

RESEARCH ON TRAINING STRATEGIES OF HIGH SCHOOL CLASSROOM MATHEMATICS IMAGE EXTRACTION LITERACY

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ABSTRACT

"Core literacy" is a hot topic in the education circle recently, and it is also a concentrated expression of mathematics curriculum objectives. Because mathematics discipline covers a large amount of abstract knowledge and abstract thinking ability, mathematics abstract literacy as the top six core literacy of high school mathematics discipline has been proposed and widely recognized by people. Secondly, although the current education mode in our country is gradually expanding, micro-classes, online classes and live classes are emerging one after another, but the most common students contact is the classroom teaching in schools, which shows that in terms of necessity and importance, classroom teaching is an irreplaceable way for students to learn. Therefore, combining classroom practice and other related teaching activities to mobilize students' attention and enthusiasm for learning, developing students' abstract thinking in mathematics and improving their abstract generalization ability have become major issues facing mathematics workers today. Through consulting a large number of relevant documents, this paper has a preliminary understanding of the understanding and understanding of mathematics abstract literacy in mathematics education circle and the process of selecting and precipitating mathematics abstract as the core literacy of mathematics. Based on the 2017 edition of the curriculum standard for ordinary high school mathematics, and according to the current actual situation of high school students in mathematics learning and mathematics abstract ability, this paper puts forward relevant strategies for cultivating high school mathematics abstract literacy. It is a new direction of mathematics teaching recently to combine teaching practice to cultivate students' mathematical abstract accomplishment and further stimulate students' mathematical abstract ability. In the past, the teaching mode paid more attention to the students' theoretical mastery of book knowledge, the correct rate of problem solving and their proficiency. The focus of teaching is on the cultivation of students' abstract mathematical literacy in classroom teaching, which is a new perspective and breakthrough in education. Therefore, the research on the cultivation of students' abstract mathematical literacy in high school classroom is meaningful.

Keywords: Mathematical Abstraction, Abstract Thinking Ability, Mathematics Core Accomplishment, Senior High School Mathematics Teaching.

INTRODUCTION

Research Background

In order to realize the fundamental task of cultivating morality and cultivating people, the Ministry of Education of our country formally proposed in 2014 to systematically plan the core literacy system for students of all learning stages, and formulated the subject core literacy for all disciplines. Among them, the high school mathematics subject core literacy is formulated as the following six: mathematical abstraction, logical reasoning, visual imagination, mathematical operation, mathematical modeling and data analysis. Therefore, "mathematics core literacy" has

become a hot word in education in recent years and has attracted the attention of experts and scholars from all walks of life. While "mathematics abstraction" was proposed as the first of the six core literacy, it has also become the focus of people's attention.

There are three basic ideas of mathematical development: abstraction, reasoning and model, of which abstraction is the basis^[1]. Students can abstract mathematical methods, concepts, propositions and systems from problem situations through the study of high school mathematics curriculum, and gradually master the activity experience from concrete to abstract. Cultivate the habit of thinking about problems generally in daily life and in practice, and discover the essence of things. Use mathematical abstract thinking to look at problems and solve them.

From this, it can be seen that mathematics abstraction is the first of the six high school mathematics core qualities, and it is particularly important to pay attention to its implementation in the classroom teaching process, so it is extremely critical to cultivate students' mathematics abstract qualities.

Mathematical abstraction is a process of construction. We usually study the problems to be solved after abstracting mathematical concepts and theorems many times. In a sense, there is theoretical knowledge to some extent isolated between mathematical abstraction and realistic prototype. To give a simple example, we came into contact with Arabic numerals in primary school. With the increase of grades and the abundance of knowledge, we began to learn mathematical symbols abstracted from Arabic numerals (such as integer Z , rational number Q , etc.), and on this basis we learned functions, differentiation, etc. This is determined by the abstraction of mathematics itself.

Research Content

This paper mainly studies the importance of mathematical abstraction in high school mathematics teaching from the perspective of core literacy, and based on this research basis, through consulting a large number of references, analyzes relevant research on mathematical abstraction at home and abroad, and further proposes teaching strategies related to mathematical abstraction literacy with the goal of cultivating mathematical abstraction literacy in high school classroom.

Research Purpose and Significance

In recent years, educators have paid more and more attention to the core quality of mathematics. Whether it is the drafting and arrangement of new mathematics curriculum standards or the teaching practice in schools, they are all making efforts to cultivate and improve the core quality of mathematics. As the first of the six core qualities of mathematics, mathematical abstraction should be analyzed and discussed in detail.

