



From Following to Leading: The Centenary Development of Basic Mathematics Education in China under the Leadership of the Party

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ABSTRACT

The CPC has led the People's Republic of China through a century of extraordinary years. On the occasion of the founding of the CPC, in order to further clarify the development process of mathematics education in primary and secondary schools in China, with the historical events of the CPC from 1919-2021 as the context, the centennial evolution research was carried out from three aspects: centennial exploration, experience summary and future outlook. By deeply deconstructing the representative characteristics and evolutionary trends of the four stages of basic mathematics, we aim to explore the cultural roots and social context of mathematics education in primary and secondary schools in China, and provide reference for the theoretical construction and practical promotion of the Chinese model of basic mathematics education.

1. Introduction

The history of mathematics education can be traced back to the primitive society where humans began counting (Wanling Wu, 2006). China is the country with the longest history of mathematics, dating back to the mathematical work "The Book of Arithmetic" formed during the Western Han Dynasty. China's ancient civilization was developed and prosperous, but due to various historical factors, Western civilization surpassed China after the 17th century. Until the introduction of Marxism after the May 4th Movement in the 20th century, under the leadership of the CPC, Chinese education and mathematics education saw a new dawn. In March 2014, Liz Truss (Deputy Minister of Education and Children's Affairs in the UK) reached a cooperation project with China: 60 Shanghai teachers will go to the UK to help local schools improve their math teaching level. This project is part of the UK government's £ 11 million mathematics enhancement plan. In July 2016, the UK announced that it would continue this exchange program and required 8000 primary and secondary schools in the UK to study mathematics teaching in Shanghai. China's basic mathematics education has gone global and become a leader in high-quality mathematics education. Over the past century under the leadership of the Communist Party of China, mathematics education in primary and secondary schools in China has gone through an outstanding journey from following to leading. This article will review its century long exploration, summarize practical experience, and look forward to the

globalization of the Chinese model of mathematics education in the future.

2. The Centenary Development of Basic Mathematics Education in China

2.1 The budding stage of mathematics education (1919-1949)

The May Fourth Movement in 1919 was an important turning point in modern education in China. During this period, Chinese national capitalism developed rapidly, and anti retro and scientism became the guiding ideology during this period, saving people from the stubborn feudal swamp and gradually embarking on the path of seeking truth and exploring the world. In 1921, when the CPC was founded, the early communist intellectuals advocated the education of revolutionary youth and did a lot of theoretical research work for the formulation of the early education policy of the CPC. In June 1923, the Third Congress of the CPC adopted the CPC's Party Program (Draft) and issued the curriculum outline in the same year, clearly pointing out that the goal of mathematics education is that students can use arithmetic to solve problems in their own living conditions, and can find solutions to problems themselves. And it is pointed out that teachers should pay attention to teaching methods when teaching: using a combination of games and homework, connecting with reality, and emphasizing inductive problem-solving methods. The 1929 Provisional Standard for Primary School Curriculum on Primary School Arithmetic clearly states the cultivation of children's ability to solve quantity problems in daily life. In 1937, the War of Resistance Against Japan broke out comprehensively. In 1944, the Education Department of the Shaanxi Gansu Ningxia Border Region formulated the goal of mathematics curriculum

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in secondary schools: to cultivate accounting and statistical talents needed by departments such as financial cooperation.

2.2 The Exploration Stage of Mathematics Education (1950-1978)

After 30 years of difficult germination before the founding of the People's Republic of China, mathematics education in our country began to take shape, and a unified textbook review and editing agency, unified pricing, and unified book use began to be established. This further cleared the obstacles for mathematics education under the leadership of the Communist Party. Mathematics loses its vitality when it leaves the reality of human life and production(1960), because mathematics textbooks have long been far from practical life. In 1950, it was pointed out that mathematics textbooks should be combined with reality. At the same time, mathematics courses are stipulated for middle school arithmetic, algebra, plane geometry, high school trigonometry, plane and solid geometry, high school algebra, and analytic geometry. In 1958, running entered communism, and basic mathematics courses mainly focused on increasing content and improving requirements. However, under the influence of the cultural revolution, the development of basic mathematics education was slow. Excluding "useless mathematics", neglecting theoretical mathematics such as topology and geometry, and there is no applied mathematics research in the Western sense, only engineering mathematics is preserved. But a few mathematicians, such as Luogeng Hua and Jingrun Chen, have achieved significant achievements in a single field in harsh and rudimentary environments(Ningzhong Shi, Shihu Lv&Shuwen Li, 2021). In September 1977, the Ministry of Education decided to establish a mathematics writing group for primary and secondary schools, to write textbooks for primary and secondary schools in the form of a national conference on textbook writing. In 1978, the Ministry of Education issued the "78 Outline" for mathematics teaching in full-time ten-year schools, which was implemented nationwide in the autumn of that year.

