Progress and Strategies of Mathematical Modeling Integrating into Primary School Mathematics Education

Yong Zhang and Hong Su

ABSTRACT

By analyzing the present situation of mathematical modeling in primary school mathematics education, this paper clearly points out that the integration of mathematical modeling into primary school mathematics education is not only a clear requirement of new curriculum standard, but also a consensus view of primary school mathematics education reform. It also points out the integration road to promote the mathematics modeling thought in macroscopic angle based on the further discussion of the key strategies for the integration of mathematics modeling in primary school mathematics education reform.

INTRODUCTION

Mathematics is a science that studies quantitative relations and spatial forms. The main characteristics of mathematics are abstraction of concept, strictness of logic, clarity of conclusion, integrity of system and extensiveness of application. People are gradually realizing the value of mathematical application, which is the foundation of constructing modern material civilization[1]. Mathematical modeling is the concentrated embodiment of mathematical application. Mathematical model is an abstract simulation, which uses mathematical symbols, mathematical formulas, programs, graphs, tables and so on to describe the essential attributes and internal relations of objective things. It is a simplified and essential description of the real world. Mathematical modeling is the whole process of obtaining the model, solving the model, reaching a conclusion and verifying the correctness of the conclusion[2]. Mathematical modeling is a mathematical thought method that finds the problem, puts forward the problem, understands the problem from the mathematical point of view, and it comes down to a class of problems that have been solved or relatively easy to solve through the transformation process[1].

Yong Zhang, College of Teachers, Chengdu University, Shiling Town, Chengdu, China
Hong Su, Experimental Primary School affiliated to the University of Electronic Science and Technology, No.1 Fuching Road, Chengdu, China
Mathematical modeling has irreplaceable value for cultivating problem consciousness, mathematical thinking and creative ability in primary school mathematics education. It is a kind of elementary school mathematics teaching strategy that has been gradually adopted in our primary school in recent years[3]. This paper analyzes the current situation of the reform of the integration of mathematical modeling ideas and primary school mathematics education, and explores the macroscopic ways of integrating mathematical modeling ideas into primary mathematics education.

THE DEVELOPMENT OF MATHEMATICAL MODELING INTEGRATING INTO PRIMARY SCHOOL MATHEMATICS EDUCATION

1 Rapid Maturity and Development of Mathematical Modeling Technology

Twenty years ago, many problems cannot be solved because mathematical modeling was limited due to the lack of computing power. With the rapid development of information technology, the calculation problem of the mathematical model has been solved to a large extent. It fully shows the powerful power of mathematical modeling and expands its application field. Now mathematical modeling and computer simulation have become a basic technology of modern science (mathematical technology) that plays a key role in such fields as quantum theory, artificial intelligence. People are becoming more and more aware of the importance of mathematics and mathematical modeling, and the idea and method of learning and applying mathematical modeling has become a common understanding in the field of education[4].

2 Deviation in Cognition of Essential Goal of Mathematics Education

For a long time, there are two viewpoints on the goal of mathematics education. One is to understand mathematics, which tends to cultivate the ability of thinking and complete knowledge system of mathematics, and the teaching category is limited to the field of mathematics. The other is applied mathematics, which tends to cultivate the ability of mathematics application, emphasizes the transfer and application of knowledge, and puts mathematics under the background of comprehensive science to teach.

For a long period of time, mathematics education had been used to teach mathematics as a classic dogma rather than a vitality of the development of the subject because it adopted the first point of view, paying attention to theoretical analysis and algorithm understanding. Teaching focuses on imparting knowledge and developing logical reasoning and computing, and rarely discusses the close connection between mathematics and the world around us. In the information world, comprehensive and systematic knowledge is no longer the essential goal of mathematics education! The essential goal of mathematics education should be finding and solving practical problems by using mathematical methods flexibly and creatively on the basis of forming basic mathematical structural knowledge and thinking ability.
3 Integration of Mathematical Modeling Ideas is the Consensus of the Reform of Mathematics Education in Primary School

At present, the reform of mathematics teaching in primary school has entered a period of profound reform of connotation [5], people came to agree that mathematics comes from life and ultimately serves life. It aims to teach mathematics from the students' life experience and existing knowledge background by creating students familiar life situations or providing students with practical opportunities. Let students acquire dynamic mathematical knowledge, skills and methods through inquiry, cooperation and other learning methods and develop abilities to come up with creative solutions to practical problems in life. This consensus is essentially mathematical modeling. Mathematics education in primary school is changing from simply treating application problems as a type of questions to comprehensive practical activities which fully reflect the integration of mathematics application and other disciplines.

4 The Cultivation of Mathematical Applied Ability is in the Low Stage

Although mathematical modeling has been popular and popularized for more than 20 years, and has been infiltrated in primary school mathematics education for 10 years, the cultivation of mathematics application ability in primary school mathematics education is still in the lower stage because of various reasons. The main manifestations are:

(1) In mathematics teaching, the ideas, methods and processes of mathematical modeling are not enough, and teachers lack experience in mathematical modeling, which is limited to creating an application situation to help students understand the application problems, as a result, it can't instruct students in thinking training of Mathematical Modeling.

