

RESEARCH ON THE IMPLEMENTATION OF MATHEMATICS CULTURE EDUCATION IN HIGH SCHOOL MATHEMATICS CURRICULUM

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ABSTRACT

With the development of Internet technology and the increasingly frequent cultural exchanges at home and abroad, students' values have been impacted and challenged unprecedentedly. Strengthening students' ideological and political education has also become the only way for national rejuvenation and social construction. High school mathematics curriculum has unique advantages in ideological and political education. Therefore, according to the characteristics of the mathematics curriculum, it is the fundamental task to realize the improvement of students' political literacy, values, and ideological and moral standards. In the process of high school mathematics curriculum education, mathematics teachers should fully tap the philosophical ideas and research methods contained in the concept definitions, theorem conclusions, etc. of mathematics, combine the mathematical core literacy, patriotism, philosophy of life, etc. in the mathematics curriculum, and assume the ideological responsibility of "preaching, teaching, and solving doubts". Therefore, the implementation of mathematical culture education is the only way to realize the fundamental task of establishing morality and cultivating people. In the implementation process, we should adhere to the correct value orientation and strengthen the consciousness of thinking; Follow the rules of students' cognition and press close to student reality; Combine the characteristics of the discipline and pay attention to organic integration; Adhere to the overall design and scientific and reasonable layout.

Keywords: Double reduction, Mathematics culture, Teaching implementation.

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INTRODUCTION

The connotation of the word "mathematical culture", in short, refers to the thought, spirit, method and viewpoint of mathematics, as well as their formation and development; Broadly speaking, in addition to the above connotation, it also includes mathematicians, mathematical history, mathematical beauty, mathematical education, the humanistic elements in the development of mathematics, the relationship between mathematics and society, and the relationship between mathematics and various cultures.^[1]

In the Middle School Mathematics Examination Outline, it is clearly proposed to examine the mathematics learning of high school students from three aspects, namely, mathematical thinking methods, mathematical ability, and the scientific and humanistic value of mathematics. This requirement reflects the spirit of paying equal attention to knowledge and ability, and giving consideration to science and humanity. In particular, it clearly puts forward the requirement of adding mathematical culture in mathematics examination, which is conducive to guiding middle school mathematics teaching to pay more attention to ideology,

culture and flexibility, and is conducive to comprehensively improving and cultivating students' comprehensive mathematical literacy.

In the Fourteenth Five Year Plan, it was proposed that to build a high-quality education system, we should fully implement the Party's education policy, adhere to the principle of building moral character and cultivating people, strengthen the construction of teachers' ethics and work style, and cultivate socialist builders and successors with all-round development of morality, intelligence, physique, beauty and labor. The mathematics curriculum teaching in middle schools under the background of establishing morality and cultivating people emphasizes the full implementation of China's educational objectives, the comprehensive improvement of the cultural quality of the Chinese nation, and the cultivation of new people of the times who assume the responsibility of national rejuvenation. Therefore, in mathematics teaching, teachers need to integrate, excavate, innovate and enrich the internal thinking resources of mathematics curriculum in addition to cultivating the logical thinking of mathematics knowledge professors and students, improve students' ideological and political literacy by promoting the ideological and political curriculum, and cultivate useful talents who can struggle for the development of socialist cause all their lives.^[ii]It is necessary to strengthen the concept of mathematical culture education, analyze the problems existing in the current mathematical culture education in high school mathematics classroom teaching, put forward the basic principles of implementing mathematical culture education, and oppose Under the background of "strengthen moral education and cultivate people", the path of mathematics culture education in high school mathematics teaching is elaborated in detail. Therefore, the research on the educational implementation of mathematical cultural content is particularly important. Through mathematical culture, we can deeply tap the moral education function of mathematical discipline, pay attention to the cultivation of students' spiritual quality and the education of their ideals and beliefs, and internalize them into personal qualities and abilities.

ANALYSIS OF THE IMPLEMENTATION OF MATHEMATICS CULTURE EDUCATION IN SENIOR HIGH SCHOOL MATHEMATICS CLASSROOM TEACHING

In order to understand the current situation of the implementation of mathematics culture teaching in high school mathematics curriculum, 150 students in Grade Two and 150 students in Grade Three of Baicheng No. 1 Middle School in Jilin Province were selected as the survey objects; We selected 10 mathematics teachers from the First Middle School in Baicheng City, Jilin Province, including 5 middle school teachers and 5 senior middle school teachers; Consult a large number of references to develop a questionnaire and an interview questionnaire as research tools.