2.3 The Reconstruction Stage of Mathematics Education (1979-2000)

The first task faced at this stage was the consequences of the Cultural Revolution. During the decade of the Cultural Revolution, mathematics education made no progress. Throughout the 1980s, mathematics education struggled to develop amidst twists and turns. In 1978, Comrade Deng Xiaoping proposed "facing modernization, the world, and the future", pointing out the direction of education advancement. Due to the policy of reform and opening up, the experience of mathematics education from abroad has rapidly spread to China, focusing not only on student performance but also on comprehensive physical and mental development. The results of the 1989 International Mathematics Test showed that Chinese 13-year-old students ranked first with an accuracy rate of 80% in mathematics tests across 21 countries and regions, ahead of South Korea and Taiwan, which tied for second place, with 73% accuracy. This once again proves that mathematics education in China has a successful side. In the 1990s, with the flourishing development of the national economy, Western teaching ideas were introduced to China. The "constructivism" that is still highly respected was favored by the Chinese people at this time. In fact, "constructivism" has an idealistic color. If its rational core can be absorbed, it can further enhance the

subjective initiative of students and promote the occurrence of deep learning. At the same time, there have been significant developments in the domestic mathematics community, such as emphasizing the systematicity of mathematical problem-solving methods, valuing the process rather than just the results, and strengthening variant exercises. As a result, a new situation has emerged in China's mathematics education, sweeping away the previous dust.

2.4 The Innovation Stage of Mathematics Education (2001 Present)

The publication of the Mathematics Curriculum Standards in 2001 officially marked the beginning of mathematics education reform. In a short period of time, textbooks uniformly compiled by the Ministry of Education have been rapidly promoted to primary and secondary schools nationwide. The basic concept of reform is to implement the principles of quality education and innovative education, and to hold high the banner of "independence, exploration, and cooperation" in the reform. Incorporate probability and statistics into basic mathematics, allowing students to be exposed to the concepts of big data and random events from an early age, laying the foundation for the cultivation of digital talents. However, there are also problems with this curriculum reform, such as overcorrection, neglecting the excellent traditions of Chinese basic mathematics (dual foundation, teacher led), completely copying the Western "student-centered" approach, forcibly grafting, and not combining with China's actual situation. Professor Dianzhou Zhang pointed out that China's curriculum reform, as well as the entire basic education reform, should combine the introduction of educational teaching ideas with the study of local education, focus on exploring, enhancing, and disseminating the characteristics and advantages of China's education, and enhance national confidence(Huijuan Yang, Yanping Huang&Naiqing Song, 2011).

So, starting from 2006, the Ministry of Education began to revise the alienated curriculum reform. The revised curriculum standards are more closely related to students' lives, pay more attention to their hearts, and pay more attention to their mathematical experience and innovative spirit. To cultivate new talents of the times, the new curriculum standard has also added content on the application of new technologies. In terms of teaching methods, the new curriculum standard also encourages teachers to use multimedia educational technology for teaching activities(Qin'an Huang, 2011). The Mathematics Curriculum Standards for Compulsory Education (2011 Edition) divide the mathematics curriculum objectives for the compulsory education stage into four aspects: knowledge and skills, mathematical thinking, problem-solving, and emotional attitude. Knowledge and skills include: numbers and algebra, graphics and geometry, statistics and probability, and synthesis and practice. Through the learning of knowledge and skills, students can acquire the basic mathematical knowledge, skills, thoughts, and activity experiences necessary for adapting to social life and further development; Understand the connections between mathematical knowledge, between mathematics and other disciplines, and between mathematics and life, use mathematical thinking methods to think, enhance the ability to discover and propose problems, analyze and solve problems; Understand the value of mathematics, increase interest in learning mathematics, enhance confidence in learning mathematics well, cultivate good study habits, and have a preliminary sense of innovation and scientific attitude.

