

The significance of Mathematics Education under the concept of mathematics culture

Xilian Fu

College of Science, Shandong University of Technology, Shandong Zibo 255049 China

Abstract: From the perspective of mathematics culture, we can not only change the traditional view of mathematics, but also form the corresponding view of mathematics education. Mathematics education under the concept of mathematics culture contributes to the unity of mathematics science education goal and humanities education goal. Therefore, the comprehensiveness of classroom teaching content can be realized and students' creative ability can be cultivated.

Key word: Mathematical culture; Mathematics education; Teaching content; Mathematical creativity

1 Introduction

Mathematics, an ancient discipline that originated in ancient times, has become a major discipline independent of natural science, social science and thinking science. With the birth of computer science and the rapid development of artificial intelligence and information technology, mathematics, especially modern mathematics, is playing an increasingly important role. Nowadays, with the increasing degree of mathematics in technology, economy and society, people no longer look at this discipline from a scientific perspective, but from a broader perspective of human culture to analyze the status, function and characteristics of mathematics. And the final result of this research will inevitably lead to profound reflection and reform of traditional mathematics education.

2. The Meaning of Mathematical Culture

What is mathematical culture? Scholars at home and abroad give the definition of mathematical culture from different perspectives. The paper^[1] gives the definition of mathematical culture from the perspective of system theory, and holds that mathematics is a dynamic system with strong spiritual and material functions. From the characteristics of thinking activities, the paper^[2] points out that mathematical culture is the static result and dynamic process of spiritual creation accumulated by human beings in mathematical activities. With the help of two basic concepts of "group" and "network", the paper^[3] defines the meaning of mathematical culture, that is, mathematical culture is a relatively independent and relatively stable social meaning network formed by the group of mathematicians consciously in understanding the mathematical world and interacting with each other.

Although the definition of mathematical culture has not been fully defined, the components of mathematical culture have been discussed in both the theory of system and thinking, and the theory of "group and network" of mathematical culture. Although there are internal and external points, static and dynamic points, material and spiritual points, and broad and narrow senses as its constituent elements, its constituent elements are composed of the following elements: mathematical problems, mathematical language, theoretical knowledge (including concepts, principles, formulas, and logical inferences) mathematical thinking, mathematical thinking methods, mathematical concepts and attitudes. The core of which is the rational spirit of mathematics. It is this spirit that inspires a person to dare to question and criticize. It is also this spirit that urges human beings to constantly explore and influence and change the way of thinking of human beings in the process of exploration. As Klein said: "In the broadest sense, mathematics is a spirit, a rational spirit. It is this spirit that inspires, promotes, inspires and drives human thinking to the most perfect extent. It is also this spirit that tries to influence human material, moral and social life decisively; tries to answer questions about human existence; tries to understand and control nature; tries to explore and establish the most profound and perfect connotation of acquired knowledge." [41] The study of mathematical culture is not only helpful to people's reunderstanding of mathematics and changing people's one-sided view of mathematics, but also has practical significance to promote the spread, education and innovation of mathematical culture.

3.The Defect and Deficiency of Traditional Mathematics Education

The current mathematical values are often utilitarian or pragmatic, The traditional mathematics education under this concept is a kind of knowledge-based mathematics education, which emphasizes the systematization and logicity of knowledge. The development level of classroom teaching content is from examples to definitions, to properties, principles and logical inference, and finally to their application. Teachers will form a kind of indoctrination education attitude and tendency consciously or unconsciously, that is, to regard students as a kind of land that can be developed and exploited, and to indoctrinate knowledge in large quantities. As a result, students can only read and memorize, not good at thinking, their own psychological ecological structure is severely damaged, and eventually lost their creativity. Students only understand the preciseness of mathematics, but can't give full play to their imagination; Learned deductive reasoning, but not inductive experiments; Only see the results of the mathematical theory, but can not insight into the process of the theory. In the end, the students form a one-sided understanding of mathematics, that is, in the whole process of his (her) mathematics learning, strictness will become everything in mathematics. This too mechanical teaching method and formal teaching content ignore students' interest and subjectivity. Students can only accept passively rather than actively participate in the class.

