

Practical Exploration of Model Thought in Primary School Mathematics Teaching

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Abstract: The thought of mathematical model is the bridge connecting mathematical problems and practical problems, and the key to solving mathematical problems. It has the teaching value of developing students' mathematical thinking ability, applying mathematical knowledge, and independent inquiry consciousness. There are some problems in the teaching of mathematical model thought, such as teachers' insufficient understanding of the value of model thought teaching, inaccurate grasp of the content contained in model thought, and insufficient practice of infiltrating model thought in the classroom. Therefore, teachers should deeply study the content of mathematics textbooks before teaching, implement the student-centered teaching design in teaching, and adopt the process oriented diversified evaluation method after teaching.

1. Theoretical Overview of Mathematical Model Thought

The idea of mathematical model is the bridge between mathematical problems and practical problems, and it is the key to solve mathematical problems.^[1] At present, the existing studies have not reached a unified understanding of mathematical models and model ideas, but they all have some common understanding: that is, mathematical models reflect the contents of mathematical formulas, concepts, laws, rules and charts.^[2-4] China's new curriculum standard points out that "mathematical models in primary education refer to algebraic expressions, relations, equations, inequalities, functions, and various graphs and charts established with letters or other mathematical symbols."^[5] According to this, some scholars pointed out that the essence of model thought is to solve a problem to solve a class of problems, which is needed in the process of solving mathematical problems and the abstract process of mathematical concepts, and exists in regular classroom teaching and expanding exercises.^[6] To sum up, the idea of model refers to the sum of conscious views and methods of mathematically abstracting and simplifying specific problem situations, describing things and their laws in the real world in mathematical language, and establishing a model and using the model to solve related or similar problems.

2. The Value of Mathematical Model in Teaching

In the process of observing problems, raising problems, reasoning problems and verifying problems, students establish the structure of mathematical models, so that they can fully develop their

mathematical thinking ability, apply mathematical knowledge and explore independently.

In the process of developing mathematical thinking ability, students first need to start from specific mathematical problems, find the laws through observing specific problems, and put forward bold conjectures. This process usually involves observation, practice, comparison, synthesis, and analysis. Secondly, after observing similar mathematical problems, we can find the common characteristics of such problems, master the induction and deduction methods from special to general when solving problems, and preliminarily construct mathematical models. Third, verify the constructed mathematical model with examples. In the process of continuous verification, we can find the similarities in mathematical knowledge and draw inferences from one instance, so as to produce good learning results.^[7] Finally, after the model is established, students also need to accurately explain the mathematical model they have built to others and explain the construction process. This process has trained students' logical thinking and language expression ability. After four stages of complete observation and conjecture, induction and deduction, example verification and summary and improvement, students' mathematical thinking ability has been gradually developed and improved.

In the process of applying mathematical knowledge and conducting classroom teaching of model thinking, teachers should first introduce specific problems that fit students' real life, so that students can experience that mathematics is everywhere in life and know the necessity of learning mathematical knowledge, so as to stimulate students' interest in learning. Then guide students to use relevant mathematical models to solve problems in the process of exploring problem situations. This process of applying mathematical models cultivates students' ability to use mathematical knowledge to solve problems.^[8]

In terms of cultivating the awareness of independent inquiry, teachers need to guide students to think and explore independently in the process of building mathematical models, so that they can fully realize the sense of achievement after building a correct mathematical model through their own efforts. This is very helpful to improve students' interest in learning and develop the habit of thinking independently when encountering problems. After students have the awareness of independent inquiry, when they encounter complex mathematical problems in later learning, they will first actively think about solutions, rather than blindly relying on others.^[9]

3. Problems in the Teaching of Mathematical Model Ideas

3.1 Teachers Have Insufficient Understanding of the Value of Model Ideological Teaching

Primary school mathematics textbooks contain a lot of mathematical model ideas, but its content is scattered and not concentrated, there is no way to form a certain system system, which will make teachers have a wrong understanding, mistakenly think that the teaching of model ideas is not important, but also let teachers lack systematic guidance for the teaching of model ideas, resulting in insufficient understanding of the educational value of model ideas. In addition, there are no detailed requirements for the teaching of model ideas in the new mathematics curriculum standards, and no clear guidance is given to teachers, so teachers can only explore on their own in the teaching process to form their own unique system, which leads to uneven teaching of model ideas. The scattered mathematical models in the textbook will give teachers the wrong understanding, making them think that the penetration of model ideas is not important.