Shanghai is a region that officially participates in the PISA test. It has participated in two tests, PISA 2009 and PISA 2012, and has achieved excellent results in three consecutive first places in mathematics, reading, and science (Fengping Gao, 2015). This indicates that China's mathematics education performance is outstanding internationally, and China's mathematics education has made significant progress. The reform of mathematics curriculum has achieved results. The content of mathematics courses is a key medium for achieving course objectives and an important basis for evaluating course quality. In the new era, courses as a whole exhibit stability, simplicity, and modernity. Basic education is a decisive factor in enhancing national competitiveness, and mathematics education is an important component of basic education. The establishment of the Basic Education Quality Monitoring Center by the Ministry of Education indicates that China has begun to monitor the quality of basic education at the national level. At present, China's evaluation of the quality of primary and secondary education mainly focuses on the development of evaluation methods and evaluation systems. The evaluation methods mainly include the national unified middle and high school entrance exams, mathematics exams organized by various provinces, cities, districts, and counties, and mathematics tests in schools; The evaluation system is also constantly improving, and the reform of the college entrance examination is the most representative measure (Wenfang Zhu, 2010).

3. Summary of Experience in Basic Mathematics Education in China

3.1 The Essence of Basic Mathematics Education

Throughout the theoretical and practical research process of basic mathematics education in various countries around the world, the most core task is often to solve the problem of "what is basic mathematics education", that is, what kind of education is truly mathematics education? What is the difference between mathematics education and other subject education? What impact can basic mathematics education bring to the development of national science and technology? How to cultivate and guide young people with mathematical potential to achieve breakthrough achievements in the field of technology? This is the core issue that needs to be addressed in the current stage of basic mathematics education and training in China.

From a research perspective, the effectiveness of basic mathematics education requires long-term tracking research, exploring the growth patterns of young people with mathematical talents, analyzing key traits that affect their growth and success, in order to make good improvements to mathematics education; From a practical perspective, basic mathematics education is a comprehensive system engineering. From the evolution trend of basic mathematics education in developed countries around the world, it has gone through a process from a single mathematical test to a model based on students' "intellectual characteristics, creative characteristics, and emotional characteristics" of comprehensive quality. The connotation of mathematical talents has been greatly enriched and developed; From the perspective of social development, basic mathematics education should have certain characteristics of the times, and should be oriented towards major scientific and technological fields closely related to the country's future economic development and technological progress. Guided by breakthroughs in key scientific fields such

as artificial intelligence, biotechnology, and aerospace, a mechanism for cultivating mathematics for young people in China should be formulated. In the process of practice, the model for cultivating mathematics for young people should be continuously improved, so that mathematics education can truly solve major strategic problems in China's scientific and technological development.

3.2 The Chinese Model of Basic Mathematics Education Practice

The Shanghai Mathematics Teaching Model has gone through a long path of reform and is a microcosm of China's basic mathematics education practice. It has formed diversified practical experiences and played a leading role in China's mathematics education and research, as well as the development of international mathematics education.

Firstly, the core of basic mathematics education lies in the foundation. Mr. Su Buqing once pointed out that textbooks should attach importance to the foundation of mathematics, and the key to basic education is to lay a foundation. The Shanghai mathematics teaching model is based on "mastering teaching methods", guiding and organizing mathematics classroom teaching, starting from basic knowledge, differentiating teaching objectives, and achieving the ultimate goal of all students in the regular class mastering knowledge points, striving to integrate all students into the classroom and master basic knowledge.

Secondly, the basic knowledge of mathematics teaching is relatively scattered, and how to fully integrate new and old knowledge and consolidate student basic knowledge has become the focus of educators. Therefore, the talent cultivation problem of basic mathematics educators urgently needs to be solved. To solve the above problems, it is necessary to strengthen the selection criteria for basic mathematics teachers. Germany, Singapore, Australia, the United Kingdom, South Korea, Denmark, Switzerland, Canada and other countries have established a series of standards and rules for the selection and training of young mathematics teachers, emphasizing the important role of teachers in the process of cultivating young talents. Therefore, for our country, clarifying what kind of teachers can become teachers of basic mathematics and the role positioning of scientists in it is one of the key issues that need to be addressed in the future cultivation of young talents.

