calculation problems have been solved, therefore, in the eyes of students, learning mathematics is just for the test, students lose their interest in learning, learning activities become numb and monotonous. In fact, every aspect of life is filled with mathematical activity, from the turning of clocks to the launching of rockets. How to make mathematics into life, make life mathematical, let students feel the charm of mathematics and the meaning of learning mathematics is the teacher need to reflect on

the teaching activities. Teaching activities are not only simple imparts of knowledge. No matter the demands of students' thoughts or the needs of The Times, teachers are required to change their teaching activities from mechanical, boring and numb injection to thoughtful and dynamic teaching activities. Students are the subjects in teaching so that students can feel their own value and the value and significance of learning in teaching activities. Develop the right values. It is clearly pointed out in Compulsory Education Mathematics Curriculum Standard (2011 edition) that "the establishment of model thought is the basic way for students to experience and understand the connection between mathematics and the outside world". Therefore, this paper will explore how to cultivate students' modeling ability in teaching based on model thought.

1. Mathematical model

The model method is a method to study the functional features and internal rules of the prototype by using the model, and then apply it to the practice. In Selected Introduction of Mathematical Methodology, Mr. Xu Lizhi mentioned that mathematical model refers to a mathematical structure generalized or approximately expressed by using formalized mathematical language with reference to the specific features or quantitative dependencies of something. ^[1] Broadly speaking, all mathematical concepts, mathematical theoretical systems, mathematical formulas, mathematical equations and algorithmic systems composed of them can be called mathematical models; In the narrow sense, only mathematical structures that reflect specific problems or specific systems of things are called mathematical models. [1] It can be said that the broad sense and the narrow sense are general and special. Their essence is to abstract and summarize the characteristics of things by using mathematical language, which is a kind of symbolic model. The characteristics of mathematical model are: abstractness、accuracy、deduction and predictability.

2. Infiltration of model thought

2.1 Problems in teaching--Take the introduction of ellipse as an example

In the course reform, from "double base" to "four base", from the introduction of core literacy, the emergence of model thought in various teaching activities can be said to be "thick makeup and light", "dressed up", but in the actual teaching, efficient and long-term penetration has become a choice for teachers to teach. In Mr. Li Dayong's "The Teaching of Integrated Design Analytic Geometry Based on the Understanding of Mathematical Thought Methods" ^[2], there is such an interesting survey--the introduction of conic curve, which students are more willing to accept and understand. Among them, in the introduction of ellipse teaching, the exploration activity given in

the textbook is to give two points, fix the point with a line segment of a certain length, put a pencil on, move the nib, and the track drawn by the nib will be an ellipse, thus the definition and characteristics of ellipse can be obtained. Such practice is a very interesting and magical experiment for me as a beginner of conic curve, a student now, and even a student of course design now. But Mr. Li Dayong's investigation made me reflect, such a "magical" experiment is really suitable for students to learn knowledge? After inquiring and investigating the students in the surrounding counseling, it is found that the students with excellent performance think this introduction is very good and accurately locate the essence of ellipse, while the children with poor performance mention: "Why is it an ellipse drawn in this way?" "How?" "How do you get the distance between two and two?" If you put these questions to the best students, I believe they will also be confused. However, at the end of the day, students will mechanically remember that the sum of the distance between one point on the ellipse and two focal points is a constant value at the request of the teacher. Students cannot see the rich mathematical knowledge behind the monotonous figure of the ellipse. Even many students cannot see the ellipse in life and want to separate the ellipse knowledge from life.

According to Mr. Li Dayong's investigation, students gain more and have a deeper understanding of the simple situation formation model than drawing the ellipse by hand. However, the benefits of drawing the ellipse by hand given in the textbook cannot be denied. So what's the trade-off? Some teachers, when cultivating the idea of model, let students feel the model "too hard", for example, in the introduction of ellipse, a teacher used multimedia to demonstrate that the trajectory of celestial movement is ellipse, but accidentally such a picture turned for a long time but did not guide students to explore the model.

As can be seen from the above problems, it is necessary to abstract the model from life, make students feel the change and unchanged, cultivate the sense of inquiry, and feel the construction process of knowledge. In teaching, teachers should not only know the importance of the model idea to the cultivation of students, but also know how to design the teaching process to make students properly integrate into the classroom and accept new knowledge.

2.2 Infiltration teaching method of model thought

The formation of thought needs a series of processes such as penetration, perception and manifestation [1], so for the infiltration teaching of model thought, I divide it into three parts: life, practice and abstraction:

Learning is to adapt to the requirements of sustainable development of modern society, so the final application of learning knowledge to life should also be taken from life, and the model mentioned in the model thought in this paper should naturally come from life. In the introduction of ellipses mentioned above, students are asked to

observe the horizontal plane when the water cup tilts, observe the shadow of the sunset on the basketball, observe the flight path of the planet and so on. These are the ellipses existing in life. The ellipse into life, not only make students feel the ellipse can be seen everywhere, but also in the process of life let students learn to abstract life model. Similarly, axisymmetrical graph learning, circle learning and so on, these models can be extracted from daily life, so as to make the seemingly "profound" ideas "popular". "Math education should give students rich real life experiences," Freudenthal said. "It should make students realize that math is available everywhere and learn to use math."