The purpose of this article is to combine one's own understanding of mathematics abstraction and put forward relevant teaching strategies through literature review, which can make a modest contribution to today's education and provide some references and basis for today's scholars to further understand and develop the core literacy of mathematics.

It is helpful to enrich the research on the cultivation of mathematics core literacy. Through the interpretation and practical application of mathematical abstraction, this study hopes to make some

efforts to popularize the core literacy of mathematics and its application in teaching practice, and to enrich the connotation and extension of the core literacy of mathematics.

It is conducive to improving the teaching effect. For teachers, the research emphasizes the importance of cultivating students' abstract mathematical literacy, which is a reminder to teachers. In order to better carry out teaching, teachers must improve their teaching literacy, understand the characteristics of mathematics, understand the difficulties students may encounter in learning under the existing knowledge level, and better transfer knowledge to students. For students, mathematics learning is a process of continuously understanding mathematics abstraction and cultivating mathematics abstraction ability. The research puts forward teaching strategies related to mathematics abstraction, so that students can learn to think from the source of knowledge, actively discover problems and solve them, and continuously enhance their interest in mathematics learning. Teachers "teach" better and students "learn" better, thus improving the teaching effect.

LITERATURE REVIEW

Relevant Research at Home and Abroad

In ancient Greece, Plato, a representative figure of idealism, pointed out that mathematics is abstract and the beauty of mathematics is an abstract beauty. There are some abstract methods in mathematics that can effectively train people's brains and psychology and are ways to help people to explore human nature.^[2] The famous British mathematician and educator Schengen integrates classification and abstraction, and analyzes the relationship between them. He thinks that abstraction is an activity. People realize the similarity on the basis of this activity. The result of abstraction enables us to distinguish new experiences that contain similarity with the existing classification.^[3] Famous Soviet educator and psychologist Davydov pointed out: Theoretical abstraction is different from empirical abstraction, and the process of abstraction is not from concrete to abstract, but from a primitive field that has never been developed to a mature field.^[4] HSD and others drew lessons from previous theories and put forward an operational definition of mathematical abstraction: abstraction is an activity that vertically recombines established mathematics and forms a new mathematical structure. Among them, "constructed mathematics" refers to previously abstract results and unrefined initial abstract entities.^[5] Through the research on mathematical abstraction, foreign educators have applied it to mathematics teaching. However, when further research is carried out on the cultivation of mathematical abstraction in the teaching process, the research object is mostly lower-grade students, while the research on high school students is very little.

Professor Shi Ningzhong defines abstraction as something that deviates from the form and relationship of specific content. The depth of abstraction is divided into three stages: simple stage, symbolic stage and ordinary stage.^[6] Professor Qian Peiling, in his book "Mathematical Thinking Methods and Middle School Teaching", divided the way of mathematical abstraction into: relational abstraction, property abstraction, strong abstraction and weak abstraction.^[7] Hou Congbo pointed out that abstraction is a thinking process in which common and essential features are extracted from many things while non-essential features are discarded. Different from other abstract things, mathematical abstraction, as a special kind of abstraction, needs to combine the nature of mathematics to explain its own particularity, which is mainly reflected in the relationship between spatial form and mathematics.^[8] Ding Shisun stated in "The Power of Mathematics" that mathematics is different from other disciplines. Although abstraction is the nature of every

discipline, the research object of mathematics is abstract and it is rich in abstract beauty.^[9] Zheng Qixin and others elaborated their understanding of mathematical abstraction analysis method on the basis of the existing research. In the co-authored "Mathematical Thinking and Mathematical Methodology", they mentioned that the three-dimensional index of the abstract, namely, relative abstraction degree, degree of emergence and degree of entry, was comprehensively used to analyze each component of mathematics and understand its internal structure.^[10]

Concept Meaning

Abstraction is the fundamental characteristic of philosophy. Abstract cannot exist alone without concrete. What we see of nature is the reflection of nature's physical objects in our minds. Abstraction is our description of the commonness of certain things. Specifically, abstraction refers to an action or process in which one or several characteristics of a complex object are extracted and only other characteristics are paid attention to (e.g. the mind only considers the shape of the tree itself or the color of leaves, and is not limited by their size and shape); The act or process of abstracting vividly or considering in isolation the common properties or characteristics of several different objects; From the objects to be studied, the substantial contents related to the research work are extracted for investigation, and the individual, non-essential or irrelevant secondary factors in the objects to be studied are ignored, thus forming a correct understanding of the problems to be studied. It is a method often used in scientific research.^[11]

Mathematical abstraction refers to the abstraction of general laws and structures from physical objects and their representation with mathematical symbols and terms. It also refers to the process of taking the relationship between number and quantity and the relationship between figure and figure as objects and forming mathematical theory through gradual abstraction.^[12]

Mathematics abstract accomplishment is the first of the six core accomplishments of mathematics, is an important basis for forming rational thinking, reflects the essential characteristics of mathematics, and runs through the generation, development and application of mathematics. Mathematical abstraction makes mathematics a highly generalized, accurate, general and orderly multilevel system.