Among them, the questionnaire focuses on three dimensions: the cognition of mathematical culture, the contact with mathematical culture in the learning process, and the expectation of integrating mathematical culture into the classroom. Seven questions are set. Are you familiar with mathematical culture? 2. Do you think it is necessary to learn mathematics culture in senior high school? 3. Does your teacher talk about mathematical culture in class? 4. In the process of mathematics learning (including mathematics classes, mathematics textbooks, and mathematics exercises), do you have many mathematical cultures? 5. How do you usually acquire mathematical culture? 6. Do you want teachers to talk about mathematical culture in class? 7. Do you think the integration of mathematics culture in the learning process will help you learn mathematics? Questions 1 and 2 belong to dimension 1, questions 3, 4 and 5 belong to dimension 2, and questions 6 and 7 belong to dimension 3. Each dimension has a score of

100 points. The interview outline sets five questions around two dimensions: cognition of mathematical culture education and implementation of mathematical culture. They are: 1. Do you know what mathematical culture is? 2. Do you think that infiltrating mathematical culture into classroom teaching in senior high school will help students learn? How can it help? 3. How do you usually teach mathematical culture in classroom teaching? 4. Do you think it is necessary to infiltrate mathematical culture into high school mathematics teaching? How to implement? Which carrier form? 5. What difficulties do you think math culture faces in integrating into high school math class? Questions 1 and 2 belong to dimension 1, while questions 3, 4 and 5 belong to dimension 2. Each dimension is scored 100 points. A total of 300 questionnaires were distributed, 278 valid questionnaires were recovered, and 10 teachers were interviewed. Statistical results of the student questionnaire (average score): 78 points for the cognition of mathematical culture, 67 points for the contact of mathematical culture in the learning process, and 91 points for the expectation of mathematical culture being integrated into the classroom. 12 teachers were interviewed, and the statistical results of teacher interviews (average score): 81 points for the cognition of mathematical culture education and 76 points for the implementation of mathematical culture.

From the results of student surveys and teacher interviews, we can see that the average scores of most dimensions are not at an excellent level. One dimension is at an excellent level, three dimensions are at a good level, and one dimension is at a pass level. From the analysis of the above results, it can be seen that:

Due to the influence of the traditional exam oriented education mode for a long time, most of the society, schools, parents and students only pursue the examination results and the rate of entering a higher school, ignoring the cultivation of students' cultural and spiritual qualities. Influenced by the current examination mechanism, teachers' traditional teaching habits and other factors, the current high school mathematics classroom still focuses on definitions, formulas, calculation rules and other contents to carry out teaching, which can only improve students' calculation ability and exam answering ability. In particular, the high school mathematics curriculum content difficulty coefficient is large, the knowledge structure is complex, and the mathematics teaching plan lacking mathematical culture penetration is boring, which can not effectively stimulate students' interest in learning, and can not achieve better teaching results. Students in senior high school are under great pressure of entrance examination. Under the role of "the baton of college entrance examination", students must focus on problem analysis and examination skills, and lack of separation skills. It is difficult for students to have time and energy to focus on the improvement of their own quality, and they cannot match well Cooperate with teachers to complete the infiltration of mathematical cultural content. At the same time, teachers do not have a deep understanding of the need to dig deeply into the mathematical cultural connotation in the textbooks and the importance of improving students' moral literacy. This objective situation has affected the students' enthusiasm for learning mathematical culture, and the actual effect of teachers' work in cultivating students' political literacy, values, and ideological and moral level through mathematical culture education in classroom teaching.

