REVIEW

Appreciation and Analysis of the "Truth, Goodness and Beauty" in Primary School Mathematics Class

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ARTICLE INFO	ABSTRACT
	Focus on cultivating students' mathematical thinking and ability to solve problems in life, guide students to form a scientific attitude of seeking truth from facts, and make students feel the charm of mathematics.

1. Introduction

In 2015, Hong Yanjun, Zhou Jiushi, Wang Shangzhi and Bao Jiansheng interviewed Professor Zhang Dianzhou of East China Normal University on the Standards of General High School Mathematics Curriculum (Revised). Professor Zhang Mouzhou believes that, the core literacy of mathematics has three dimensions: "truth, goodness and beauty": (1) Understand the cultural value of rational mathematical culture, and experience the rigor and accuracy of mathematical truth; (2) Have the basic ability to analyze and solve practical problems with mathematical thinking methods; (3) can appreciate the beauty of mathematical wisdom, like mathematics, and love mathematics[1]. Professor Zhang Dianzhou used the words "truth, goodness and beauty" to accurately summarize the connotation of mathematical core literacy.

Based on Professor Zhang Dianzhou's interpretation of the core literacy of mathematics, the 10 core words of core literacy in primary school mathematics, combined with the characteristics of the primary school mathematics class and the level of mental development of students, explore how to create a "truth, goodness and beauty" pri-

mary school mathematics class.

2. Interpret "Truth, Goodness and Beauty" in Primary School Mathematics Class

The author believes that primary math class with "truth, goodness and beauty" is a class that can teach students rigorous mathematical knowledge, cultivate students' rigorous mathematical thinking, cultivate students' ability to use the mathematical knowledge they have learned to solve problems in life, cultivate students' attitude of seeking truth from facts, and guide students to experience the charm of mathematics.

2.1 Let Students Feel the Rigor of Mathematics in Primary School Mathematics class and Experience the Scientific Attitude of Seeking Truth from Facts

Whether it is the concepts in the primary school mathematics class, the knowledge system embodied in the primary school mathematics class, or the methods used in the primary school mathematics class, all follow Piaget's third stage of children's cognitive development——the cognitive characteristics of children in the specific operation stage (7-12 years old) are also rigorous.

(1) Primary school mathematics concepts are rigorous. The mathematical concepts presented in primary school are different from the knowledge in our mathematical knowledge system, without the rigorous and scientific concepts in our system. For example, the definition of triangle, as defined in the primary school mathematics book: a triangle is a figure surrounded by 3 line segments (the endpoints of each adjacent two line segments are connected). Definition of triangle in Baidu Encyclopedia: A triangle is a closed figure composed of 3 line segments 'head and tail' that are not connected on the same straight line in the same plane. The definition of triangles in primary school mathematics books is obviously not as rigorous as the definition of triangles in Baidu Encyclopedia, but for children around 10 years old, the definitions in mathematics books are easier to understand and accept, so we say that this definition is also rigorous.

(2) Primary school mathematics knowledge system is rigorous. The mathematical knowledge taught in the primary school mathematics class seems to be rigorous in the entire mathematical knowledge system, but these knowledges are closest to the child's most recent development area, and are still rigorous for children at this stage. For example, the teaching content of the "graphics and geometry" part of the primary school mathematics textbooks of the PEP Education Edition and Shanghai Education

Edition is not presented strictly in the logical order of knowledge. It is based on the physical and psychological characteristics of children, with graphic understanding as the main line, and the teaching system based on the logical relationship of graphic content. These contents are mathematical knowledge presented according to children's cognitive level, and these knowledge systems are still rigorous.

(3) Primary school mathematics teaching methods are rigorous. The rigorous mathematics teaching model is "Axiom Content——Axiom Proof——Axiom Nature ——Axiom Application", while the primary school mathematics often adopts a "propose problem situation—— explore problems in the situation——solve problems —— expand and apply". This teaching mode is based on the characteristics of children's thinking, and it is carried out in specific situations, and it is based on the idea of asking questions, analyzing problems, and solving problems. This teaching method still lacks rigor.

The rigor in the primary school mathematics class is different from the rigor that everyone understands. It is the rigor of mathematical knowledge and children's thinking. It has rigorous logical thinking and rigorous mathematical knowledge. Let students experience the process of re-creation in the primary school mathematics class, so that students feel the rigor and precision of mathematics. Mathematics is rigorous and accurate. It must be false and vague. Learning mathematics with a spirit of truth will benefit you for life.