Through the cultivation of mathematical abstract accomplishment, students can better understand mathematical concepts, propositions, methods and systems, and form the habit of thinking about general problems. Can be simplified in the study of other disciplines, understand the knowledge structure and essential characteristics of the discipline.

METHOD

This research combines the education and teaching practice with the current development of high school students' abstract mathematics literacy, and explores the teaching strategies to cultivate students' abstract mathematics literacy in high school classes. This paper mainly adopts the methods of documentation and lesson analysis.

Documentation Method

According to certain research topics or research purposes, make full use of school resources, including books in the library and CNKI, etc., and learn and understand the core accomplishment of mathematical abstraction, mathematical abstraction and the actual situation of mathematical

education at this stage through consulting and studying. On this basis, by collecting relevant domestic and foreign literature on the core literacy of mathematical abstraction, the author analyzes the attention of the current educational circles to mathematical abstraction, and puts forward corresponding teaching strategies based on his understanding of mathematical abstraction literacy.

Lesson Analysis

Based on the relevant theories of mathematical abstraction, this paper analyzes relevant teaching examples (taking the concept of a required function in senior high schools as an example) to prove the importance of mathematical abstraction and further explore the process of cultivating students' mathematical abstract literacy in senior high schools.

RESULT

In view of the current situation of high school students' cultivation of mathematical abstract literacy and in combination with the current situation of mathematics learning, I have consulted relevant references, analyzed the collected data, and based on the purpose of improving the cultivation process of students' mathematical abstract literacy, I propose the following teaching strategies for the cultivation of relevant mathematical abstract literacy.

Construct Knowledge System

According to the data, students will not contact with the knowledge they have learned and build a knowledge system framework. As we all know, mathematics abstract accomplishment is not cultivated overnight. Because mathematics itself is abstract and mathematics abstract is comprehensive, mathematics abstract concrete is not easy to be accepted by students in high school mathematics teaching materials, which makes it difficult for students to adapt to the abstract part of high school mathematics. There is no way to establish the connection between new knowledge and previous knowledge while learning new knowledge, and the knowledge framework cannot be constructed. Therefore, teachers should strengthen the guiding role, so that students can consolidate relevant previous knowledge before learning new knowledge, make the whole class coherent, and help students build a complete knowledge system.

Cultivate Analysis and Analogy Ability

The mastery of mathematical concepts, the exploration of mathematical laws, the induction of mathematical theorems and the condensation of problem methods often require the complete abstract activities of student managers. Teachers should guide students to observe, analyze, guess, analogy and other activities as much as possible, which is helpful for the divergence of students' thinking and the extraction and construction of the correlation between mathematics knowledge and the real world in comprehensive scenarios. In the process of classroom teaching, teachers can carry out more mathematical inquiry activities and mathematical modeling activities to stimulate students' interest in learning, arouse students' learning enthusiasm, and let students take the initiative to cultivate mathematical abstract literacy.

Master the Combination of Concrete and Sensibility

The abstract nature of mathematics itself leads to the premise that it must be presented in concrete form, so it is necessary to transfer knowledge in concrete form as the main teaching mode in the teaching process. Senior high school students' logical ability is still in the stage of improvement,

and their acceptance ability is still insufficient. Therefore, in order to enable students to better digest some abstract knowledge theories, teachers can start from concrete examples in teaching activities and combine intuitive, concrete and abstract sensibility to facilitate students to accept knowledge and improve the efficiency of teaching activities.

Combine Other Mathematical Attainments

The cognitive structure of senior high school students has been formed and developed. When thinking is developed to be free from concrete content and realistic influence, it reaches the level of abstract logical reasoning. It is well known that the six major disciplines of mathematics are interrelated and blend with each other, forming an organic whole. The formation of each accomplishment is in fact synchronized with the development of mathematical abstract accomplishment. Attention should be paid to the formation of other mathematical accomplishments while paying attention to mathematical abstract ability. Therefore, it will achieve twice the result with half the effort to cultivate abstract mathematics literacy in high school classroom and integrate other mathematics literacy.

