

A Comparative Study of Chinese and Western Mathematical Thoughts

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Abstract. China's traditional mathematics has a long history and rich achievements. From the founding to the modern times, traditional Chinese mathematics has been developing independently and is rarely influenced by Western mathematical thoughts. I will analyze the historical significance and value of "Nine Chapters of Arithmetic"; the reasons for the rise of mathematics in Sui and Tang Dynasties; the reasons for the rapid development of mathematics in the Yuan Dynasty; the reasons for the decline of mathematics in the Ming and Qing Dynasties, and the analysis of the characteristics and ways of thinking of ancient Chinese traditional mathematics. This paper has summarized it and compared it with Western mathematical thinking. Also, it has discovered the differences and similarities between the two. Based on the predecessors, I have summed up and predicted about how the future of Chinese mathematics should go.

Keywords: Ancient Chinese mathematics; western mathematics; mathematical thought; history of mathematics; comparative mathematics.

1. Introduction

The research and education of the history of mathematics can be traced back to very early times. In 1884, the French mathematician Tannery opened a course in mathematics in Paris and was officially recognized. The largest investment in the history of mathematics in this century belongs to the former Soviet Union. The first one listed mathematics history as a compulsory course for the mathematics department. However, research and study in the history of mathematics in the country have not been highly valued. Since the founding of the People's Republic of China, due to the advocacy of experts in the history of Chinese mathematics, Li Wei, Qian Baozhen, Yan Dunjie, and Qiu Chengtong, there were many spontaneous people in the country who were engaged in the study of mathematics history, but these people were conducting independent research and rarely consult each other. This also led to the study of the history of mathematics in the country which could not be accepted by most people. Therefore, it could only be spread among a small number of people. This thesis will summarize the characteristics of ancient Chinese mathematics from the history of mathematics development in the Nine Chapters of Arithmetic, Sui and Tang Dynasties, Yuan, Ming and Qing Dynasties, and will discover the ideas of Chinese mathematics in the wave of history, and then represent the ancient Greek mathematics. Western mathematics analyzes and uses the mathematical features of ancient Egypt and Arabia as evidence to discuss the differences between Chinese and Western mathematics.

2. A Brief History of the Development of Mathematics in Ancient China

The most familiar thing about Chinese mathematics is "Nine Chapters of Arithmetic." As an encyclopedia of mathematics in the country, the book contains a variety of mathematical problems in life, which is of great research value for culture and folklore.

2.1 "Nine Chapters of Arithmetic"

"Nine Chapters of Arithmetic", as a summary of various application problems in life, it cannot be called a mathematical work. But its impact on China and the world cannot be underestimated. The oriental mathematics tradition is a mechanized algorithm system; the western mathematics tradition is an axiomatic deductive system. The history of the development of mathematics is the history of the two, which are mutually influential and mutually influential. From the work of Descartes, it is not



difficult to find traces of mutual influence (Wu Wenjun, 1998). Although the "Nine Chapters of Arithmetic" has an abyss in the history of Chinese mathematics, it also has inevitable shortcomings: the pragmatic ideas of "Nine Chapters of Arithmetic" are self-sufficient and lead to the lack of innovation (Zha Youliang, 2018).

2.2 The Development of Mathematics in Sui and Tang Dynasties

During the Sui and Tang Dynasties, due to social, school, religious and other reasons, more and more attention was paid to mathematics. The achievements of ancient mathematics in the country were also more abundant. In the Tang Dynasty, after the Gaozu, Taizong, Gaozong, and Wuhou four dynaslties, the imperial examination system was gradually improved. The Tang Dynasty added a new type of imperial examination - Ming Law, referred to as "Mingke". Mingke was one of the permanent subjects in the Tang and Song Imperial Examinations. Tang Taizong began to set up to test the special knowledge of the decree and select the professionals who are proficient in the law. The exam content included mathematics, books, and law. The subjects of the computer test were mainly selected from the ten calculations, and those who passed the examination will be assigned to the positions below the nine products. This was the first time that mathematics had been officially recognized by the government as an auditing standard for selecting bureaucrats.

2.3 Analysis of the Reasons Why the Yuan Dynasty Attached Importance to Mathematics (AD 1271-1368)

Compared with other dynasties, the Yuan Dynasty established a dynasty as a nomadic nation. The emphasis on mathematics does not belong to any dynasty in history. The science and technology of the Yuan Dynasty is very high, and astronomy and mathematics are the top levels in the world. At this time, Arab and Persian scholars came to China. These elites mastered the most advanced science and technology in the world at that time. Later, the gradual evolution of the ethnic group brought the knowledge of astronomy, mathematics, chemistry and other aspects of Arabia and Persia and even Greece and Rome to China. The reason for this phenomenon may be to start with the Western Expedition of Genghis Khan. The Yuan Dynasty attaches importance to mathematics in addition to having a large number of mathematical talents, including the strengthening of large-scale construction projects, the promotion of prosperous business and the support of government policies.