2.2 Let Students Experience the Extensive Application of Mathematics in the Primary School Mathematics class and Experience the Usefulness of Mathematics

Mr. Hua Luogeng said: "The size of the universe, the size of the particles, the speed of the rocket, the ingenuity of chemical engineering, the change of the earth, the mystery of biology, the complexity of daily use, the mathematics is everywhere."[2] This is a wonderful description of the wide range of applications of mathematics. Mathematics has a wide range of applications, from the discovery of Comet Halley, Neptune, electromagnetic waves, etc., to as small as us, we can experience the applicability of mathematics in our daily lives. We guide students to feel the application of mathematics in the primary mathematics class.

(1) Design common situations around the primary school mathematics class so that students feel that mathematics is with us. Mathematics is not far away. Mathematics is all around us. Mathematics is everywhere. Introducing as many of these scenarios as possible in our primary school mathematics class will allow students to

better feel the applicability of mathematics. For example, ask students to observe the shape of the air conditioner's outer frame hanging on the wall, so as to understand the stability of the triangle well. The practical problem of choosing a large laptop bag in online shopping can better fit the laptop. Using "composite histograms" to persuade mothers to give themselves pocket money and other common and interesting issues around students can arouse the interest in learning mathematics.

(2) Pay attention to the penetration of mathematical thought methods in primary school mathematics class, so that students feel the usefulness of mathematics. In the teaching of mathematics, not only must students be taught mathematical knowledge, but more importantly, students should be trained in mathematical thinking methods so that students can use these mathematical thinking methods to solve practical problems. As the saying goes, "Teaching people to fish is worse than teaching people to fish", and cultivates good mathematical thinking methods for lifelong use. For example, the "seven strokes" idea is used to solve the famous Seven Bridges problem; the "combination of numbers and shapes" is used to solve the itinerary problem; Use "mathematical induction" to solve the problem of general terms of series; use the method of reduction to explore the area of trapezoid; use the method of induction to explore the exchange law of addition and multiplication.

(3) In the primary school mathematics class, we will introduce the wonderful stories related to mathematics in history, so that students can further experience the wide range of mathematical applications. Introduce the magical Mobius band, the Chinese folk intellectual game——Nine Consecutives, hourglass timer, the famous four-color problem, "Pufeng shot" and other stories in primary school math class, not only make students feel the wisdom and wisdom of mathematicians, but also makes the students feel the usefulness and wide application of mathematics.

2.3 Appreciate the Beauty of Mathematics and Feel the Charm of Mathematics in the Primary Mathematics class

Mathematics reveals the inherent laws and internal beauty of nature and human society, and uses simple and beautiful theorems and formulas to describe the nature of the world[3]. There are many beauties in mathematics: order, harmony, coordination, and symmetry in mathematics are beauty; Concise mathematical methods, fluent mathematical language, and mysterious mathematical results are a kind of beauty; the harmony of numbers and shapes is a beauty, and the elegance of geometry is a beauty...

the beauty of mathematics is everywhere in mathematics teaching, as long as you have a pair of eyes that discover beauty, you can appreciate the beauty of mathematics in mathematics teaching, feel the charm of mathematics, and like mathematics. For example, by observing the number of petals, the spiral of a sunflower, and other common things in life that are represented by the Pei Bonacci sequence, the beauty of the sequence in life is shown. Use jigsaw puzzles to spell out all kinds of beautiful graphics and enjoy the beauty of graphics.

3. Practice "Truth, Goodness and Beauty" in Primary School Mathematics Class

Mathematics teachers should make full use of their position——mathematics class, and create "truth, goodness and beauty" primary school mathematics class.

3.1 Creating A "Truth, Goodness and Beauty" in Primary School Mathematics Class Requires a High-Quality Teacher Team

(1) Primary school mathematics teachers must have generous knowledge of mathematical culture. As a primary school mathematics teacher, in addition to having a solid knowledge of mathematics, systematic pedagogy, and psychology, he must also accumulate a wealth of mathematical culture and other cultural knowledges.