Thirdly, basic mathematics education takes it as its responsibility to promote lifelong development of students. Therefore, how to promote the development of students with different abilities in basic mathematics education has become a trend in the current reform of basic mathematics education. Based on the Shanghai mathematics teaching model, attention should be paid to the feelings of each student in education and teaching, and the initiative should be handed over to students to strengthen their participation in teaching and elevate the bottom of class mathematics learning. Encouraging and inspiring higher-level students can fully stimulate their interest, explore more new fields of mathematics, and improve the overall teaching effectiveness.

3.3 Policy support for basic mathematics education and ecological environment

Mathematics education is a systematic project, and the implementation of various educational work often requires the joint participation of all sectors of society to ensure the smooth

operation of the education system and cultivate outstanding talents for the development and progress of the country. As a key area for the future development of education in our country, the cultivation of basic mathematics talents requires more attention and support from all sectors of society in order to ensure the smooth progress of related work. This is also the key issue we are facing at the current stage, that is, "How can the country support the development of basic mathematics education?" Developed countries like the United States and Russia have made the cultivation of mathematical talents their national strategy. Russia has legalized the cultivation of mathematical talents from a legal perspective, highlighting the crucial role of mathematical talents in their national development process, and mobilizing resources from all aspects of society to safeguard the cultivation of young talents. Therefore, in the future, if China wants to catch up with the development of mathematical talent training in developed countries such as the United States and Russia, it is even more necessary to formulate comprehensive security measures and mobilize the forces of various levels of society to support the development of basic mathematical training in China.

Basic mathematics education is of great significance to national development and social progress, and can largely solve major problems faced by future human social development, providing guarantees for the improvement of China's comprehensive national strength and the happy life of the people. Therefore, basic mathematics education is not only the responsibility of schools and governments, but also a major historical task that requires the collective efforts of the entire society to complete. It is necessary to mobilize forces from all levels of society to participate in China's basic mathematics education and build an educational ecology that is conducive to China's basic mathematics. Firstly, clarify the key role of the government in China's basic mathematics education. To lay the foundation for the development of basic mathematics education in China through policy formulation, standard setting, institutional setting, funding supply, teacher selection, and other means; Secondly, clarify the crucial role of the scientific community in China's basic mathematics education. The group of scientists can provide useful guidance for the development of basic mathematics education in China from the aspects of curriculum design, selection mechanism, training mode, evaluation methods, etc. Therefore, how to enable the group of scientists to participate in the process of basic mathematics education firsthand and play the role of guides and evaluators for students is an important guarantee for the future development of basic mathematics education; Thirdly, clarify the key roles of universities and technology venues in basic mathematics education.

4. The Future Outlook of Basic Mathematics Education in China

4.1 Strengthening Cultural Confidence and Spreading the Tradition of Basic Mathematics Education in China

One of the important ways to enhance a country's cultural soft power is to tell the story of China well, especially the story of Chinese education. The Shanghai Mathematics Teaching Model, as an important component of China's basic mathematics education system, plays an important exemplary role in teaching China's education model well. But how to promote the establishment of cultural confidence based on the "Shanghai Mathematics Teaching Model" is an important part of

the development of basic education in China. In November 2019, with the official launch of the Sino British Mathematics Teacher Exchange Project, it not only means that the largest teacher exchange project between China and developed countries will continue to deepen, but also indicates the recognition of the status of Chinese education and culture in the international community (Sifan Yang & Xueyun Zhao, 2020). In the long run, China should continue to develop the "Shanghai Mathematics Teaching Model", adhere to reform and opening up, fully utilize China's unique traditional cultural experience and wisdom, and improve the story of Chinese education. At the same time, in order to further expand the global influence of the "Shanghai Mathematics Teaching Model" and promote the further development of education in China, we should take the "Shanghai Model" as the educational foundation, build an international education network, strengthen international exchanges, and thus establish confidence in Chinese education culture and tell the story of China well to the outside world.