2.4 Reasons for the Ignorance of Mathematics Education in the Ming Dynasty

The reason why the Ming Dynasty fell behind the Yuan Dynasty, the personal understanding is that each dynasty in China is the last opposition. That is to say, each dynasty will carefully study the fault of the previous dynasty and then overcorrect it.

2.5 Mathematics in the Qing Dynasty

The mathematics of Manchu originated from the practice of society, and in the first year of Shunzhi, the Qing army entered the Manchu mathematics and began to make large-scale contact with the Han mathematics.

3. Summary of Western Mathematical Thoughts

Western mathematics also has a long history. The thesis can only describe the three aspects of ancient Greek mathematics, brilliant Egyptian civilization and Arabic mathematics as the origin of Western mathematics. The mathematics of the three is used to describe the characteristics of Western mathematics.

3.1 Ancient Greek Mathematics

In addition to the current Greek peninsula, ancient Greece also includes the Aegean region and acedonia, Thrace, Italy, Turkey, and now the northern part of Africa. The vast territory brought a prosperous culture to ancient Greece. Famous schools such as the Ionian School were born on the



land of ancient Greece. However, the idea of prosperity could not bring strong national strength. The ancient Greece in history was conquered by Persia, Macedonia, Rome, and Arabia. Until 641 AD, Alexander was captured by the Arabs, and ancient Greece finally died.

3.2 Ancient Egyptian Mathematics

Ancient Greece was the first of the four ancient civilizations. Its unique and developed civilization has been recognized by the whole world. The achievements of ancient Egyptians in astronomical calendar, literature, mathematics, medicine, architecture, etc. had left Egyptian culture in history. The Nile River is flooded every year. The fertile land after the river recedes not only raises the Egyptians, but also urges the Egyptians to re-measure the land area of the residents. Because of the needs of life, the measurement knowledge accumulated over many years has gradually evolved into mathematical knowledge. At the same time, the Egyptians also need a lot of mathematical knowledge in the process of building pyramids and temples. From the mathematics paper cursive literature retained by various museums, we can see that the ancient Egyptians possessed mathematical knowledge including counting, arithmetic, algebra and geometry.

3.3 History of Arabic Mathematics

Arabic mathematics refers to the mathematics established in the Islamic countries of the Middle East and North Africa during the period of the Arab culture boom (8th to 15th century AD). In fact, there are very few Arabs of pure mathematics who make great contributions. Therefore, this period could also be called Islamic mathematics. For the Arabs, people thought of three aspects: (1) extreme poverty caused by war; (2) fierce religious conflicts; (3) huge wealth brought by oil.

Arabic mathematics was expressed in the same way as writing an article, and even the number was written in Arabic, which was quite like ancient Chinese mathematics. The main features were practical, closely related to astronomy, and a lot of annotations on classical works. Arabic mathematics lacks creativity, but for the world that was in the dark ages of science, these achievements were enormous. Until the Renaissance, Europeans learned about mathematics in ancient Greece, India, and China through their translations, which greatly promoted the development of later generations of mathematics.

4. Comparative Analysis of Chinese and Western Mathematics

4.1 Comparison of Chinese and Western Mathematics

Western mathematics is based on the philosophical system of ancient Greece and is a result of thinking. The traditional Chinese mathematics is based on the calculation. All the conclusions are drawn from the calculation. It is a kind of mathematics that uses the algorithm as a system. Ancient Chinese mathematics is good at calculation, with algorithm as the core. The study of almost ancient mathematics is inseparable from the graph of quantitative relationship. It uses feasible methods to transform the actual problem into a mathematical model, and then mechanizes the solution process.

4.1.1 Reasons for Differences between Chinese and Western Mathematics

(1) Different cultural backgrounds

Ancient Chinese mathematics used calculation as a tool for mathematical calculus, which was different from the interpretation of ancient Greece by expressing itself in isolation from concrete objects. From the very beginning, ancient Chinese mathematics included its mystery in bamboo sticks of different lengths. It was a kind of system that gradually evolved from divination to quantity computing system, relying on concrete practical examples in life to express its own numerical calculation function. The concept of mathematics has always been developed on the dual function of mystery and quantity. Therefore, ancient Greek mathematics combined with mystery, thus explaining the status of mathematics in the world at the level of religion and philosophy. This is the difference in the cultural background between Chinese and Western mathematics (Zhou Yuhua, 2013).