3.2 The teacher's Grasp of the Content Contained in the Model Idea is not Accurate

The teacher's understanding of the model idea, the selection of teaching methods, and the method of guiding students are very critical, which directly affects the students' absorption and understanding of the knowledge of model ideas.^[10] Teachers have a good way of infiltrating in their daily teaching,

and students' knowledge of model ideas is high, and vice versa. In conventional teaching, some teachers do not have a clear grasp of the content of the model ideas of the teaching materials, do not understand the content to be taught deeply enough, do not know to what extent the model ideas contained can penetrate, and do not grasp the degree of understanding of students. Therefore, when teaching models, they cannot create appropriate problem scenarios and guide students appropriately in combination with real life, and they cannot effectively use topic maps to guide students to make bold guesses, build relevant models and verify summaries. The infiltration of such a model idea in the teaching is clearly a failure.

3.3 Teachers' Lack of Practice in Infiltrating Model Ideas in the Classroom

Teachers lack the operational experience of infiltrating model ideas in daily teaching, and do not form a good habit of consciously infiltrating model ideas in teaching, which is mainly manifested in the following two aspects. On the one hand, the utilitarian purpose of current teaching is too strong, parents often only pay attention to the students' immediate achievements, and do not care about the formation of relevant mathematical ideas, and the daily assessment of model ideas is less, teachers naturally ignore the penetration of model ideas in daily teaching, as long as students get the ideal results, and ignore the far-reaching impact of teaching model ideas on students. On the other hand, although in conventional teaching, teachers will also use relevant models to teach mathematical problems, but it does not allow students to understand in depth, nor does it systematically integrate such teaching, which directly leads to the lack of practical experience of teachers infiltrating model ideas.

4. Teaching Penetration Strategies for Mathematical Model Ideas

4.1 Preparation Before Teaching - in-Depth Study of Mathematics Textbook Content

Teachers need to do two preparatory work before teaching mathematical model thinking.

First of all, it is necessary to systematically and deeply study the content of the textbook. In the study of mathematical knowledge, teaching materials are the link between students and teachers, teachers impart knowledge to students through teaching materials, and students acquire knowledge by learning teaching materials taught by teachers. Therefore, in order to let students have more gains, teachers need to internalize the content of teaching materials into their own knowledge, clearly know what teaching methods should be used for teaching, constantly innovate their own teaching methods, and improve their comprehensive literacy. In primary school mathematics textbooks, models are everywhere, and their content is mainly reflected in the textbook's example problems, formulas, exercises and other related knowledge. Therefore, teachers need to conduct in-depth research on the content of textbooks, dig deep into the model ideas contained in the textbooks, and have a comprehensive and thorough understanding of model ideas. Only in this way can students achieve deep learning of model ideas in the classroom.

Second, highlight the teaching design of the student as the main body. How to make efficient use of the 40 minutes of each lesson, so that students can enjoy learning, love learning, and exert subjectivity in the math classroom. It is a university question that teachers need to study carefully. Therefore, when designing the teaching activities of mathematical model ideas, teachers should abandon the traditional teaching mode of teacher teaching and students listening to lectures, return the dominant position of the classroom to students, let students participate in the whole process of building mathematical models, improve students' ability to use their brains to construct mathematical models, and understand the charm of model ideas, so as to learn from each other.