It is an even more ancient truth that true knowledge comes from practice. Practice can be divided into indirect practice and direct practice. Indirect practice is to make the eyes and brain get the experience of practice by observing the teacher's demonstration. Direct practice is hands-on experience. In order to improve teaching efficiency, teachers generally make students gain indirect experience in the process of teaching, but some simple practices can involve students to increase their interest in learning. Besides, different levels of participation will lead to different feelings and understandings of students. For example, in the teaching of monotonicity of exponential function, there are three teaching modes: Mode one, PPT demonstrates the process of image drawing; In the second mode, the teacher draws the exponential function on the blackboard with the five-point drawing method, and uses the form of "you say I draw" in the drawing. In mode three, let the students draw the function on scratch paper. In practice, it is found that mode 2 will make students more profound in the image of exponential function, while Mode 3 students will ask questions that are difficult for students in mode 1 and 2, such as "Why are all the images of functions above the X-axis?". The essence of this question is different between the teacher asking the students and the students themselves. Another example is when drawing an ellipse with two fixed points and fixed length, some students find that if the distance between the two points is greater than the fixed length, they cannot draw an image, and some students are impressed to keep the two points unchanged in the drawing. Therefore, in the teaching design, knowledge should not be "floating on the surface", but directly given to students. In the case of completing the teaching task, students should try their best to feel the knowledge, find and raise questions, so as to obtain their own knowledge.

If life and practice is to cultivate students' ability of observation and discovery, then abstraction is to cultivate students' ability of imagination and construction. Abstractization formalizes and symbolizes the model observed by students and the relationship between change and invariance obtained through practice by using mathematical language. For example, in the process of establishing the standard equation of ellipse, it is students who find the equal relationship between the distance and the sum of two fixed points. The teacher guides students to establish the

coordinate system, sets the points on the ellipse, and describes the restriction conditions with mathematical language, thus drawing a conclusion. Through the process of "building modernization", the text is abstracted into mathematical language, and the method of finding the trajectory equation is also infiltrated, reflecting the idea from the general to the special. Similarly, in the implementation process of abstraction, different coordinate axes are established, and the mathematical language abstracted from images with different characteristics will be different. This is also the difficulty for teachers in the infiltration of model thought--to make students implement abstraction.

To sum up, the infiltration teaching of model thought is a process from the outside to the inside, which is to discover the mathematical model from life, discover the characteristics from the model, and abstract the special mathematical language of the model from the characteristics. Therefore, mathematical models make mathematics out of the mathematical world and build a bridge between mathematics and the real world.

3. Model thought in teaching implementation principle

The development of the subject, the need of the society and the need of the basic mathematics education are the background of implementing the model thought in the middle school mathematics classroom. Therefore, the implementation of model thought in teaching should follow certain principles.

3.1 Principle of Necessity

The purpose of teaching is to transfer knowledge to students, and enable students to master knowledge and use knowledge. And the premise of using knowledge is to understand knowledge, knowledge itself is alive, it has a shape, a source, a feature. Want students in the ever-changing test like a duck to water, it must let students grasp the essence of knowledge, really understand knowledge, and mathematical thought is the essence of mathematical knowledge. Therefore, the infiltration and implementation of model thought in teaching is necessary for the purpose of teaching. On the other hand, in the current exam-oriented education model, many teachers tend to pursue results too much, ignoring the fact that students are developing and thoughtful. They often lose interest because of boring knowledge teaching, can not feel the meaning of learning, and thus lose their enthusiasm for learning. The idea of model enables students to discover mathematics in life and feel the connection between mathematics and life, so they will naturally feel that mathematics is closely related to themselves, which has nothing to do with test scores. Therefore, the infiltration and implementation of model thought in teaching is necessary for the development of students.

3.2 Principle of living

Mathematical model is the bridge between mathematics and life, the implementation of the model idea in teaching can not be separated from life. Making the model idea into life is a low starting point and easy to master for carrying out modeling teaching in middle school. Activity, interest; Emphasis on method, emphasis on thought "[5] is to implement the idea of coming from life to life. Life-oriented mathematics makes students easier to understand, more familiar and more interested, and also has guidance for students' development.

3.3 Principles of teacher modeling literacy

In order to make students have a cup of water, teachers need a river of water. In order to implement the model idea in teaching, teachers must have certain modeling consciousness and modeling ability. Modeling ability is the basic knowledge and skills, teachers need to optimize and improve in continuous learning. The awareness of modeling is not only the sensitivity of teachers to the model, but also the implementation of the model idea, which is more important in teaching. Different from the traditional teaching ideas of dealing with examinations, teachers need to focus on student development and provide students with developmental knowledge and ideas, so that they can cope with the constantly evolving problems.

The idea of model can effectively cultivate students' innovative thought and creative ability, solve the problem of "what's the use of mathematics" of students, and provide motivation for their learning of mathematics and improve their interest. Thought is imperceptible infiltration, so in order to inculcate the idea of implementing the model, it needs teachers to constantly design suitable for students' development of the classroom, the implementation of infiltration in mathematics teaching.

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