

# THE APPLICATION OF HEURISTIC TEACHING IN JUNIOR MIDDLE SCHOOL MATHEMATICS CLASSROOM TEACHING

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## ABSTRACT

Heuristic teaching is not a fabricated product, but derived from east and west and after one thousand verified the effective teaching methods, heuristic teaching in make up the defects of traditional teaching, or solve the limitations of junior middle school mathematics classroom teaching situation, even for students' future learning and development is of great significance. This paper first briefly illustrates the background of heuristic teaching, purpose, meaning and present situation, fully define the concept of heuristic teaching, analyzes the factors affecting the heuristic teaching, and then discusses the mathematics class, how the class and after class teachers apply heuristic teaching method, finally expounds the heuristic teaching in the middle school mathematics classroom teaching application of three advantages, this article to the heuristic teaching in junior middle school mathematics classroom teaching application to explore, deepen the understanding of the junior middle school mathematics teaching mode.

**Keywords:** Heuristic teaching; junior middle school mathematics; classroom teaching; heuristic teaching application.

## 1 INTRODUCTION

Since the 21st century, the new era of information technology development makes the teaching quality and teaching quality improved, the new curriculum reform advocates all-round development of quality education, junior high school mathematics classroom teaching application heuristic teaching is the focus of mathematics teaching, very research significance, now I explore heuristic teaching in junior middle school mathematics classroom teaching.

### 1.1 Research Background

Until the 21st century, heuristic educational ideas still have inexhaustible power. The German educator Distohui once said: "education is guidance". Many education sages also realize the importance of heuristic teaching in education, and after thousands of years, "heuristic teaching" enduring, fit each era of education characteristics, coruscate update vitality in the field of education, is to cultivate students 'innovation ability, thinking ability, open the students' mind, expand students' vision of the most direct and effective teaching method. Heuristic teaching can make up for the defects of traditional junior middle school mathematics classroom teaching, can solve the limitations of junior middle school mathematics classroom teaching, and even for students' future learning and development are all have great significance.

### 1.2 Study Purpose

In junior middle school mathematics classroom teaching use of heuristic teaching, can solve the current junior middle school mathematics education method is still traditional problem, also can maximize the students 'talent potential, finally realized through the application of heuristic teaching in junior middle school mathematics classroom teaching to promote the development of students' innovative thinking, stimulate students 'learning intrinsic motivation, cultivate

students' divergent thinking, meet the students learn diversified teaching purpose.

### **1.3 Study significance**

The new curriculum reform advocates the comprehensive development of quality education and training people with all-round development. In order to further implement the spirit of the new curriculum reform, teachers should change teaching ideas, improve teaching methods and update teaching content. Heuristic teaching truly embodies the educational concept of "student-centered", which is of great significance for students' future learning and development.

#### **1.3.1 Theoretical Significance**

First, the research of heuristic teaching can enrich the educational theory system, and is also conducive to the development of mathematics teaching methods in junior middle school.

Second, heuristic teaching has improved the teaching quality and teaching quality in the new era, which can promote students 'all-round development and personality development, practice the student view of "people-oriented" and "student-oriented development", and at the same time cultivate students' innovative spirit and practical ability.

Thirdly, the research on the application of heuristic teaching in junior middle school mathematics classroom teaching is in line with the educational spirit of the new curriculum reform, and its research content is of great significance for the reform, innovation and development of junior middle school mathematics classroom teaching, and promotes the combination of classroom teaching theory and practice.

#### **1.3.2 Practical Significance**

First, junior high school students are in the critical period of psychological, physiological and thinking development, and there are differences among students, so to do a good job in education, the most important thing for teachers is to teach students learning methods, so that students can learn independently, and teachers should teach students in accordance with their aptitude, which depends on heuristic teaching.

Second, mathematics discipline itself has a strong logic, and junior high school mathematics is a science in real life, logic, complexity, abstract, hierarchical, junior high school mathematics is not simple concept accumulation, also not text aggregation and deconstruction, but students cannot understand or through the previous experience of cognitive mathematical knowledge, and heuristic teaching is the junior middle school students innovation ability the most direct and effective teaching method, to cultivate students 'self-study ability, fully mobilize students' learning creativity, stimulate students' learning initiative, enthusiasm.

Third, heuristic teaching advocates two-way communication between teachers and students, not only teachers can conduct timely guidance and inspiration, but also can let students learn, learn to achieve the effect of drawing inferences from one example. The real purpose of heuristic teaching is to enable students to use the existing knowledge to observe, compare, practice and summarize in the background materials, so as to establish their own mathematical system and form their own mathematical thinking. The use of heuristic teaching in junior middle school mathematics classroom teaching can give better play to the potential of students in learning mathematics, achieve the teaching purpose of improving students' innovative thinking through heuristic teaching, and also better realize the teaching goal of "student-centered".