4 The Significance of Mathematics Education under the Concept of Mathematics Culture

The essence of mathematics education under the concept of mathematics culture is to break the traditional values of mathematics, and regard mathematics not only as a tool, but also as a culture. In the process of mathematics education, we should not only impart knowledge and training skills, but also penetrate the concept, attitude and spirit of mathematics. So mathematics education under the concept of mathematics culture is: "by combining the external mathematical knowledge with the internal human life education organically makes people discover the external objective world as well as the internal spiritual world, so that the mathematical education not only embodies the mathematical spirit, but also embodies the humanistic spirit, so as to really turn the process of mathematical education into the process of cultivating people."^[5] Its significance is mainly reflected in the following aspects:

4.1 Correct the one-sidedness of traditional mathematics education goals and realize the unity of scientism and humanism goals

As mentioned above, the traditional mathematics education is the mathematics education under the scientism concept. "Moreover, from a broad social background, under the pattern of market economy, the knowledge of science education retained in mathematics education is being erased by the value orientation of utilitarianism, so that the value of science education in mathematics education is almost lost."^[6] In the establishment of the educational goal of mathematics subjects, people only see the goal of result, but there is no educational goal of process and experience. It only reflects the educational goal of scientism, but ignores the goal of humanism. From a cultural perspective, mathematics is not only filled with the spirit of scientism, but also permeated with rich humanistic spirit. Therefore, mathematics education under the concept of mathematics culture can prompt mathematics educators to reflect on the defects and deficiencies of traditional mathematics education goals. It makes people realize that in the process of mathematics education, people should not only pay attention to the thinking training function of mathematics, but also emphasize the unique educational function of mathematics. Based on the existing educational goals of scientism, the educational goals of mathematics are the unity of scientism and humanism.

4.2 Break the singleness of the teaching content in the traditional teaching process and realize the comprehensiveness of the teaching content

Under the traditional mathematics values, mathematics education has artificially cut off the connection between mathematics and other subjects, resulting in the singleness of classroom teaching content, losing the activity and vitality of mathematics knowledge, making students feel boring, tasteless and losing strong interest in learning. From the perspective of culture, the unity of scientism goal and humanism goal in mathematics education determines the comprehensiveness of teaching content, which is the combination of mathematics and history, mathematics and mathematical philosophy from a macro

perspective. Mathematics education can not be separated from the history of mathematics. Mathematical philosophy is a bridge connecting mathematics and humanities, and the history of mathematics can provide rich materials. The combination of mathematics, history of mathematics and philosophy of mathematics can not only have an overall understanding of the development of mathematics from a historical point of view, but also fully understand the dialectical relationship between mathematics and practice, mathematics and logic, so as to cultivate students' correct outlook on mathematics and correct learning attitude.

From the microcosmic point of view, the combination of mathematics, mathematical history and mathematical philosophy is to transform the mathematical knowledge of academic form in textbooks into the mathematical knowledge of educational form. That is to say, the historical background, evolution process, ideological methods and attitudes of the concepts and principles taught are integrated into the classroom teaching content. A knowledge system characterized by integrity, hierarchy and process is formed, which has description state, open state and dialogue state. Mathematics is a subject full of spirituality and life. The comprehensiveness of mathematics teaching content makes it possible to activate mathematics knowledge and stimulate students' strong interest in learning. Therefore, students actively participate in the teaching process. It is the comprehensiveness of mathematical knowledge that makes students not only pay attention to the result knowledge in textbooks, but also pay attention to the process knowledge of knowledge formation, so as to change the original single knowledge structure of students and form a reasonable knowledge structure. From the point of view of ecology, the design of this kind of reorganization and comprehensive elasticity of mathematical knowledge is an important way to restore the ecological relationship between curriculum content and construct the complete knowledge ecosystem in the teaching material. It is also the basis of returning to nature in mathematics classroom, interaction and dynamic generation in mathematics teaching process.

