

# How to Cultivate Students' Innovative Thinking in Mathematics Teaching in Senior High School in the New Period

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**Abstract:** In the relevant standards of mathematics teaching all over the world in the new period, it is clearly pointed out that cultivating students' innovative thinking is one of the main goals, and at the same time, mathematics subjects are mostly used in the research of quantity, structure, space and information. there is also a high standard for innovative thinking. In order to effectively help the majority of high school students to improve their ability of reasoning and deduction and solving practical problems in mathematics learning, it is necessary to take the cultivation of innovative thinking as an important foundation. Based on the above background and combining with the reality, the article first analyzes the definition and connotation of innovative thinking and the purpose of cultivating students' innovative thinking, and then points out the current situation of mathematics classroom teaching in senior high school and puts forward the shortcomings of teaching mode. Finally, it focuses on the feasible strategy of cultivating students' innovative thinking in high school mathematics, in order to provide a reliable reference for high school teaching. The discussion is as follows.

**Keywords:** High School Mathematics; Teaching Strategies; Students; Innovative Thinking

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## Introduction

Mathematics education is not only a basic discipline, but also a course of great significance to the future development direction of our country. The mathematical knowledge in senior high school is more abstract and pays more attention to the reasoning logic of knowledge, so it is more difficult for students to learn. Teachers should guide students to think and deeply understand the connotation of mathematical knowledge while solving mathematical problems. Nowadays, in the mathematics teaching of senior high school under the new curriculum reform, more and more attention has been paid to the cultivation of students' innovative thinking. Innovative thinking should be the basic quality of students, and as an important part of curriculum education, innovative thinking can not only enhance the interest of senior high school students in mathematics, let students actively participate in the classroom, but also lay the foundation for the study of other disciplines. and then promote its all-round development.

### 1. The definition and connotation of innovative thinking.

Innovative thinking refers to the use of intuition, conjecture, reasoning and other ways to understand the nature of things in thinking activities. In short, it is the process in which the subject solves the problem in a more novel way. Innovative thinking breaks through the traditional mode of thinking framework, with a more unique vision to explore problems, in order to obtain extraordinary measures, and finally form a unique thinking results <sup>[1]</sup>. Anyone has the characteristics of innovation, and the thinking ability can be formed after integration. Innovative thinking is based on people's knowledge accumulation and comprehensive quality. It has the following characteristics: First, initiative. Initiative means that people accomplish something actively and spontaneously under the drive of consciousness. Students' active practice can promote thinking innovation to a great extent. Second, regularity. When analyzing problems, students should not only pay attention to the problem itself, but should have the overall concept, and learn to combine relevant similar problems when thinking about problems, so as to find out the common ground of different problems and merge them. Finally, the innovative development of the way of thinking can also improve the efficiency of problem solving. Third, divergence. When cultivating innovative thinking, we can comprehensively consider the relevant points of an element, learn to think about the causality of different elements, and then expand it to achieve analogy and divergent thinking, so as to achieve the

integration of various ideas to draw a conclusion.

## **2. The purpose of cultivating students' innovative thinking.**

The so-called innovation is to look at events from a new perspective and seek more new ways to solve problems. The use of innovation can expand people's thinking and cognition, and thus obtain more new results, which belongs to a wide range of valuable thinking activities <sup>[2]</sup>. For the students themselves, now in the information age, various industries are developing rapidly, and the market competition is particularly fierce. If after learning knowledge can not be combined with innovative application, but can only carry out repetitive, mechanical work, then it is doomed to be eliminated by the times. At the same time, some surveys show that people who are good at innovation are often widely welcomed and are the mainstay of the future development of society; and from a macro point of view, for countries and nations, innovative spirit and innovative ability are the driving force for their development. it's also an important cornerstone. In order to make long-term progress, different subjects need a steady stream of innovative vitality to promote. Mathematics Curriculum Standard puts forward new requirements for the cultivation of students' innovative thinking, which aims to stimulate students' innovative consciousness and ability through effective education in mathematics and other disciplines. In mathematics teaching in senior high school, students' learning should not pay attention to the surface of theoretical knowledge, but should deeply tap students' potential and attach importance to the cultivation of students' ability, among which "thinking ability" occupies the first place in many abilities. How to cultivate students' innovative thinking scientifically is also a complex problem faced by educators at present. under the guidance of the goal of cultivating core literacy, teaching should carry out reform and abandon the previous mode of only paying attention to the explanation of book knowledge. instead, we should put the cultivation of innovative thinking and innovative ability in the forefront, let students learn and explore independently, think deeply and from many angles, and develop good learning habits. And can also improve the ability to use all kinds of mathematical thinking methods.