#### 1.4 Study status

"Heuristic teaching" multiplied for thousands of years, enduring, heuristic teaching is a kind of outstanding education ideas and methods, less in the ancient Chinese and western culture exchange, Chinese and western education communication difficult stage, but Chinese and foreign educators after long-term education practice, through the difficult exploration of education thought and theory, on the heuristic teaching, attaches great importance to heuristic teaching, until today, heuristic still has many teaching scholars.

##### 1.4.1 Status of domestic research

The source of "heuristic teaching" can be traced back to the Spring and Autumn Period of ancient China, the education sage Confucius advocated "not angry, not delicate, not a corner of the corner, no longer." It is the earliest enlightening educational thought in the world. Zhu Xi, the famous educator in the Southern Song Dynasty, formed a theoretical and systematic heuristic teaching thought based on Neo-Confucianism thought in his forty educational practice. Today, its heuristic education thought still plays an important role. CAI Yuanpei, president of Peking University, proposed that "we should arouse students' interest in reading". Since ancient times, China's educational problems have been highly valued. At the same time, what educational methods are used to educate students are also the focus of educators and teachers. Many famous educational scholars actively advocate the use of heuristic teaching in practical teaching. Since the new century, basic education has changed, the specific education goal has two aspects about heuristic teaching, on the one hand, change the curriculum implementation process too much emphasis on rote, the present situation of learning, advocating students actively participate in learning in the process, on the other hand is to change the course too much attention to knowledge, emphasize students form active learning attitude, let the students work hard, willing to explore, cultivate students' four base four can.

##### 1.4.2 Status of foreign research

In the West, Socrates was the first to put forward heuristic teaching ideas. He believed that learning knowledge was like a midwife delivering a child, and compared the teacher to a "midwife of knowledge". Later, some foreign educational theories are also enriching the heuristic teaching. For example, Bruner's "discovery method" and Osuber's meaningful theory of accepting learning are all very representative heuristic teaching concepts. In recent years, the combination of theory and practice of heuristic teaching has been gradually increased.

Although the development of heuristic teaching in modern theory and application is relatively mature, there are still some problems. With the continuous development of the society, countless educational scholars express their views and constantly enrich the relevant educational concepts.

#### 1.5 Concept definition

"Heuristic teaching" refers to in the process of education teaching, teachers should according to the teaching actual situation and students learning objective law, using a variety of education teaching methods, everything from the reality of students, to inspire students 'thinking as the core, fully mobilize students' learning creativity, enthusiasm and initiative, to enable students to actively to learn a kind of teaching method. Junior high school students are in the critical period of the development of adolescent physical psychology and thinking, and junior high school students have make public personality and active thinking, coupled with junior middle school mathematics curriculum compared with elementary school mathematics itself is more logical, more difficult to understand the unique nature, these determine the "heuristic teaching" must become junior middle school mathematics classroom teaching "mentor", so the heuristic

teaching in junior middle school mathematics classroom teaching application is particularly important.

## **2 Factors that influence heuristic teaching**

### **2.1 cramming teaching is common**

In the actual teaching, many junior high school mathematics teachers use injection teaching in ordinary teaching, instill knowledge machinery to students, leading students to carry out the tactics of questions, no matter whether students can understand the knowledge, regardless of what degree students understand, it is very conducive to the development of students' thinking and logic. The heuristic teaching is often carried out in the open class, is with the color of performance, the inspiration is often not deep, superficial, not really inspired students.

### **2.2 Wrong understanding of the enlightening connotation**

Because teachers lack of understanding of teaching methods, so in teaching, can't really understand the connotation of heuristic teaching, simply think questions, speak less practice is heuristic teaching, but teachers' behavior cannot mobilize students' creativity and enthusiasm of learning, not stimulate students' interest in mathematics, also can't establish students' confidence in mathematics, so that although using heuristic teaching in class but often "qi" and not hair, affect the teaching effect.

### **2.3 The key teaching points are not prominent**

The materials prepared by teachers before class and the problem situation created are uncertain, which does not necessarily achieve the effect of inspiring students, and directly lead to the inconsistency of teaching content. In the classroom, if the teaching objectives are not clear, the teaching key and difficult points are not prominent, heuristic is difficult to carry out teaching. When students have independent discussion, it cannot be guaranteed that all students will concentrate on thinking. There may be students using discussion time to do things unrelated to the classroom. When students interact, students have a low sense of participation, and such discussion is also not effective.

### **2.4 Problem design repeat simplification**

In the inspiration to step by step, can not rush to achieve, after class, homework should also pay attention to the number of exercises, difficulty, exercises should be targeted. In actual teaching, improper grasp of students' interest, teachers' application of heuristic teaching is often mechanized, the questions raised by teachers are serious, the problem design is single, can not take into account the inherent differences between students' learning interest and personality, teachers directly give answers to questions, which is also not conducive to students' thinking.

