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Truth, Goodness and Beauty in Mathematics Teaching

Xilian Fu

School of Mathematics and Statistics
Shandong University of Technology
Zibo, 255049, China

Abstract

Mathematics is the unity of truth, goodness and beauty. In mathematics teaching, we should embody three levels of content: the imparting of knowledge and methods - reflecting the truth of mathematics; the application of thoughts and methods - reflecting the goodness of mathematics; the appreciation of mathematics - reflecting the beauty of mathematics. Thus, the combination of rational spirit and humanistic spirit of mathematics can be realized, and the unity of truth, goodness and beauty in mathematics education can be achieved.

Mathematics Subject Classification: 00A30

Keywords: mathematics teaching; thought and method; mathematics beauty; mathematics spirit

1 Introduction

As one of the oldest disciplines in the long history of mankind, mathematics has become a major discipline with the same status as natural science, social science and thinking science after a long period of accumulation in elementary mathematics to the birth of modern mathematics in the 17th century, and then to the rapid development of modern mathematics. Throughout the history of mathematics development, the solution of every major problem shines with the brilliance of human thought. The establishment of every theory reflects the

wisdom of mathematicians and perspectives the spirit, concept and attitude of mathematics.

Mathematics is not only a tool, a technology, but also a culture, an art. Mathematics is the unity of truth, goodness and beauty. In mathematics teaching, we need to embody three levels of content: That is, the imparting of knowledge and methods - reflecting the truth of mathematics, the application of ideas and methods - reflecting the goodness of mathematics; the appreciation of Mathematics - reflecting the beauty of mathematics. Thus, the combination of rational spirit and humanistic spirit of mathematics can be realized, and the unity of truth, goodness and beauty in mathematics education can be achieved.

2 Truth in mathematics teaching

The main task of any subject education is to seek truth from teaching. As far as mathematics is concerned, the question of what to teach and how to teach depends on teachers'views on mathematics. Different views of mathematics form different values of mathematics, which determines the structure of mathematics knowledge and the way of training talents in the process of mathematics education. The traditional view of mathematics is often pragmatism or scientism. Although it has certain rationality, it can not reflect the characteristics of mathematics comprehensively and profoundly. This leads to the fact that in the traditional mathematics teaching process, teachers only concentrate on the imparting of knowledge and the formation of skills, but neglect the most charming rational spirit contained in mathematics knowledge.

From a scientific point of view, mathematics is a systematic theoretical system consisting of knowledge and methods and thought with a rigorous structure from a scientific perspective. From the cultural point of view, although the definition of mathematical culture has not been fully defined up to now, as a knowledge of mathematical culture, people have reached a consensus that mathematical culture is different from mathematical history, mathematical philosophy and mathematical methodology; it is neither a general knowledge of mathematical theory nor a statement of some mathematical phenomena. Mathematical culture is a deeper content in the process of the generation, development and perfection of mathematical knowledge, that is, the spirit, attitude, concept and method of mathematical science.

"Scientific culture and instrumental rationality are the source of civilization and the foundation for the establishment of the world; humanistic culture and value rationality are the foundation of civilization and the foundation of human beings"[1]. Therefore, the term "truth" here means that teachers not only impart the definite knowledge in mathematics textbooks, let students master truth, but also let students master the method of obtaining truth, and understand the rational spirit of mathematicians seeking truth and pursuing

truth.

The problem is the heart of mathematics, knowledge is the carrier of mathematics, method is the behavior of mathematics, and thought is the soul of mathematics. In the process of teaching, we should form a constructivist teaching view of mathematics, which regards problems as the logical starting point of classroom teaching design, knowledge as the carrier, ideology as the guidance, cultivating students'scientific spirit as the goal, reconstructing the process of knowledge regeneration,so as to cultivate students'various mathematical abilities and improve students'thinking products, quality, and let them feel the scientific spirit.