Education is two aspects of "teaching" and "educating", which are complementary and organically integrated and inseparable. Teachers should not only impart knowledge and skills to students, but also, more importantly, cultivate students' core quality and moral character through mathematical culture education. "Developing students' mathematical core literacy" has become the core goal of the current reform of mathematical curriculum standards. Under the guidance of the new curriculum standard, mathematics teaching should deeply explore the

connotation of the subject and the moral elements in the teaching content, guide students to develop a scientific outlook on the world, life, values, and constantly improve their own soft power and core discipline quality.^[iii]

BASIC PRINCIPLES OF IMPLEMENTING MATHEMATICAL CULTURE EDUCATION

Adhere to correct value orientation and strengthen thinking awareness

By studying the mathematicians, the history of mathematics, the humanistic elements in the development of mathematics and the cultural background of mathematics in mathematical culture, mathematical culture is infiltrated into the moral education oriented mathematical classroom, so that students can develop correct value orientation and correct outlook on life in the influence of mathematical culture. In the mathematics textbook, many mathematicians' deeds and popular science knowledge are introduced. Through understanding the content of relevant mathematical cultural knowledge, students can not only ignite the desire to explore mathematical knowledge, but also be influenced by the strong will of mathematicians.

Because of the teaching needs of the mathematics class, moral education ideas should be implemented in the mathematics class, and teachers should also change the traditional mathematics teaching methods. By leading students to carefully study the contents of the mathematics textbooks related to the history and culture of mathematics, mathematical ideas, and the research history of mathematicians, students can not only understand the hard won mathematical knowledge, but also experience the exploration and dedication of mathematicians.^[iv] For example, before the beginning of the course, let students collect famous quotes and sentences from mathematicians. Schools or teachers can recommend some extracurricular reading materials of mathematical works for students to improve their mathematical vision, enrich their knowledge structure, and use communication and sharing to understand the meaning of learning mathematical culture. The potential impact of mathematical knowledge and mathematical culture absorbed by students in this process can provide support for students' future life development planning, and provide correct guidance for students to establish a good outlook on life, values and world outlook.

Follow students' cognitive rules and be close to students' reality

Fully consider the cognitive development characteristics of students from simple to deep, from perceptual to rational as they grow older, strive to be close to students' life, learning, and ideological reality, determine the educational objectives of different students, as well as specific learning content and carrier form, distinguish levels, highlight key points, and reflect the advanced learning, with appropriate content and form, and moderate capacity. The development of knowledge is phased, which requires historical foreshadowing and demand promotion. If people want to deeply understand some knowledge, they also need to understand its background, formation process and future development potential.^[v] However, the current traditional teaching often separates knowledge from its development process. In the process of mathematics teaching, only mathematical knowledge is taught, and its development process is not analyzed in depth. When students study, they often cannot understand the value of knowledge, nor can they really understand its essence and internal structure, as well as the logical connection between mathematical knowledge and the objective world. Therefore, teachers should pay attention to putting mathematical knowledge into mathematical history. In order to enable students to realize the vitality of knowledge.

Under the current social background, in order to achieve innovative mathematical teaching mode, expand mathematical teaching carrier, improve students' learning efficiency, and

increase the promotion of the fundamental task of moral education, teachers should integrate practical activities into the mathematical teaching system regularly, so that students can participate in the process of moral education personally, under the guidance of the new curriculum standard and the actual situation, Deeper understanding of the importance of cultural education. Students' hands-on operation can close the relationship between mathematical knowledge and practical problems, improve students' practical operation ability and stimulate their enthusiasm for learning. At the same time, in the process of organizing practical activities, teachers should accurately determine the form of practice and the main content of practical activities in combination with the learning content and learning objectives of the mathematics teaching unit chapters. For example, when learning "simple random sampling", in order to deepen students' understanding of knowledge points and improve their application ability of mathematical knowledge in practical activities, teachers can lead students to their cities and counties. The library will conduct random sampling of the books with contamination problems in the library collection, so that students can better master the random sampling method, understand and remember the relevant terms and terminology of "random sampling", recognize the importance of protecting books, and enhance their ideological awareness in specific practice.

Focus on organic integration in combination with discipline characteristics

Based on the internal relationship between excellent and extensive mathematical culture and mathematics discipline, and combined with the specific themes, units, modules, etc. of high school mathematical knowledge, the corresponding content and carrier form of mathematical culture are integrated. Classical mathematical classics, mathematicians' discoveries, inventions, creations, biographies and other specific contents are selected to be presented in the curriculum or textbooks. Students can also form their own mathematical knowledge structure and mathematical history system through in-depth understanding of mathematical cultural connotation, as follows:

(1) Topics in geometry and algebra. Introduce the corresponding mathematicians with relevant knowledge. For example, in the unitary quadratic equation, teachers can use Yang Hui's triangle and Yang Hui's research story as the starting point to carry out the teaching of binomial coefficients. In the part of solid geometry, it introduces the "Zugeng principle", the number sequence (or series) in "Nine Chapters of Arithmetic" and "Zhang Qiuqian's Mathematical Manual", Yang Hui's stacking technique, etc. To enable students to learn complex knowledge, they can further understand the innovation and unique contribution of mathematicians in the history of mathematical development, and feel the wisdom charm of mathematics.