## **3. The present situation of mathematics classroom teaching in senior high school**

The survey shows that the current situation and problems in mathematics teaching in senior high school are mainly highlighted in three parts: teaching mode, teaching resources and teaching level. First, the teaching mode is single. High school mathematics knowledge has a certain degree of difficulty, and some high school mathematics teaching work still adopts the traditional mode, and teachers occupy the main position of teaching, and even adopt "instillation" and "cramming" education methods. letting students passively accept raw and difficult mathematical knowledge will not only dampen students' enthusiasm, but also not conducive to their imagination, hinder the improvement of innovative ability, and the quality of teaching is not good <sup>[3]</sup>. Second, the shortage of teaching resources. The teaching resources that can be adopted in some senior high school teaching work are limited, and mathematics teachers mostly use mathematics textbooks or designated teaching materials for teaching. At the same time, under the influence of the concept of examination-oriented education, some students form the habit of rote memorization. it is impossible to have an in-depth understanding of the connotation of mathematical knowledge, and it is even more difficult to draw lessons from others. In this case, it is even more empty talk to help students build up a sense of innovation. Third, the teaching level is limited. The teaching methods adopted by some mathematics teachers are simple, mostly expounding the theoretical concepts of formulas in textbooks, but not better combining students' real life, resulting in the separation of knowledge points and students' life. It is difficult for students to apply what they have learned to all kinds of problems in life, which will certainly affect the quality of mathematics teaching.

## **4. The feasible strategy of cultivating students' innovative thinking in mathematics teaching in senior high school.**

### **4.1 Change teaching methods and stimulate innovative thinking.**

Teaching method is not only the soul of improving students' mathematics achievement, but also the key means of cultivating students' innovative thinking in mathematics. Before formulating teaching methods, high school mathematics teachers should take into account the physiological and psychological characteristics of students at this stage, so as to

develop more targeted methods to help students understand mathematical knowledge points. As mentioned above, a single teaching method will limit the development of students' thinking, so teachers should use it to break through the constraints of traditional models, change teaching strategies and analyze knowledge points in a more novel way. It can not only stimulate students' interest, but also help them master knowledge points and achieve ideal teaching results [4]. For example, when teaching the relevant knowledge points about "number series", because the content of this chapter belongs to new knowledge and is relatively abstract, it can be analyzed with examples in teaching to help students associate and understand. It can explain to the students the stories about the mathematicians of the Pythagorean school in ancient Greece and draw out the knowledge points with novel stories. The teacher proposed: "mathematicians use pebbles to represent different numbers on the beach. After research, they think that numbers such as 1, 3, 6 and 10 can be expressed as triangles, while 1, 4, 9 and 16 can be expressed as squares." so it is called triangle number and square number respectively, or "Hilpinski triangle" is used to introduce teaching content to guide students to observe and analyze the sequence requirements of the series. And use their own language to define and describe first, so that students can gradually enhance their innovative thinking in novel teaching methods in order to achieve the teaching goal.