(2) Different social differences

Different from the importance of scientific development in the West, the development of Confucianism in the country had caused other disciplines to be severely suppressed. During the period of Emperor Wu of the Han Dynasty, "the slogan of the singularity of the singularity of the Confucianism" made the thoughts of the Mo School and the Legal School, which attached importance to the logical form, fail to pass down. Confucianism emphasizes simplicity and ignoring logical thinking. This practice of not paying attention to logical thinking led to the impediment to the development of ancient mathematics in later history. The West had always attached great importance to scientific development. Ancient Greece advocated science education. Their educational goal is to cultivate talents with all-round development. For a long time, their pursuit of perfection has provided superior conditions for the development of mathematics (Zhu Lin, 2016).

(3) Different habitual thinking of the nation

The Chinese had believed that China was the Central Plains since ancient times, and other national tribes were the genus of barbarians. Therefore, the Chinese rarely and even disdain to learn from others. As mentioned above in the ancient Egyptian mathematics and Arabic mathematics, these two kinds of mathematics were the same experience gained from practice before they are exposed to foreign mathematics. But the difference between the two and the country is that they intended to contact foreign cultures and learn. The Chinese people's national thoughts were generally resistant to foreign cultures. When faced with foreign things in those TV dramas, the Chinese people will always say "the heavens and the earth, the material treasures..." if there is not much communication between China and the outside world. This is not acceptable. Since the establishment of the Silk Road in the Western Han Dynasty, China and Arab countries have exchanged with Western Europe and other places, but the country only accepted their goods and did not accept their culture.

4.1.2 The Influence of Chinese and Western Thinking on the Development of Mathematics

In the future of mathematics learning, China and the West will learn from each other's strengths, that is to say, China learns from the West to spread its own thinking, and does not stick to the rules and regulations; while the West learns from China to be down-to-earth and not to break away from daily life. It can be seen from the Chinese and Western mathematics works that Chinese mathematics attaches importance to algorithms and practicality, and lacks thinking about independence. When this level of mathematical thinking becomes the code of conduct for the people, it is difficult for people to explore high-level mathematical logic. As a result, the mathematics of the country has stopped. The West attaches more importance to the dual combination of deductive reasoning and logic, making it possible to be independent of high-level mathematics outside social practice. (Highlight, 2010).

The perception of staying on the surface is limited and requires further exploration. This kind of exploration is helpful to find out the main reason why the mathematics in the country is stopped. Then the two sides can complement each other and improve the mathematics system of both sides. In the process of mathematics development, Westerners are good at logical reasoning and consider the possibility of mathematical objects. The Chinese have shown goodness in summing up and considering the practicality of the problem. The combination of the two kinds of thinking, to a certain extent, to achieve the complementary advantages of the role, can effectively advance the progress of mathematics (Fry dental, 1995).

5. Conclusion

After reading the history of mathematics development in the country for thousands of years, it is not difficult to find that the mathematics of the country is produced in the needs of society and developed in the practice of human beings. In its development, mathematics has not only one aspect in practical application, but also one aspect of practical needs, and another aspect of relatively independent development of practice. It can surpass the needs of social practice at that time and develop forward according to its own logic. However, in some cases, due to the limitation of people's level of understanding, advanced mathematical results may be coldly accepted by society and even abandoned. Some of the mathematical achievements in the Song Dynasty that developed to the new level did not have any practical application in the social reality of the time. In the history of the Song Dynasty, although "practical" was also the mainstream of scientific thought, it still produced the possible conditions for research that did not aim at practicality. Therefore, high-level mathematical theory research became a reality and yielded fruitful results.

West is a rational pursuit of mathematics. In their eyes, mathematics is a rational spirit with a dual status of philosophy and reason, not only a tool for serving life. Use mathematics to explore the true meaning of things. In a sense, mathematics is a kind of spirit that can prompt human thinking to accelerate. Thereby affecting the material life of human beings, on this basis, trying to explain nature and further prove the knowledge that has been obtained.

Both Chinese and Western ideas show their respective advantages and disadvantages. It can be said that the two are two endpoints of a number axis. Under the influence of this kind of thinking, the mathematics of both sides began to develop in two opposite directions, one from actual to deductive, and one from deduction to reality. The education mode of our country originated from the Soviet Union in the early days of the founding of the People's Republic of China. While studying the Soviet education mode, it also strengthened the training of logical thinking. Together with the influence of the post-college entrance examination, it emphasized the foundation and gradually formed a mode of paying attention to the dual foundation and emphasizing the three major capabilities. Under this type of education, students' ability to apply mathematics cannot be expressed. With the advent of education reform, the ancient idea of attaching importance to mathematics once again entered people's sight. For the future mathematics education, I think that pure emphasis on use or simple reasoning is not advisable. The two are generally the best. After all, according to the current national conditions, we cannot copy other people's things, have changed, have China's own characteristics are the best for us.

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