

Mathematics Education and Mathematics Culture-Training Mathematics Literacy in Mathematics Education

Yongxiang Li

Shandong Jiaotong University, Weihai, China

Keywords: Mathematics Education; Mathematics Culture; Mathematics Literacy

Abstract: As early as the 1950s, mathematicians and mathematics educators have realized the importance of mathematics culture in mathematics education. People need the support and participation of mathematics in adapting to social life, participating in production practice and further learning. Mathematics education in China is facing higher requirements and challenges. Learning mathematics culture in mathematics education has become an effective way to cultivate students' good mathematical literacy. As for the status quo of the development of mathematics culture, how to implement it in mathematics classroom, and what aspects need to be improved are all topics worthy of our deep consideration. Therefore, it is of great significance to carry out the research on mathematics education and mathematics culture.

1. Introduction

In the past half century, the study of mathematical culture has attracted the attention of mathematicians both at home and abroad. It frequently appears in the field of mathematics education, reflecting people's understanding and understanding of mathematics from the perspective of culture. The educational value of mathematical culture is mainly reflected in the cultivation of people's mathematical literacy. Whitehead, a British scholar, believes that the real purpose of education is to make students understand some common and universal principles. Even if these people forget the details of their learning, subconscious judgments will guide them in applying these principles. Until you get rid of textbooks, burn down notes, and forget the knowledge you remember for the test, then what you learn will be valuable. Japanese math educator Miyama Guozang also believes that the fundamental purpose of math education is to improve people's lifelong math literacy by cultivating people's mathematical thinking, mathematical spirit and mathematical methods.

At this stage, countries have increased their investment in the study of mathematical culture, but mathematical culture education has encountered its development dilemma - many educators clearly feel that it is very difficult to carry out cultural education in mathematics teaching. Educators and mathematics teachers are trying to explore the cultural value of mathematics and the educational value of mathematics culture in order to carry out the education of mathematics culture more effectively. These studies have played a role in promoting mathematics teaching.

This paper tries to define the concepts of mathematical culture and mathematical literacy, reveal the educational value of mathematical culture, explore the factors affecting mathematical literacy, and then examine and reflect on the current mathematical education by discussing the differences between Chinese and Western traditional mathematical culture and comparing the differences between Chinese and Western traditional mathematical culture. On the basis of theoretical analysis, through interviews and surveys and educational action research. After understanding the teachers' mathematics culture, the basic status of mathematics literacy and the students' mathematics literacy level, some measures and suggestions are put forward to improve mathematics education effectively, so as to promote students' further development in mathematics.

2. Mathematical Culture and Mathematical Literacy

Mathematics is a kind of culture, which should have the educational value of culture. Zhang

Shunyan believes that the educational value of mathematics lies in: "First, the abstractness of mathematics helps us to grasp the commonness and essence of things; secondly, mathematics gives knowledge logical rigor and reliability of conclusions; thirdly, mathematics is the gymnastics of thought."

Mathematics not only has the basic characteristics of abstraction, accuracy and extensive application, but also should have profound education, which is embodied in the following aspects:

- ✚ Exploring the Materialist Dialectics of Science
- ✚ Cultivating Students' Rational Thinking
- ✚ Shaping Good Personality Quality

The influence of mathematical culture on human beings is manifested in human mathematical literacy. Mathematics literacy is an important training goal of mathematics education and one of the basic qualities that citizens in modern society must possess.

Mathematical literacy is not only to meet the needs of current life, but also to meet the needs of individuals in the future. Mathematical literacy is a kind of mathematical ability that an individual must possess in life, study and work. This ability urges people to understand and understand mathematics, and use mathematics to judge and solve problems. People with mathematical literacy also have innovative spirit and reflective ability.

There are many factors affecting students' mathematical literacy. The author will draw the following conclusions by referring to relevant literature:

1) Individual subjective factors. This is the most important factor affecting students' mathematical literacy.

2) Mathematical cultural factors. Students' learning of mathematics culture has a certain influence on the cultivation of mathematics literacy. Through learning mathematics culture, students can have a deep understanding of mathematics thoughts and spirits, which is helpful to cultivate mathematics literacy.