4.2 Implementation in Teaching - Implement Student-Oriented Teaching Design

The specific steps for teachers in teaching mathematical model ideas are as follows. First, create an interesting teaching situation and initially perceive the mathematical model. The more interesting the teacher designs the classroom activities, the more willing the students are to use their brains to think and focus their attention on the classroom. Second, encourage students to make bold guesses and build mathematical models on their own. The mathematical model knowledge obtained by students through independent inquiry is deeper and more memorable than the understanding they have learned by the teacher's direct lectures. In teaching, teachers should let students boldly go through the exploration process of independently constructing mathematical models, propose their own conjectures, verify conjectures, and finally obtain relevant knowledge. Finally, Flexibly use mathematical models to solve practical problems in life. The ultimate goal of model thinking teaching is to let students use the construction model to solve mathematical problems in reality, experience the role of mathematics in real life, and thus realize the necessity of learning mathematics. ^[11] Therefore, in the process of teaching, teachers should try to use real-life examples to teach and give students a deeper understanding.

Taking the lesson of "Knowing the Corner" of the second grade of primary school mathematics in the human-taught version as an example, through the design of vivid and interesting perception games in teaching, games are used throughout the classroom, so that students can learn while play and play while learn. At the beginning of the teaching, the classroom is introduced through the game of guessing the angle and finding the angle, so that students can initially perceive the model of the angle and make a preliminary impression of the characteristics of the angle. Next, ask students to touch and point to the angles around them to further perceive the characteristics of the angles. Then, in the key link of the new knowledge inquiry, through the courseware to show different angles, let students make bold conjectures, discover the common characteristics of these angles, so as to build a model of the angle in mathematics, and then through the form of mathematical paradise, verify the model of the angle and perceive the size of the angle. Finally, return to real life, show the angles in life, and let students feel the unique charm of the angles. Through perceptual situations, conjecture construction, verification and modification, applied model, such complete process of model construction, students can truly construct mathematical model ideas.

4.3 Reflection after Teaching - Adopt a Process-Oriented and Diversified Evaluation Method

Teaching reflection is an important means for teachers to comprehensively and systematically examine the success or failure of their own teaching design and improve their teaching ability, which needs to be actively and seriously treated.

First of all, advocate the evaluation method of emphasizing the teaching process. Infiltrating model thinking is a gradual process, and the result of gradual accumulation in the daily mathematical learning process, not overnight. One or two teachings are unlikely to have a significant effect, so after each class, attention should be paid to evaluating the overall performance of students in the entire teaching process in this math classroom, rather than just focusing on students' learning results. If teachers only pay attention to the evaluation of learning results, students may appear to know what model thinking is, but they do not know how to build model thinking, so that the effect of infiltrating model thinking is not achieved at all. Therefore, in the teaching process, teachers should pay attention to the appropriate guidance of students, pay attention to the specific performance of students in the construction of mathematical models, mainly including students' ability to think independently, how to build mathematical models, and the performance of answering questions in class for comprehensive evaluation, and summarize and reflect.

Second, adopt a diversified evaluation method. When evaluating students' learning, a single

evaluation method is not objective. Teachers should use a variety of evaluation methods to objectively evaluate all aspects of students' learning of mathematical models. For the evaluation of students, teachers can either make a comprehensive evaluation of students through specific performances in the classroom, the process of building models, special exercises, etc., or they can take the method of mutual evaluation of students to let students evaluate the same group or nearby students. For the evaluation of teachers, teachers can use questionnaires or interviews to listen to the evaluation of students in the classroom, or teachers can summarize and reflect on their own teaching process, analyze the penetration of model ideas in classroom teaching, find problems and correct them.

Mathematics is a relatively abstract subject, teachers need to guide students to first abstract the essence of the problem from the real problem, build a relevant mathematical model, synthesize the same type of problem, and finally can achieve the effect of extrapolation. At the same time, only when students go through a series of conjectures, construction, verification, and summary under the guidance of teachers, their mathematical model ideas can be gradually improved. Only in this way can we implement the cultivation of mathematical ideas of primary school students, and it is mathematical learning in the true sense.

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