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Research on the Strategy of Cultivating Chinese High School Students' Applied Consciousness in Mathematics Based on Personalized Homework

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Abstract **– Chinese high school students are generally not very conscious about applying mathematics in their mathematics courses. One of the goals of high school mathematics curriculum is to train students to have a good sense of applied mathematics. In classroom teaching, assignment is one of the important links. Personalized homework changes the shortcomings of traditional homework and tailor-made "homework" for students, which is very helpful to cultivate students' mathematical application consciousness. According to the different types of personalized homework, this paper proposes strategies for cultivating Chinese high school students' consciousness of mathematical application.**

Keywords **– Chinese High School Mathematics, Personalized Homework, Mathematics Application Consciousness.**

I. INTRODUCTION

Mathematics is a discipline that studies concepts such as quantity, structure, change, and spatial models. The emergence and development of mathematics have an inseparable relationship with real life. Mathematics has promoted the development of today's information society and the advancement of science and technology. The application of mathematics has brought great convenience to people's life and production, and the requirements of the entire society for the application of mathematics have gradually increased. In China's basic education, students 'mathematical application ability is generally low, mathematics teaching is constrained by the backward mode of exam-oriented education, and students' mathematical application ability is relatively backward. Therefore, the above two reasons make it a practical need to improve students' consciousness of mathematical application. The "personalized homework" is proposed to solve such problems. It can help students establish a connection between mathematics and life, and apply mathematical knowledge to practical problem solving. Therefore, the rational design and use of "personalized homework" by educators can effectively improve the mathematics application consciousness of Chinese high school students.

"Personalized homework" is teachers who design and give each student sufficient learning conditions (such as resources, content, assessments, etc.), guide students to complete learning tasks at their own method and pace. [1]

That is to say, the homework is specific to each student's specific academic situation and ability level. The homework is set according to the needs of the students. [2]

According to the research history of homework design in recent decades, there are two basic methods of homework. The first is an experimental homework based on experimentalism proposed by Dewey in the United States. This form of homework can improve students' application and innovation consciousness. The second is a textual assignment based on cognitionism proposed by Kairov of the former Soviet Union. This form of assignment can help students to supplement and extend the knowledge learned in school. For most western countries, teaching is mainly in small classes, which is different from the unified teaching in large classes in China. Personalized homework are included in personalized teaching. In China, the form of homework is roughly the

same as that of foreign homework, but teachers generally attach importance to correcting and commenting on homework. They have some shortcomings about the scientific nature of the homework and the analysis of student homework. The research on personalized homework in China is not enough, but the personal homework meets the requirements of high school mathematics core literacy, and is more in line with the goal of cultivating Chinese students' mathematical consciousness. Therefore, this paper will propose strategies for cultivating Chinese high school students' mathematical application consciousness according to different types of personalized homework.

II. Understanding of Applied Mathematics

Mathematics application consciousness is a mental state and an intention. It is the psychological tendency of the subject to describe, understand, and solve various problems with mathematical language, knowledge, and thinking methods from a mathematical perspective.

The general understanding of mathematical application consciousness is as follows [3]:

A. From the perspective of psychological characteristics, that is to emphasize the consciousness and initiative of mathematical application consciousness. When encountering problems, the subject can actively try to solve the problem from a mathematical perspective, and when the subject learns a new mathematical knowledge, it can actively seek the practical application value of knowledge.

B. From the perspective of mathematical thinking, that is, reasoning abstract whole, into the sum of consciousness to constitute the mathematics application consciousness.

C. From the perspective of problem solving, mathematical application consciousness refers to the consciousness of turning actual problems into mathematical problems and establishing mathematical models to find solution strategies.

Mathematical application consciousness includes the following three levels [4]:

A. Realize that there are a lot of mathematical information in real life, and mathematics has a wide range of applications in real life.

B. In the face of practical problems, can actively try to apply the mathematical knowledge and methods learned to find solutions to problems.

C. When faced with new mathematical knowledge, can actively seek its practical application background and seek practical application value.