## **4.2 To create a good atmosphere and cultivate innovative thinking.**

Students' learning will be affected by many factors, among which the teaching atmosphere and environment are also important factors. If the teaching atmosphere is not good, it will reduce students' interest in learning and lead to low efficiency. Creating a good teaching atmosphere is an important basis for teachers to carry out teaching activities. Mathematics teachers should also make clear the importance of teaching environment and regard it as one of the important items when designing courses. Teachers can adopt a straightforward narrative method as an introduction to classroom teaching, or use questions with questions that can stimulate students' curiosity as opening remarks, all in order to make teaching have a more colorful beginning. directly and effectively render students' psychology. For example, when teaching "reasoning and proof", teachers can explain the famous mathematical stories and the reasons for the naming of classical inequalities, so as to create an atmosphere for students to explore actively. When students have some knowledge and then in-depth study, can significantly improve the level of problem-solving.

In this process, teachers should establish advanced ideas, grasp students' psychological demands, and harmonize the relationship between teachers and students. For example, when teaching knowledge points such as "power function", we can create an atmosphere with the help of multimedia and other equipment. For example, when playing a video, Xiao Li buys a total of  $X$  kg of fruit at 3 yuan per kilogram, so there is a connection between the amount of money ( $Y$ ) he needs to pay and the amount of fruit he buys. From the summary, we can know that  $Y$  is a function of  $X$ , and for example, playing a video of Xiao Wang cycling, Xiao Wang cycled forward  $X$  meters in  $S$  seconds. Ask him what is the functional relationship between the speed of his bike and the time. The creation of such a teaching environment is conducive to making students think and innovate in a vivid atmosphere.

## **4.3 Exercise innovative thinking in combination with creative training**

In teaching work, we can play the role of training students' thinking with the help of creative training, which can be implemented from three aspects: first, mathematics teachers should stimulate students' thinking by creating situations. Mathematicians point out that it is necessary to stimulate students' curiosity and creativity through the selection and arrangement of questions. The problem is known as the "heart" in the field of mathematics, which is closely connected with students' innovative thinking. When teaching, teachers should start from the students' real life, let the mathematical knowledge points have a connection with their life, and guide the students to take the initiative to think and explore, so as to form mathematical skills and diverge thinking. Secondly, it is necessary to carry out the combination of numbers and figures in order to cultivate students' imagination.

Mathematician Hua Luogeng once pointed out the concept of "the combination of number and shape is good in all ways", thinking that the absence of number is not intuitive enough, and the fusion between the two can exert the greatest effect [5].

There are many knowledge and problems about "the combination of numbers and figures" in the mathematics curriculum of senior high school, which can make students associate and make the problems easier to solve. For example,

when students are seeking the number of solutions to the equation, the mathematics teacher can guide the students to make functions and images, use the number of intersection points to get the answer more intuitively, exercise the students' innovative thinking ability, and make them solve the problem in other ways. Finally, the methods of analysis and analogy advocate association. Analogy and association are closely related. Through association, students can find out the rules from what they have learned in the past, which can be used as a reference to find ways to solve the current problems, such as teaching "number series" and other chapters. teachers can make full use of analogy, analysis and association to let students explore and summarize independently and correct them appropriately.

## **Conclusion**

To sum up, innovation is an immutable key word in national and national development. Countries that lack innovative consciousness can not talk about progress, and people who lack innovative consciousness are also difficult to achieve longer-term development. The outline of the National medium-and long-term Education Reform and Development Plan points out the ideological principles such as "people-oriented, reform and innovation", and emphasizes the need to give full play to students' subjective initiative in order to cultivate more top-notch innovative talents. Today, the 21st century is a century of innovation, the cultivation of innovative talents has long been included in the major direction of education by colleges and universities, and the key to cultivating such talents is to cultivate innovative thinking. This time, through the background analysis of mathematics teaching in senior high school, three major strategies are summarized, namely, changing teaching methods to stimulate innovative thinking, creating a good atmosphere to cultivate innovative thinking, combined with creative training to train innovative thinking.

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