3 Goodness in Mathematics Teaching

"If the truth of mathematics represents is the scientific value of mathematics, goodness of mathematics represents the social value of mathematics"[2]. In the process of mathematics teaching, if the truth refers to the imparting of knowledge and the mastery of ideas and methods, then goodness is the relationship and interaction between mathematics and technology, society, economy and engineering. The development of modern mathematics is characterized by its high degree of abstraction and unity. It is this high degree of abstraction that has led to the wide application of mathematics. The application of modern mathematics produced in the 17th century is limited to astronomy, navigation technology, mechanics, physics and other fields. The thought and method of modern mathematics has penetrated into almost all fields of economy and society, and increasingly affects human life.

In the 1950s, British mathematician and mathematic logician Whitehead pointed out in his famous speech-Mathematics and Goodness: "Considering that mathematics has infinite subject matter, mathematics and even modern mathematics are still a science in infancy. If civilization continues to develop, then in the next two thousand years, the overwhelming new feature of human thought is the dominance of mathematical understanding"[3]. Therefore, the application of mathematics should be emphasized in today's higher and higher degree of mathematicalization in science, technology, society and economy.

Firstly, the practical background, mathematical significance and scientific value of the emergence of mathematical theory are expounded from a historical point of view. Secondly, facts and data are used to illustrate the role of mathematics in promoting the national economy and its impact on our lives. Thirdly, strengthen the connection with other professional courses and carry out case teaching. Fourthly, set up practical application examples with certain difficulties, let students work on their own, use the knowledge and methods they have learned to establish mathematical models, and solve these problems independently. Through the teaching strategy of integrating theory with prac-

tice, students can realize the purpose of learning mathematics, stimulate their interest in learning mathematics, and finally form a correct mathematical attitude, that is, to learn to observe things mathematically, understand things mathematically, and solve practical problems mathematically. "Mathematics is regarded as a rational way of thinking beyond concepts and methods, the best way to express the world and a belief in"near"truth. It is recognized that the use of the useless is the core of mathematical development"[4].

4 Beauty in Mathematics Teaching

Mathematician Russell pointed out: "Mathematics, if viewed correctly, not only has truth, but also has the supreme beauty, just like the beauty of sculpture, is a cold and serious beauty. This beauty is not a weak aspect of our nature. This beauty does not have the gorgeous decoration of painting or music, it can be pure to the sublime, and it can achieve the perfect situation that only the greatest art can show"[5]. Mathematics is a subject of beauty, because its object of study-mode is an idealized model, idealized model is the product of abstract thinking, implying a symbolic and formal process of representation, reflecting simplicity and harmony, which is naturally beautiful.

According to the social and material attributes of mathematical beauty, mathematical beauty can be divided into content beauty and form beauty. The former can also be divided into structural beauty, linguistic beauty and methodological beauty, while the latter is the external and internal performance of the former. The external performance can be divided into concise beauty, unified beauty, symmetrical beauty and neat beauty. The internal performance is characterized by singular beauty and speculative beauty. Mathematical beauty can be divided into formal beauty, rational beauty and creative beauty according to the hierarchy from surface to interior.

Mathematical beauty is an abstract beauty, cold beauty, how to turn this cold beauty into hot thinking? First of all, we should show the beauty by the truth, guide students to perceive the formal beauty of mathematics sensibly, and make students realize that mathematics is full of the charm of beauty. Secondly, through the external beauty of mathematics, the rational thinking and mathematical beliefs of the mathematicians implied in it are deeply analyzed, including unique and wonderful methods and profound ideas, and the pursuit of strict and unified mathematical beliefs. From this, the unity of content beauty and form beauty can be achieved. Thirdly, mathematical aesthetics is often accompanied by mathematical creative activities. Mathematical creation can not be separated from mathematical intuition. Mathematical intuition is a choice, that is, making the most subtle and essential choice according to aesthetic principles. Therefore, in the process of knowledge innovation and application innovation, let students feel and appreciate beauty and learn how

to enlighten truth by beauty.

Mathematics teaching can not be separated from the analysis of the characteristics of mathematics. Only mathematics teaching that reflects the truth, goodness and beauty of mathematics can truly achieve the truth, goodness and beauty.

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