Affected by China's test-oriented education, teachers' design of students' homework focuses on the cultivation of problem-solving skills, and ignores the use of mathematical knowledge to solve practical problems. Therefore, the level of students 'consciousness of mathematical application is low, which affects the development of students' comprehensive quality.

III. Understanding of Personalized Homework

Homework is a form of instructional activity that teachers prepare in a purposeful, planned, and conscious manner based on the teaching goals and curriculum standards that require students to master the content of teaching materials [5]. Compared with traditional homework, personalized homework are a new form of homework. Personalized homework retain the advantages of traditional homework to strengthen their

understanding of knowledge and skills, enrich classroom content, and cultivate students' good study habits. And personalized homework abandon the negative effects of traditional homework, which tend to bring students annoyance in learning, make students who are less conscious have plagiarism behaviors, and gradually increase the gap between backward students and outstanding students. Teachers play a very important role in truly personalized homework design. They must teach students according to their aptitude, respect the individual differences of students, and truly enhance students' application consciousness and creative ability of mathematics. But to really let different students get different development, there are certain requirements for teachers. To design personalized homework, we must have a correct understanding of different types of students at different levels. So for the backward students, placing personalized homework is to publicly acknowledge that these students are learning backwards. If the teacher handles it improperly, it will have a negative impact on the mentality of the undergraduates, which may lead to such phenomena as weariness. Therefore, teachers should deal with the following aspects when dealing with such problems:

A. *Correct Understanding of Student Differences*

Teachers should respect the individual differences of students, arrange individualized homework for students in a targeted manner, improve the learning effect of students, and allow each student to gain in learning. Teachers should treat each student fairly and patiently, and do not discriminate against the backward students.

B. *Timely Encourage and Guide Students*

For the backward students, the teacher reduces the difficulty and amount of homework, so not only will such students have no difficulty in completing the homework, but they can also master the knowledge solidly. For the little progress of the backward students, teachers should be keen to observe, praise and encourage the students in a timely, adequate and appropriate manner, so as to stimulate the potential of the students, and then enhance their learning motivation and self-confidence. Create a relaxed, cheerful and positive learning atmosphere so that the backward students have certain goals for learning.

C. *System Education for Students*

Give full play to the leading role of school education, so that schools, families, and society can influence the education of students under the same educational goal and achieve common educational goals.

In addition, the design of personalized homework should also have the following characteristics:

1. *Clear Assignment Design Goals, Improve the Pertinence of the Assignment*

When designing homework, teachers must keep the content of the homework consistent with the assignment goals, and the assignment goals must be consistent with the teaching and education goals. When designing personalized homework, teachers should not only highlight the teaching focus, but also make up or adapt the topic according to the teaching objectives to improve the pertinence of the homework. In the preparation of exercises, teachers need to break through the rules, study and master the methods of making the questions carefully, think about the problems from different angles, and prevent the mindset [6].

2. *The suitability of Homework Design Can Improve Students' Learning Effect*

When designing personalized homework, the amount of homework, difficulty of homework, and assignment

time must be suitable for the students' development level. They must not be too simple to prevent students from thinking and exploring, or be too difficult, so that students lose their interest and confidence in learning.

3. *Assignment Design Close to Life, Improve Student Learning Interest*

Mathematics originates from life and is used in life. Teachers should integrate knowledge into the teaching situation as much as possible, and after careful preparation, make it a problem that is close to the actual life of students, so that students realize the value of mathematical knowledge.

IV. The Application Strategy of Personalized Assignment in Cultivating the Consciousness of Mathematics Application in Chinese High School Students

Diversity is one of the important manifestations of individualized mathematics homework in high school. In order to enable students to study in a targeted manner and effectively enhance Chinese high school students' consciousness of mathematics application, the following strategies are proposed in combination with the characteristics of the discipline and different types of personalized homework:

A. *Design Practical Homework and Cultivate Consciousness of Mathematical Application*

Practice is the sole criterion for testing truth. Practical homework allows students to gain knowledge through practice. Therefore, students should be allowed to carry out hands-on practice, independent exploration, cooperation and communication, integrate mathematical problems into students' active exploration and practice, improve students' learning interest, cultivate students' application consciousness, and let students see the world with a mathematical perspective. For example, in the lesson of learning probability, the teacher can arrange the homework for pre-class review: ask students to toss the same coin 100 times, record the number of heads up and back, respectively, and calculate the probability through data. In this way, all the students bring the test results to class, and the teacher learns new knowledge together with the students through the homework completed by the students.