4.3 Permeating the Concept of Mathematical Culture Helps to Cultivate Students' Creative Ability

Mathematical creation depends not only on logical thinking, but also on non-logical thinking. According to Descartes, logic is only a tool for the exchange of known knowledge; Adama regards logic as a test method to check whether the result of intuition is correct; Y.B.Chavanz emphasized the significance of mathematicians' intuition and imagination on the basis of recognizing the role of logic, It is because of this ability that they can break the shackles of traditional concepts and establish new and revolutionary concepts and theories. According to A.S.Besiovitch, "Great mathematicians know that a theorem is true before they constitute a logical proof, and they are satisfied as long as they see the provability. The greatest advance in mathematics is driven by people with outstanding intuitive ability, not by people with strict proof ability. "[7] However, the traditional mathematics teaching process only emphasizes the logical connection of knowledge, pays attention to the cultivation of students' logical reasoning, and ignores the cultivation of non logical thinking such as mathematical intuition.

According to the viewpoint of system theory, the structure of system determines the function of system. The synthesis of mathematics classroom teaching content is essentially the optimization of knowledge structure. The impartation of knowledge and the cultivation of ability complement and promote each other, the knowledge system with reasonable structure will certainly promote the cultivation of students' ability with reasonable structure, in which mathematical creativity is the core of the ability structure, Creativity here should not be limited to discoveries and innovations in science. It is an extensive attitude and way of cognition including mathematics feeling, mathematics observation, mathematics understanding, mathematics consciousness, mathematics knowledge learning, mathematics problem solving, mathematics thinking, mathematics communication, mathematics application and other different mathematics activities from the perspective of education^[8].

Ability training is inseparable from thinking activities, and thinking activities are inseparable from mathematical thinking methods. Under the concept of mathematical culture, mathematical teaching is based on theoretical knowledge as the carrier, ideological method as the guide, and the introduction, abstraction and generalization of theoretical knowledge as the embedding point, so that the contents of mathematical history, mathematical philosophy and mathematical culture are organically combined with the theoretical knowledge of mathematics, forming a dynamic process in which the main activities are the abstract process of concepts and principles and the exploration of proof methods. In this process, not only the students' logical reasoning ability but also their non-logical thinking ability such as observation, analogy, association, induction and mathematical intuition are trained.

Reference

- [1] Qin'an Huang. Mathematics quality education under the concept of mathematics culture [J]. Journal of mathematics education. 2001,10 (3): 12.
- [2] Tie'anLi. Mathematics and its educational implications under cultural significance [J]. Journal of mathematics education, 2008,17 (6) 16-20.
- [3] Zheng qiang. Enlightenment of mathematical culture in educational form on mathematical education [J]. Journal of mathematics education, 2008,17 (3) 21-22.
- [4] Yuxin Zheng, Xianchang Wang, CAI zhong. Mathematical culturology[M]. Chengdu: Sichaun Education Press 2000,310.
- [5] Xinchang Hou , Zhang xiong, Shu-e Sun. Highlighting the humanity of mathematics under the concept of culture and education[J]. Journal of mathematics education, 2014,23 (5) 6-9.
- [6] Qin'an Huang, Cheng Hua. On the humanistic goal of mathematics education[J]. Mathematics education research, 2005, issue 6,2-4.
- [7] Kapur.J.N. Trans. Qingren Wang. Mathematicians on the nature of mathematics [M]. Beijing: Peking University Press, 1989,322.
- [8] Qin'an Huang . Mathematics quality education under the concept of mathematics culture[J]. Journal of mathematics education, 2001,10 (3) 12-17.