(2) The related research between mathematical modeling and primary school mathematics education is not enough. Through the keyword "Mathematical Modeling" + "Primary School" search network, only 19 papers were retrieved, many of which are specific to the classroom examples. There are too few papers on how to combine mathematical modeling with primary school mathematics education and education reform, how to realize the idea of mathematical modeling in the framework of primary school mathematics teaching, and how to build mathematical modeling resources.

(3) The comprehensive knowledge background of primary school teachers is insufficient, and mathematical modeling needs complex knowledge framework, which is the result of multidisciplinary cooperation and directly faces all kinds of scientific, engineering, economic, management and social problems. It requires open knowledge and thinking mode. At present, the elementary school mathematics teachers generally lack this open ability and knowledge structure.

(4) Teaching and learning means are single, information media is still relatively backward. Teachers' classroom instruction and simple courseware demonstration are almost all the media of knowledge dissemination. The relationship between mathematical modeling teaching and information technology is not enough. In fact, through the computer virtual reality, we can visualize the application background of mathematical knowledge discovery, visualize the process of mathematical modeling, and visualize the effect of mathematical problem solving. The use of multimedia
multi-channel is expected to reflect the charm of mathematical modeling, improve the effectiveness of mathematics education.

(5) Textbooks cannot support the integration of mathematical modeling ideas. For a long time, the arrangement of teaching materials has formed a basic mode of classroom teaching: the lead-in and introduction of examples, the interpretation and analysis of examples, the practice and application of examples. The compilation of sample teaching materials will make the teacher think that the study of mathematics is to understand the examples, master the examples and solve similar problems. It is a common problem when teachers teach examples, students do exercises, and life is separated from the reality, students only know how to solve the same or similar problems taught in class resulting in rigid way of thinking. It affects the development of students’ creativity [6].

KEY STRATEGIES OF INTEGRATING MATHEMATICAL MODELING INTO PRIMARY SCHOOL MATHEMATICS EDUCATION

A Survey of Primary School Mathematics Teaching Materials from the Perspective of Mathematical Application

In order to overcome the disadvantages of the presentation of the compilation of sample textbooks, this paper gives guidance to the compiling structure and developing mode of mathematical textbooks from the high point of view of mathematical application. At some key nodes, innovation in writing patterns can be done at the expense of some style uniformity, if necessary. In fact, many elementary school mathematics knowledge points have different backgrounds, some plain, some very interesting. The textbook should show the vivid whole process of practical problem solving and mathematical model refining, so that students can get great impact and perception, and affect students’ views and feelings on mathematics. This kind of teaching material can avoid the dull and monotonous theoretical formula as much as possible, and let students have love and trust in mathematics.

Teachers’ training in Mathematical Modeling ideas and methods

Some of the new graduates have had experience in mathematics modeling courses or mathematical modeling competitions, but some young teachers and older mathematics teachers have no experience in mathematical modeling applications. Mathematical modeling is a complex and large system field. It is difficult for teachers without mathematical modeling experience to integrate mathematical modeling ideas into mathematics education, only through training.

Establishment of Primary School Mathematical Modeling Resource Base

Information technology is not only a multiplier of mathematical modeling, but also an important support for the integration of mathematical modeling ideas into primary school mathematics teaching. Mathematical modeling needs a large number of living cases, but also needs to fully, appropriately and effectively demonstrate the mathematical modeling process through the multimedia information visualization. This
work cannot be achieved only by primary school mathematics teachers, it must be handled with combined aspects of efforts, including but not limited to the implementation of primary school mathematical modeling resource database or teaching case base construction. The formation of resources can be widely used to support the primary school mathematics education and teaching reform.

The primary school mathematics modeling resource base should not only include the courseware resources needed in classroom teaching, but also include the resources of students' self-study and development, at the same time, we should consider the resources of teachers' training and in-depth learning.

Consciously embody the Application of Mathematics in Teaching Design

In teaching design, it includes creating situation, letting students perceive mathematical modeling thought, introducing relevant teaching, providing opportunities for the students to participate in inquiry, and actively constructing mathematical model. Finally, it is necessary to design a model to solve the problem and expand the applied mathematical model.

The creation of the scene should be combined with various factors related to mathematical problems such as the reality of social life, the hot issues of the times, nature, social culture, and so on, so that students can feel real, novel, interesting and operable in order to meet the psychological requirements of students' curiosity and active nature. In this way, it is easy to arouse the students' interest and activate the existing life experience in the students' minds. It is also easy for the students to use the accumulated experience to feel the implicit mathematical problems in order to promote students to abstract life problems and perceive the existence of mathematical models.

CONCLUSION

To sum up, mathematical model is a basic concept in mathematics, it is at the heart of all mathematical applications[1]. The establishment of mathematical models is an important part of mathematics learning. The special position and function of mathematical modeling have been reflected in primary school mathematics. Mathematical modeling shows the relationship between learning mathematics and applying mathematics to solve practical problems, which is an iterative process. This teaching idea is a presentation of a miniature scientific research process, so that students find it fresh, which not only promotes the strengthening of students' mathematical awareness and mathematics literacy, more importantly it also promotes the students' mathematical quality. Whether in colleges, middle schools or primary schools, the value of mathematical modeling will have a positive impact on students' learning, so we should carry out the idea of mathematical modeling and grasp the connotation of mathematical modeling in primary school mathematics teaching in order to start a perfect math learning process.

REFERENCES

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