(2) Primary school mathematics teachers have the consciousness of cultivating students' mathematical thinking and the scientific rigorous spirit of seeking truth. Mathematical culture has a long history, from China's "Nine Chapters of Arithmetic" and "Geometry Original" of ancient Greece to the current computer age and big data era; three breakthroughs from arithmetic to algebra, from constant mathematics to variable mathematics, from deterministic mathematics to random mathematics, are all developed and made breakthroughs in continuous truth-seeking. Truth-seeking is a necessary spirit in mathematics learning.

(3) Primary school math teachers should have an eye to discover and appreciate beauty. The core literacy of mathematics refers to the mathematical abilities that students should possess. Mathematics teachers are the main implementers of training such abilities. Change teachers' ideas, and let the core concepts of mathematics take root in the minds of mathematics teachers. Only by letting the math teacher know which mathematical abilities to train the students will they be consciously cultivated; after realizing the importance of developing these abilities, we will try every means to improve ourselves so that we have the ability to develop these mathematical abilities.

3.2 Create Teaching Strategies for "Truth, Goodness and Beauty" in Primary School Mathematics Class

There are many common teaching strategies for various subjects, such as the case study teaching strategy, trial teaching strategy, scenario teaching strategy, six-step teaching strategy, and autonomous learning teaching strategy. On the basis of these teaching strategies, combined with the characteristics of mathematics disciplines, timely penetration of mathematical culture teaching strategies, mathematical experimental teaching strategies, and mathematical appreciation teaching strategies can better create "truth, goodness and beauty" in primary school mathematics class[4].

3.2.1 Mathematical Culture Teaching Strategy

The contents of mathematical culture are mainly divided into 4 categories, namely, history of mathematics, mathematics and real life, mathematics and science and technology, mathematics and humanities. The organic integration of our mathematical knowledge with mathematical culture such as the history of mathematics, real life, science and technology, humanities and arts in mathematics teaching can broaden students' knowledge horizons, enhance their interest in learning mathematics, and make students feel the fun and usefulness of mathematics.[5] In this teaching strategy, we can also adopt the method of mathematical reading to learn mathematical culture, let students voluntarily learn about mathematical culture, take the initiative to learn mathematical culture, and enhance the passion for learning mathematics in a silent and silent way.

For example, when learning the area of a triangle, introduce the meaning of "half wide and multiply positive congruence" in "Nine Chapters of Arithmetic"; introduce the story of Halley and Halley's comet in the law of first grade; use the story of "Effendi Take the Seven Rings Cleverly" to ask mathematical questions; introduce the hourglass and sundial in the second grade "Knowing the Time", and infiltrate the original boring mathematics class.[6] The infiltration of a large amount of mathematical and cultural knowledge enables students not only to know what it is but also why it is, so that students can feel the truth of mathematics and achieve the purpose of training students' spirit of seeking truth[7].

3.2.2 Mathematical Experiment Teaching Strategy

Mathematical experiment refers to a teaching activity in which students gain knowledge through hands-on operation and practice under a certain environment[8]. At present, primary school mathematics experiments are generally carried out in small groups. We can carry out multi-channel mathematical experiment activities, and the locations of experiments can be diversified. The place of activity can be in the class or outside the class; it can be in a formal math laboratory or on the playground; it can be in or out of school. Teacher Zhang Hongwei designed a mathematical experiment-"Autonomous Detection on Sandy Road", to allow students to do mathematical experiments on the sandy road in the playground to review the relevant properties of cylinders and cones; design a mathematical experiment ——"Evaporation Timer", and let students create their own timers at home using principles similar to hourglasses. Carrying out such mathematical experiment activities in mathematics teaching can enable students to experience the whole process of inquiry, cultivate students 'ability to find problems, analyze problems, solve problems, and initially cultivate students' creativity. Let students use mathematical thinking methods to solve problems in experiments.

3.2.3 Mathematical Appreciation Teaching Strategy

Teachers excavate the inherent beauty in textbooks in teaching, guide students to view mathematics with appreciation, and arouse the students' aesthetic consciousness, so that students acquire the knowledge, the emotion of mathematical beauty, and the pursuit of mathematical beauty. We admire the beauty of symmetry and the beauty of movement while feeling the wisdom of mathematics. Implementing the teaching strategy of penetrating mathematics appreciation in teaching can effectively enhance students' interest in learning mathematics and thus enjoy mathematics learning.