3) Education and environmental factors. Li Yonghong investigated the students in a university in Zhengzhou. The survey results show that the positive factors affecting mathematics literacy include education and environment.

Through the elaboration and analysis of the influencing factors of mathematics literacy, this paper provides a reference for the effective education of mathematics literacy, and requires people to fully consider the influence of these factors on the cultivation of mathematics literacy in the process of mathematics education.

3. Chinese and Western Traditional Mathematics Culture and Its Impact on Mathematics Education

3.1 Traditional Chinese Mathematics Culture and Its Impact on Mathematics Education

Mathematics culture in China has a long history and has experienced several obvious periods of development.

1) Origin and early development period - before the Spring and Autumn Period: Chinese traditional mathematics sprouted at the end of primitive society and initially developed the concept of early number and form.

2) The period of formation and development - from the Warring States Period to the early Sui Dynasty: During this period, a large number of mathematicians emerged and many mathematical works were published.

3) From the heyday of Sui Dynasty to the end of Yuan Dynasty: Mathematics education began to change from informal to formal.

4) Slow Development Period - Late Yuan to Early Qing Dynasty: With the development of feudal society in China, the rulers have entered the late stage. They have exercised totalitarian rule, propagated idealist philosophy, implemented the eight-part examination system, and led mathematics to mystery.

5) The period of integration of Chinese and Western mathematics: in the late Qing Dynasty, in

order to safeguard its ruling needs, the Westernization School, based on the guiding ideology of "middle school as the body, Western learning as the use", dispatched a large number of foreign students to study advanced science and technology and Western mathematics in the West under the slogans of "self-improvement" and "seeking wealth", at the same time, set up new schools, organize academic groups, and conduct research and teaching in mathematics disciplines. It has made positive contributions to academic exchanges and so on. Due to the current situation, the development of mathematics in China is relatively slow at this stage.

3.2 The Development of Traditional Mathematics Culture in Ancient Greece and Its Impact on Mathematics Education

The civilization of ancient Greece gave birth to the philosophy that has influenced us to this day. Many influential mathematicians appeared, such as Taylor, Pythagoras, Plato, Aristotle, Euclid and so on. People can fully feel the existence of reason from the thought of ancient Greek philosophy. They generally believe that real knowledge is rational knowledge, and truth can only be obtained by means of reason. They believe that only rationality can correctly understand the law of things when they operate in an orderly world according to the law.

Ancient Greek mathematics showed obvious deductive reasoning. School education represented by Ionian school and Pythagoras school and school education represented by Plato integrate academic activities with educational activities to impart cultural knowledge to school-age children. However, in 529 AD, the rulers of the ancient Roman Empire ordered the closure of schools and schools in Athens and strictly prohibited the teaching of mathematics. Since then, the development of mathematics in ancient Greece has changed from prosperity to decline, but the ancient Greek mathematical culture thought has been inherited and developed widely.

3.3 The influence of the differences between the western and Chinese traditional mathematics culture on Mathematics Education

From the development stages of Chinese traditional mathematical culture and the ideas of ancient Greek mathematicians, we can see that although both China and ancient Greece have made remarkable achievements in mathematics, they follow different tracks: Chinese traditional mathematical culture is better than mechanized algorithm, while ancient Greek traditional mathematical culture is better than axiomatic logical argument. Both of them have contributed to the prosperity and development of world mathematics culture.

The foundations of Chinese and Western traditional mathematical culture are quite different, and there are obvious differences. This is not the difference between national intelligence, but the difference in the formation of Chinese and Western traditional mathematical thought and its mathematical structure. We should correctly treat the educational value of Chinese and Western mathematics culture, and promote the positive dialogue between Chinese and Western traditional mathematics culture, and eventually integrate into mathematics education in order to better cultivate mathematical literacy.