B. *Designing Survey-type Homework to Cultivate Consciousness of Mathematical Applications*

Survey homework refers to the process of solving practical mathematical problems through daily life investigation, discussion and analysis of survey results among student groups. Investigative homework can improve students 'enthusiasm for learning, and cultivate students' spirit of exploration, ability to cooperate in inquiry, and consciousness and ability to apply mathematics. For example, before learning the meaning of set, students can be assigned an investigation homework, so that students can investigate in daily life, see where the knowledge of set is applied in real life, record the results, display in class, and then teachers and students can jointly explore the representation method of set, and continue to learn new knowledge. For another example, when studying statistics-related content, students are given survey-type homework to investigate "the most favorite classroom teaching method for students in this school" and "health conditions for students in this school". Let students feel that there is a lot of mathematical information in real life, and gradually build up students' consciousness of solving practical problems with mathematical methods.

C. *Design Mathematical Modeling Homework and Cultivate Mathematical Application Consciousness*

Many problems in daily life can be solved by building mathematical models. High school mathematics mode-

-ling is the primary stage of training students in mathematical modeling. Students read analysis and understanding of problems, grasp the quantitative relationship among problems, use mathematical knowledge to build mathematical models, and solve practical problems. Teachers can design and arrange simple problems in mathematical modeling so that students can use basic mathematics to solve practical problems and cultivate students' consciousness of mathematical application. For example, the following table I shows the speed of a car and the parking distance after braking. A function can be used to model the relationship between the parking distance y after braking and the vehicle speed x. The simulation function can be used as $y = ax^n$ y (a, n is a constant, $a \neq 0$, $n \neq 0$) or $y = ax^2 + bx + c$ (a, b, c is a constant, $a \neq 0$), try to choose a better simulation function model from it, and use this function model to predict the braking speed at $120km/h$ Parking distance.

Table I.

x (km/h)	10	15	30	40	50	60	70	80	90	100
y (m)	4	7	12	18	25	34	43	54	66	80

The function model in this question is known. You can find the simulation function based on the known data, and then verify which function is better based on the error between the actual value and the observed value.

Using this kind of assignment form, not only can let students feel the charm of mathematics in their own experience, stimulate their interest in learning, but also can strengthen their understanding and mastery of the knowledge they have learned, so that when students face practical problems, they can actively try to use the mathematical knowledge and methods they have learned to find strategies to solve problems, and improve their consciousness of mathematics application and experience mathematics in the process of cooperative learning with their classmates Widely used in life.

D. *Design Layered Homework and Cultivate a Sense of Mathematical Application*

Hierarchical homework design refers to teachers 'different level of targeted homework design and layout based on full consideration of students' personality, ability, and basic differences. Layered homework can be divided into three gradients: first, design simple, imitative questions that consolidate the basic knowledge for all students, especially those with weak foundations; The second gradient: design some comprehensive, technical problems, can improve the ability of students, for most of the students with moderate academic performance; The third gradient: design some difficult and innovative problems, which can strengthen the knowledge [7]. This is for students with good academic performance in the class [8]. Layered homework is an effective way to consolidate students' learning achievements and improve teaching quality. It can make every student have a sense of joy and achievement in learning and a sense of application of mathematics in learning. Therefore, it is necessary to apply the layered assignment design to mathematics teaching. For example, after learning "finding the approximate solution of the equation by dichotomy", the teacher can design the following assignment questions:

(i) Among the following functions, the zero point approximation that cannot be obtained by dichotomy is ( ).

A. $f(x) = 3x - 1$

B. $f(x) = x^3$

C. $f(x) = |x|$

D. $f(x) = 1n\,x$

(ii) The root of the equation $x^3 - 2x^2 + 3x - 6 = 0$ in the interval [-2, 4] must be ( ).