## **3 The application of heuristic teaching in the classroom teaching of junior middle school mathematics**

The use of heuristic teaching strategies in junior middle school mathematics teaching can make students better understand the generation and development process of knowledge. In actual classroom teaching, heuristic teaching can be used as a teaching idea to guide the whole education teaching process, and can be applied to the actual teaching process; teachers can use heuristic teaching to match other teaching activities, or can integrate into other teaching methods, teachers should master the connotation and extension of heuristic teaching, skillfully use of heuristic teaching methods, improve and perfect the teaching links, only in this way can ensure the effective degree of junior middle school mathematics classroom teaching, so as to promote the overall improvement of students' mathematical literacy.

### 3.1 Apply heuristic teaching before class

As the name suggests, heuristic teaching is that teachers should think about students in the process of mathematics classroom teaching, so it is necessary for teachers to create a certain problem situation, stimulate students to be active creativity in learning mathematics, so that students can be interested in mathematical problems. The problem situation is not temporarily created by the teacher in class, but based on the understanding of the textbooks and students, after a period of lesson preparation. For example, in the class of teaching "positive and negative numbers", teachers can prepare to pass "In one year, China's peanut output increased by 2.8% compared with the previous year, and the rapeseed output increased by  $-1.7\%$  over the previous year. What does 'growth 2.8%' mean here? What does 'growth  $-1.7\%$ ' mean?" This problem to introduce the concept of positive and negative numbers, After guiding the students to complete the concept of "positive and negative numbers", the teacher should prepare to guide the students to analyze the examples to deepen their understanding of the concept and write it out on the blackboard " $-5$ ,  $5.8$ ,  $0$ ,  $2013\pi$ " and so on. Ask one student to classify the numbers, and guide the other students to analyze whether the student's classification is accurate. Teachers and students explore "Within a month, Xiao Ming weight gain  $2kg$ , Xiao Hua weight reduction  $1kg$ , Xiao Qiang weight without change, write their weight gain this month", induction can use positive and negative number respectively in the problem of the opposite meaning, let the students to example some real life examples of positive and negative numbers, and example the practical significance of the relevant data to explain. Teachers should make full preparation before class, create problem situation, flexibly use according to the specific situation of class, with the help of teachers and students interaction and inspire teaching to let students really participate in the classroom, do the master of mathematics class.

### 3.2 Apply heuristic teaching in the course

The essence of heuristic teaching is to correctly handle the relationship between "teaching" and "learning", so that students can act as the subject of learning and guide students to study independently. In the real curriculum introduction, teachers should combine the characteristics of students to create a teaching situation closely related to the content of teaching, so as to effectively mobilize students' initiative and creativity in learning. For example, in the professor "axis" this knowledge, teachers can let the students observe "thermometer", draw "in an east-west road, there is a bus station, bus station east  $3m$  and  $7.5m$  have a willow and a poplar, bus station west  $3m$  and  $4.8m$  place have a locust tree and a pole" to introduce the concept of "axis", through these two examples, students can more intuitively understand the main characteristics of the axis. Based on the understanding of the concept of the number axis, the teacher lets the students judge which of the given figures are the number axis, so as to have a deeper understanding of what is the number axis. As can be seen from this example, the introduction of curriculum in an appropriate way is a prerequisite for the better application of heuristic teaching in junior middle school mathematics classroom teaching.

Real-time questioning in the classroom is an important means of heuristic teaching, and the questions raised by teachers should be enlightening, guiding, difficult and appropriate. For example, when teaching the knowledge point of "secondary function", the teacher gives examples: (1) Zhaozhou bridge, the first stone arch bridge in China, has a history of 1400 years and is the second earliest and most complete preserved stone arch bridge in the world. Students observe the shape of the Zhaozhou Bridge. (2) The rainbow after the rain, the fountain in the park, the skipping rope will form a curve, students observe the curve. (3) Existing a  $12m$  long wire rope, with it around a rectangle, how to surround, to make the area of the rectangle? Xiao

Yu thinks that when the rectangle is square, it is the largest area. Does he make sense? Let the students work together in groups to explore the analytical function between  $y$  and  $x$ . The teacher asks the question:  $y = 3\pi x^2$  and  $y = 2(x+4)^2$  What are common with these two functions? What are the relationships between them and the functions they have learned before? The question raised by the teacher is enlightening, which is helpful for the students to use their brains, develop their thinking, and think deeply about the quadratic function. At the same time, in the classroom can not only teachers unilateral questions, students answer questions, and encourage students to bold put forward their own ideas, let students to explore, active ideas, students actively to the teacher, that students seriously thinking about the problem, it can make the students thinking development and progress.