DISCUSSION

Mathematical abstraction is the basic thought of mathematics, which runs through the whole process of mathematics learning. Based on the generative nature of mathematics literacy, this paper puts forward the teaching strategy of cultivating mathematics abstract literacy in high school classroom, and then takes the concept of function as an example to discuss.

Function is one of the most abstract knowledge points in students' learning stage. Whether it is to flexibly use the combination of numbers and shapes or to convert between geometric language and algebraic language, students will encounter obstacles. In class, teachers should guide students to find out the three elements of the function and be able to independently judge when the two functions are equal. From the function learned in junior high school to the function learned in senior high school, this is a process in which the concept of function is abstracted again. Students need to carry out self-exploration activities in the whole learning process, grasp the essence of the concept of function, and further promote and abstract the concept of function on the basis of mastering the existing concept of function in junior high school. In a series of activities carried out by the students following the teachers in the classroom, the concept of function is gradually enriched, what is a function is understood, the concept abstraction can be felt from the generation process of variables, and the mathematical abstraction can be realized, so that the understanding of the mathematical abstraction of the students is gradually developed and formed in their own knowledge system, which is the basic preparation for cultivating the students' mathematical abstract literacy in the classroom.

CONCLUSION

The application of mathematical abstraction in mathematics teaching is the focus of attention of mathematics educators, and we are paying more and more attention to the formation process of students' accomplishment in mathematics classroom. This article refers to many domestic and foreign documents, and combines with the understanding of various aspects of mathematics education in recent years, taking high school mathematics classroom as an example, puts forward

the strategy of cultivating mathematics abstract literacy in high school mathematics classroom. Based on the proposed teaching strategy and my own research on the cultivation of mathematical abstract literacy, the following conclusions are drawn: combining with mathematical abstraction for teaching, students can have clearer ideas in the learning process, have a clear understanding from the source of knowledge to the final conclusion, and have a deeper understanding of knowledge; The purpose of mathematics abstract teaching is to guide students to learn mathematics knowledge effectively, to carry out quality education for students, to cultivate students' mathematics abstract literacy consciously in the teaching process, to help students master new knowledge more firmly, and to analyze and solve other mathematics problems independently starting from mathematics abstract.

In recent years, there has been an increasing number of researches on mathematical abstraction in our country. The importance of mathematical educators to mathematical abstraction accomplishment also reflects its importance to students' learning. There is still a long way to go in the study of mathematical abstraction. We will make joint efforts to explore in mathematics teaching so as to better cultivate and develop mathematical abstraction.

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REFERENCES

- [1] Shi Ningzhong. Talking about the Basic Ideas of Mathematics [J]. Journal of Mathematics Education, 2011,20 (04): 8
- [2] Tang Binru, Zhao Yuemin. Plato and Mathematics [J]. Journal of Jiangxi Institute of Education (Natural Science), 1997: 18-19
- [3] Lin Min, Sun Zhifeng. A brief review of Piaget's research on reflective abstraction and its development [J]. Journal of East China Normal University (Education Science Edition), 2006: 66.
- [4] Tang Qin. An Overview of Extragraphic Research on "Mathematical Abstraction" [J]. Middle School Mathematics Monthly, 2016: 55.
- [5]Freudenthal, H. Revisitingmathematics education:China ectures[J].Cognitive Development,1991(13):199.

- [6] Shi Ningzhong. Introduction to Mathematical Thought (Part I); Abstract relation between quantity and quantity [M]. Changchun; Northeast Normal University Press, 2008: 3.
- [7] Qian Peiling. Mathematical Thinking and Middle School Teaching [M]. Beijing: Beijing Normal University Press, 1999: 7.
- Hou Mincong. Application of Mathematical Abstraction in Mathematics Teaching [J]. Management, 2012 (16): 348.
- [9] Ding Shisun. The Power of Mathematics [J]. Science Lecture Hall, 2004,55.
- [10] Zheng Qixin, Xiao Bairong, Xiong Ping. Mathematical Thinking and Mathematical Methodology [M]. Chengdu: Sichuan Education Press, 2001: 4.
- [11] Luo Hongcai, Liao Liusheng. Research and Thinking on Mathematics Abstraction [J]. Journal of Mathematics Education, 2001: 6.
- [12] Wang Yongchun. Elementary School Mathematics and Mathematical Thinking Methods [M]. Shanghai: East China Normal University Press, 2014,13.