A. Within (-2, 1)

B. Within $(\frac{5}{2}, 4)$

C. Within $(1, \frac{7}{4})$

D. Within $(\frac{7}{4}, \frac{5}{2})$

(iii) It is known that the image of the quadratic function $f(x) = x^2 - x - 6$ on the interval [1, 4] is a continuous curve, and $f(1) = -6 < 0, f(4) = -6 > 0$. According to the existence theorem of the zero point, we can know that the function has zero point in [1, 4]. When we use the dichotomy method to solve the problem, if we take the midpoint a of (1, 4), then $f(a) =$ ( ).

(iv) Among the 26 new gold coins, there is a fake one (of smaller quality) with the same appearance as the real one. Now there is only one balance. The idea of dichotomy is used to find the counterfeit coin by calling it ( ) times at most.

(v) An equation has an irrational root in the interval D = (2, 4). If you use the dichotomy method to find the approximate value of this root, if you want the accuracy of the obtained approximate value to reach 0.1, you should divide the interval D equally at least ( ).

(vi) At 12:40 on January 5, 2020, Beijing time, a magnitude 5.5 earthquake struck Mexico with a focal depth of 10 kilometers. After the earthquake, residents' lives were difficult. It is known that the telephone line from A to B is faulty (assuming there is only one fault). This is a 10km long line with a utility pole every 50m. How to find out the fault quickly?

(vii) The school invited 30 carpenters to make 200 chairs and 100 desks. It is known that the ratio of working hours for making a desk to a chair is 10: 7. Q: How can 30 carpenters work in groups (a group of desks and a chair) to complete the task.

There are six questions, of which the first four are designed for all students and the first six are for students with moderate academic performance. Students with a good foundation and strong learning ability should complete all the homework. The use of this form of assignment can consolidate the basic knowledge for all students, and improve students' consciousness and ability in mathematical application according to different levels of students, so that all students can make certain progress on their own basis.

E. *Designing Self-selected Homework to Cultivate Consciousness of Mathematical Application*

Different students should develop differently in the course of mathematics learning. The self-selected assignment mode is an assignment mode designed according to each student's different personality, cognitive ability and learning ability. The design of self-selection homework requires the teacher to know each student, before or after teaching a class, according to the same homework content design into different homework content and presentation. Self-selection homework can be independently selected based on their own interests and knowledge mastery, which is open and expandable. Effectively designing self-selected homework can cultivate

students' mathematical application consciousness and help each student to make progress and gain something. For example, after learning the class "function model and its application", teachers can design and assign optional homework to students based on the content of this class. Students can choose a problem they are interested in to study from the following four kinds of homework.

Homework i: please sort out and summarize the characteristics of the four functional models learned in class and the ideas of solving practical problems. Choose one of the four function models to solve the problem.

Homework ii: please share the characteristics of the four functional models and the ideas of solving practical problems with the team members. Choose one of the four functional models to solve the problem.

Homework iii: after you have consolidated your knowledge in class, please choose one of the four function models to solve. And read relevant materials to share the content of this lesson with the group members.

Homework iv: please choose one of the four function models and solve it. Then choose one to challenge with other students and sort it out.

Using this form of assignment, the teacher proposes to all students the same core knowledge of mathematical application problems as learning goals, designs and arranges different homework, and the students choose homework that meet their own abilities and interests, so that the common and personal goals of student learning This has been achieved, and allows students to fully appreciate the extensive application of mathematics in real life, and gradually increase their consciousness of mathematical application.

V. CONCLUSION

To sum up, this paper briefly analyzes the mathematics application consciousness and personalized homework, lists several types of high school mathematics personalized homework, and studies the cultivation strategy of Chinese high school students' mathematics application consciousness based on personalized homework. However, it is still necessary to continue to study and practice the types of homework in the strategy of cultivating the application awareness of personalized homework for senior high school students. In short, personalized homework plays an important role in cultivating students' consciousness of mathematical application. At the same time, as a teacher, we should also improve our self-cultivation, pay attention to the development of students' personality, design effective and favorite personalized homework for students, improve students' consciousness of mathematics application, and make different students get different development.

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