4. Suggestions and Countermeasures on Mathematics Education and Mathematics Culture

Based on the previous understanding of mathematics culture and mathematics literacy, the combing of the history of the development of traditional mathematics culture in East and West, and the analysis of the results of investigation and evaluation, the author puts forward some humble opinions on the concrete practice of "learning mathematics culture to cultivate mathematics literacy in mathematics education":

(1) Suggestions on State Policy

Since the founding of the People's Republic of China, nine rounds of curriculum reform have been launched. In the implementation of the new curriculum reform, the state has also issued a series of documents to promote the process of the new curriculum reform. Teachers and students will face greater challenges. However, at the national level, there is a certain gap between the formal curriculum and the curriculum that the subject teachers understand, and the curriculum that

the teachers operate in the specific teaching situation is far from the formal curriculum. Educational experts offer advice on educational policy, but in the course of specific operation, there should also be cases to guide teaching practice to promote to teachers.

(2) Suggestions on the content of textbooks

The author carefully read the middle school mathematics textbook published by PEP, and found that the textbook has complete structure, clear context, and very clear requirements for the four bases, but there are still shortcomings in inheriting and developing mathematical culture. In choosing and arranging the content of mathematics textbooks, we should fully display the form, content and method of Chinese traditional mathematics culture, not just the content of modern mathematics. We should also try our best to choose problems related to daily life so that students can use mathematical methods to think and solve problems.

(3) Suggestions for Schools

Schools need to create a suitable environment for students to learn mathematics and build a platform for the in-depth development of mathematics education and effective exchange of mathematics culture.

(4) Suggestions on Classroom Teaching

Classroom teaching is the main place to carry out educational and teaching activities. Educational psychology holds that students are the center of teaching and should be fully student-centered. Teachers should try their best to choose problems related to daily life and put students' learning process of mathematics in the process of problem solving. This can not only guide students to actively study mathematics, but also help students improve their ability to solve practical problems by using mathematics, and cultivate students' mathematical literacy.

(5) Suggestions on Information Technology

With the help of information technology, teaching is due to the limitation of school hours. Because of the pressure of entering school, teachers can not explain and impart mathematics culture systematically in mathematics education. Students also neglect learning mathematics culture because of their lack of energy and limited time. In view of this phenomenon, the effective way is to make full use of network information resources to enrich and improve the content of teaching materials. Teachers can use these network information resources to teach in combination with textbooks. Students can also learn in depth through relevant resources.

(6) Suggestions for Teachers

Teachers are not only action researchers in mathematics education, but also disseminators of mathematics culture and cultivators of mathematics literacy. Mathematics teachers should always learn all the knowledge about mathematics, understand mathematics culture and improve mathematics literacy from various ways. As a mathematics teacher, we need to fully understand the significance of implementing mathematics education lies not only in teaching students the basic knowledge and skills of mathematics, but also in cultivating students' mathematical thinking habits and improving their mathematical cultural literacy.

(7) Suggestions for Individual Students

Students can experience success and failure by exploring and researching problems independently. Mathematics problem solving can not only let students taste the joy of success, but also experience the hardship of failure, thus cultivating the positive psychological quality of students not afraid of suffering, stubborn struggle, and face failure squarely.

(8) Suggestions on Evaluation

Under the background of the new curriculum reform, the evaluation methods have changed dramatically. For teachers, the level of students' performance is not the only evaluation criterion, more noteworthy is the process evaluation. To evaluate teachers accurately, we should evaluate whether they can help students to recognize the knowledge of mathematics, whether they can actively construct the knowledge of mathematics, whether they can enable students to discover and solve problems, and whether they can acquire mathematical emotions.

References

- [1] Sun Xiaoli, Deng Donggao. Mathematics and Culture [M]. Peking University Press, 2015.
- [2] Zheng Yuxin, Wang Xianchang, Cai Zhong. Mathematical Culture [M]. Chengdu: Sichuan Education Press, 2017.5.
- [3] Wang Xin. A Preliminary Study on the Educational Function of Mathematical Culture [J]. Contemporary Educational Practice and Teaching Research, 2017.05.
- [4] Li Yonghong, Shi Yongsheng. Analysis of the factors affecting the formation of College Students' mathematical literacy [J]. Statistics and consultation, 2016.01.
- [5] Tan Xiaoze. Spiritual Heritage of Ancient Greek Mathematical Culture and Its Educational Value: A Pythagoras-Centered Survey [J]. Journal of Mathematical Education, 2014.01