3.2.4 Innovating Mathematical Assignment Strategy

At present, the traditional math assignments are mainly exercise books and workbooks on the books. Students immerse themselves in the "work pile" all day. The homework forms are simple and boring, and the training requirements are unified, which wastes a lot of students' extracurricular time. In order to better build our primary school mathematics class, we started to study creative homework. We hope that the organic combination of creative homework and traditional homework will better motivate students to learn and create a more dynamic math class. The above teaching strategies do not exist alone, and often interpenetrate and complement each other. For example, Teacher Zhang Hongwei's "Mathematics Meets Spring-Panoramic Mathematics Interdisciplinary Integration Course: Mathematical Culture in "Review of Addition and Subtraction Within 100" ——The Pei Bo-

nacci sequence is the main line. Outdoor mathematical experiments have been carried out, admiring the branches of the fork, pine cone seeds, and sunflowers to further understand the reflection of the Pei Bonacci sequence in nature. Based on the original teaching strategy, the teaching strategy of infiltrating mathematical culture, mathematical experiments, and mathematical appreciation makes the original boring review lessons colorful.

3.3 Create "Truth, Goodness and Beauty" in Primary School Mathematics Class and Change the Existing Evaluation System

From the evaluation results of PISA and TIMSS, the evaluation of students 'mathematics learning in China is still mainly based on the examination of students' "mathematics knowledge". This assessment is still a quantitative assessment method led by scores. The core literacy of mathematics is a kind of ability, and this kind of ability cannot be evaluated with quantitative standards. Some quantitative assessment methods now seriously hinder the development of students' core mathematical literacy. In order to better promote the cultivation of mathematical core literacy, it is necessary to change the existing evaluation method and adopt a multiple evaluation system combining quantitative evaluation and qualitative evaluation to provide good soil for the cultivation of core literacy.

4. Appreciate "Truth, Goodness and Beauty" in Primary School Mathematics

Let's enjoy Madam Curie, Newton, Chen Jingrun... the famous people's scientific attitude of seeking truth from facts, and learn their spirit of seeking truth; let's enjoy the solution of the Seven Bridges in Königsberg with one stroke, the optimization method of Hua Luogeng, the four-color problem... appreciate the mystery of solving problems with mathematical ideas; let's use the mathematical perspective to appreciate the Fibonacci sequence in nature, the beauty of the golden ratio, the beauty of symmetry, harmony, and unity of mathematics. Let us lead students to appreciate the "truth, goodness and beauty" of mathematics, and lead them to travel in the world of mathematics.

5. Conclusion

Mathematics teachers have rooted the core mathematical literacy in the students' minds in their own mathematics class so that students can form a mathematical ability that will benefit them for life. It is hoped that students can gradually cultivate good core mathematics literacy in the six years of study and life in primary school, and lay a solid foundation for future continuous learning and lifelong learning. Let the core literacy of mathematics be integrated into the teaching of mathematics like a spring rain that nourishes all things, and nourish students' hearts in a subtle way.

References

[1] Hong Yanjun, Zhou Jiushi, Wang Shangzhi, Bao Jiansheng. Consultation of "General Senior High School Mathematics Curriculum Standards (Revised Draft)" —— Interview with Mr. Zhang Dianzhou[J]. Journal of Mathematical Education, 2015 (3):35-39. (in Chinese)

[2] Gu Pei. Mathematical Culture[M]. Beijing: Higher Education Press, 2008:12-13. (in Chinese)

[3] Chen Yumin Primary school students' sense of number[J]. Education Practice and Research (Primary School Edition), 2008(6). (in Chinese)

[4] Su Hongyu. Research on students' mathematical literacy from the perspective of PISA and TIMSS[J]. Communications in Mathematics. 2007(9):1-5. (in Chinese)

[5] Ye Xuanchen. The recitation of ancient poetry in primary school[J]. New Curriculum (Primary), 2018 (08):84. (in Chinese)

[6] Wu Mei. Strategies for improving ancient Chinese poetry teaching in primary schools[J]. East, West, North and South; Education, 2018 (2):193. (in Chinese)

[7] Cai Yun. Let children understand the love of mothers in the most appropriate way [J]. Publisher, 2018 (05):65. (in Chinese)

[8] Jia Jinrong. How to Guide the Study of Classical Poetry in Primary School Chinese Teaching[J]. China Off-School Education, 2015 (27):125. (in Chinese)