4.2 Strengthening policy support and constructing a strategic layout for basic mathematics education

The construction of China's basic mathematics education system and model relies on the joint participation of all levels of society in China, creating a favorable social environment for the development of basic mathematics education. Therefore, strengthening the emphasis on basic mathematics talents at the national policy level is beneficial for constructing a strategic layout of mathematics education. Establish a "government high" integrated training model. In the process of cultivating basic mathematics talents, the government mainly supports and guides various levels and types of education departments to participate in the practical work of basic mathematics talent cultivation through policy guidance, institutional setting, and fund allocation, and evaluates the implementation results of relevant plans. As an important provider of local educational and intellectual resources, universities are responsible for the selection of basic mathematics talent teachers, providing sufficient intellectual support for the cultivation of scientific and technological talents through the construction of young scientists. On the other hand, they should provide a real practical place for the cultivation of basic mathematics talents to a large extent, guiding students to participate in scientific research projects in universities.

4.3 Focusing on the generation of diverse abilities, emphasizing the cultivation of students' social and emotional skills and autonomy

Shanghai, China successfully topped the Program for International Student Assessment for 15-year-old students with excellent grades in 2010 and 2013, bringing Shanghai's basic education to the world stage, attracting global attention and earning international reputation (Qian Xu, 2019). However, the self-reported data from students presents some problems: on the one hand, the student-centered corresponding knowledge in Shanghai's mathematics teaching strategy is lower than the average of OECD, which more reflects the teacher centered teaching strategy (Xingfeng Huang & Minxuan Zhang, 2019); On the other hand, although students have high grades, their interest in the subject is generally not high. This is a situation that urgently needs to be changed for basic mathematics education in our country. Therefore, basic mathematics education in our country should give more autonomy to students, fully based on their

more independent thinking space in education and teaching, and unleash their creativity. In mathematics teaching, every educator is required to draw on the experience of mathematics education in primary and secondary schools in Shanghai, pay attention to the lifelong development of every student, and fully integrate the classroom with real life in teaching practice, using local materials to fully stimulate students' interest in learning and promote the development of social and emotional skills.

References

- Wanling Wu (2006) A Review of Mathematics Education in 20th Century America Journal of Kangding Ethnic Normal College (03), 88-91 Doi: 10.13934/j.cnki.cn51-1729/g4.2006.03.023
- (1960) Implementing the Party's educational policy and improving the quality of mathematics teaching Mathematical Bulletin (06), 30-34
- Ningzhong Shi, Shihu Lv&Shuwen Li (2021) Analysis of the Development and Characteristics of Mathematics Curriculum in Chinese Middle Schools over the Past 40 Years of Reform and Opening up Journal of Mathematics Education (01), 1-11
- Huijuan Yang, Yanping Huang&Naiqing Song (2011). China's Basic Education Advancing in Reform, Inheritance, and Confidence - The Voice and Inspiration of Mathematics Educator Mr. Zhang Dianzhou Chinese Journal of Education (11), 9-11+36
- Qin'an Huang (2011) Where is the Reform of Mathematics Curriculum Going - A Survey Report on the Reform of Mathematics Curriculum and Teaching in Basic Education Journal of Mathematics Education (03), 12-16
- Fengping Gao (2015) The Inspiration of PISA Mathematical Literacy Test on Basic Mathematics Education in China Journal of Mathematics Education (05), 63-66
- Wenfang Zhu (2010) Reflection on Building a Quality Monitoring System for Mathematics Education in Primary and Secondary Schools with Chinese Characteristics Curriculum, Textbooks, and Teaching Methods (03), 35-39 Doi: 10.19877/j.cnki.kcjcf.2010.03.008
- Sifan Yang&Xueyun Zhao (2020) Tell the Chinese Education Story Well: The Impact and Inspiration of the Shanghai Mathematics Teaching Model on Mathematics Education in the UK Journal of Chongqing Normal University (Social Sciences Edition) (03), 61-67 Doi: 10.19742/j.cnki.50-1164/C.200308
- Qian Xu (2019). Minxuan Zhang, Dean of the Institute of International and Comparative Education at Shanghai Normal University and Head of the Sino British Mathematics Teacher Exchange Program: Telling the Story of Chinese Education on the World Stage. Shanghai Education (34), 24
- Xingfeng Huang&Minxuan Zhang (2019). Shanghai Mathematical Education Wisdom Learned by the UK. Chinese Journal of Education (11), 18-23+30