(2) Cultural and artistic themes. The unique architectural gardens, cultural sites and folk arts can be further used as background materials and learning materials. For example, in the teaching of mathematical knowledge of central symmetry, teachers can introduce symmetrical figures frequently used in ancient Chinese garden construction, or introduce folk paper-cut with strong central symmetry as a starting point to carry out mathematical classroom. Guide students to understand the life wisdom and aesthetic pursuit while exploring mathematical principles.

(3) Modeling inquiry topics. Through group cooperation, project learning, presentation reports and other ways, students can learn about algorithmic mathematical thinking methods and their important position and role in the era of computer and artificial intelligence while studying mathematical achievements and thinking methods, so that students can further strengthen their cultural self-confidence.

Adhere to overall design and scientific and reasonable layout

The content of mathematics culture curriculum should run through the whole middle school curriculum, so that the core quality of mathematics, traditional humanistic spirit, innovative development quality, etc. will always positively affect the development process of students' life and learning. We should coordinate all aspects of mathematical culture, ensure that different types of mathematical culture are fully covered, and form a pattern of vertical and horizontal organic connection and coordination between mathematical knowledge and mathematical culture. For example, with the help of network and new media and other resources, learn the relationship between mathematics and information technology, fine arts, economics, statistics, physical chemistry and other disciplines, guide students to learn mathematical knowledge on specific topics, and summarize and summarize.^[vii] Mathematics culture in senior high school curriculum education and teaching is more precise and clear in its purpose, more systematic and complete in its layout, more scientific and reasonable in its content, and more vivid in its presentation. The teaching content of mathematics culture should strengthen the educational functions of cultivating cultural details, cultivating family and country feelings, strengthening social care, improving personality cultivation, and casting a strong sense of community with a shared future for mankind.

CONCLUSION

A country cannot thrive without virtue, and a person cannot stand without virtue. Therefore, the implementation of mathematical culture education is an inevitable choice. Through mathematical culture, students can seek all-round development, so that students can understand the history of mathematics, broaden their understanding of mathematics, arouse their interest in mathematics, comprehend mathematical ideas, improve their thinking quality, improve their mathematical literacy, and learn how to observe the world with mathematical rational thinking. At the same time, mathematics culture courses will greatly broaden our horizons. Students can not only raise the mathematical knowledge they have learned for many years to the level of viewpoint, spirit, method and thought, but also review the laws in the development of mathematics from the perspective of culture and philosophy, and learn the emotions, morality and values of scientists and mathematicians; Not only understand the role of social progress in promoting mathematics, but also understand the role of mathematical development in promoting social civilization. In the new era, the quality education is constantly deepening the reform. In the process of students' learning mathematical knowledge, the fundamental task of establishing morality and cultivating people and simultaneously developing five educations is implemented, so as to truly educate people with culture and moral education, and realize the all-round development of students with high quality.

REFERENCES

- [1] Gu Pei *Mathematical Culture* [M] Beijing: Higher Education Press, 2016.
- [2] The Ministry of Education has issued the Guiding Outline for Ideological and Political Construction of University Courses to comprehensively promote ideological and political construction of university courses [J]. *New Education*, 2020 (19): 32.
- [3] Fu Junlong. The Path to Permeate Moral Education in Senior High School Mathematics Teaching under Core Literacy [J]. *Middle School Curriculum Guidance*, 2022 (26): 93-95.
- [4] Wu Xuehuang. Focusing on Mathematical Culture, Implementing Morality and Cultivating People [J]. *Test Questions and Research*, 2021 (08): 7-8.
- [5] Liu Yu. Establishing a Correct Outlook on Mathematics and Showing the Beauty of Mathematical Culture in the Classroom [J]. *Mathematics Teaching Newsletter*, 2019 (02): 37-

38.

[6] Liu Hong. How to Implement Mathematical Culture Education in High School Mathematics Teaching [J]. College Entrance Examination, 2021 (27): 85-86.