For some simple and easy to understand course content suitable for independent inquiry, teachers can also organize students to have independent discussions, so that students can inspire each other. For example, when learning the "square root of arithmetic", the teacher does not teach directly, but lets the students discuss and explore independently. (1) Can two small squares with an area of  $1dm^2$  be used to make a large square with an area of  $2dm^2$ ? What is the side length of this big square? How long is the diagonal line of a small square? (2) Xiao Tian wanted to use a square paper piece of  $400cm^2$  to cut a  $300cm^2$  rectangular paper along the direction of the side so that its length-width ratio was  $3:2$ . She didn't know if she could cut it out. Do you think she can succeed? In the process of discussion, the teacher makes appropriate points to standardize the students' inquiry process, and the students can understand the meaning of the square root of arithmetic through the discussion of these problems. Then the teacher explains will make the students understand more thoroughly, but also highlight the main position of the students in the classroom. It is necessary to apply heuristic teaching to organize students to discuss and explore activities independently.

### 3.3 Apply heuristic teaching after class

Mathematics is the most basic subject. The ultimate goal of students to learn mathematics is to have a good ability to find and put forward problems, to analyze and think about problems, to solve problems and thinking logic, as well as the ability to connect mathematical knowledge with life and production, and to apply mathematics to solve practical problems. Students' understanding and application of the knowledge learned in class is a very important evaluation standard to judge the practical effect of heuristic teaching. Therefore, in the heuristic teaching mode, the completion of the classroom teaching is not the end of the teaching process, teachers after the explanation of the teaching content, should give students some related after-class practice tasks and homework, in order to further consolidate the students' understanding of knowledge, so as to effectively improve the students' mathematical learning ability. For example, (1) after explaining the "sum of the inner angles of the triangle", guide students to compare the idea of the inner angles of the triangle to independently explore the law of the inner angles of the polygon. (2) After learning "parallelogram", guide students to explore the properties of special parallelogram (rectangular, diamond, square) in homework. This can not only deepen students' understanding of the content taught in the class, but also understand the new content to be learned in advance. Through the training of these problems, it can correct students' learning ideas, but also arouse students' interest in solving problems, and students can exercise their ability to solve problems with their hands and brains. In the process of doing the problem, the students' habits and thinking will collide with the teacher. Therefore, math teachers should guide students to do questions with inquiry significance, in order to really inspire students to learn.

## 4 Advantages of the application of heuristic teaching in junior middle school mathematics classroom teaching

### 4.1 Inspire students' mathematical and logical thinking

Junior high school stage of mathematics knowledge more complicated, systematic, also increased some extensibility, expanding content, teachers flexible use of heuristic teaching to guide their own education process, can let students focus, excavate the potential of students' mathematics, improve students' mathematical accomplishment, can also develop the students' field of vision, make the students from different angles of mathematics this subject. In the traditional education mode, students are always passive learning, the teacher as the main body of the classroom, it is difficult to play to the principal position of students, will limit the students' thinking and vision, and heuristic teaching can let students do the master of the classroom, the teacher is the leading role, through a planned purpose guide, enable students from shallow, step by step learning mathematics knowledge.

### 4.2 Promote a psychologically compatible teacher-student relationship

In Han Yu's "Teacher Shuo", "A disciple does not have to be inferior to the teacher, and a teacher does not have to be superior to the disciple. He asks him in order and specializes in his skills." In the vast ocean of knowledge, students have more knowledge in some aspects than teachers, so it is very necessary to establish a teacher-student relationship with respect for teachers, equality, democracy and psychological compatibility. Heuristic teaching is an effective teaching method to establish a good teacher-student relationship. In the actual mathematics classroom, heuristic teaching is flexibly used, teachers guide students to express their ideas, teachers are the students' helpers, the imparting of knowledge. In the democratic and equal classroom atmosphere, students can express themselves more and promote students' learning.

### 4.3 Improve students' independent learning level

Heuristic teaching pay attention to the result of learning, pay more attention to the learning process of learning, is the junior middle school students autonomous learning ability the most direct and effective teaching method, students through the teacher to learn and then gain knowledge, in the process of learning is more rely on the students themselves to gain knowledge, explore the conclusion, let the students' ability really improve.

## 5 CONCLUSION

In a word, heuristic teaching has various forms, which is very suitable for application in junior middle school mathematics classroom teaching. Mathematics learning is not only the learning of mathematical knowledge, but also the learning of mathematical methods and mathematical thinking. Teachers should understand the heuristic teaching ideas, flexible use of heuristic teaching strategy, master the application of heuristic teaching method, rich teaching content, improve the teaching link, as the basis of education teaching, flexible application of heuristic teaching strategy, stimulate students' interest in learning and logical thinking, truly "have hair". Heuristic teaching has strong vitality and conforms to the educational concept of the new era. Junior middle school mathematics teachers should be skilled in applying heuristic teaching to improve the quality of education.

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