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Analysis of Heuristic Teaching in Middle School Mathematics Classroom Teaching

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***Abstract*—With the development of the times, China's education system is also undergoing changes. In order to cultivate talents that meet the requirements of the new era, China has carried out a new curriculum reform. The new curriculum standard emphasizes the need to pay attention to the learning process of students, which is consistent with the idea of heuristic teaching. Heuristic teaching can deeply and accurately grasp the essence of teaching, and adhering to "heuristic teaching" in the classroom can effectively improve the quality of teaching for teachers and improve the learning efficiency of students.**

In the classroom teaching of middle school mathematics, the reasonable use of heuristic teaching can effectively enhance students' learning interest, improve the quality of classroom teaching, and guide students to better develop. This article mainly explores the measures of implementing heuristic teaching in middle school mathematics classrooms.

***Index Terms*—heuristic teaching; Middle school mathematics classroom teaching; Logical thinking; New curriculum reform; Teaching feedback.**

I. Introduction

Throughout history, the idea of heuristic teaching has a long history. Under the influence of social progress and the development of the times, the idea of heuristic teaching has once again shone with youth. The idea of heuristic teaching emphasizes the student-centered and teacher led model, which can more effectively improve students' learning initiative, help them develop the habit of independent thinking, and has a solid theoretical foundation. Therefore, the idea of heuristic teaching has been widely recognized in the current society.

At present, many people at home and abroad have conducted systematic and profound research on the concept of heuristic teaching, but there is still a lack of relevant exploration on the practical application of heuristic teaching in middle school mathematics classrooms [1-5]. Mathematics classroom teaching is an extremely important part of middle school educational activities. In general, it is difficult for students to develop a strong interest in some obscure formulas, laws, principles, etc. If students lack interest in learning knowledge, their initiative and enthusiasm for learning will be significantly reduced. Obviously, such learning efficiency and teaching quality are very poor. Reasonable implementation of heuristic teaching in the classroom can effectively guide students to develop a strong interest in learning, which has a great impact on their learning efficiency and the quality of classroom teaching.

Therefore, this article takes the research and implementation of heuristic teaching in middle school mathematics classroom teaching as the research topic, explores the methods of conducting heuristic teaching in middle school classrooms, discusses practical cases of conducting heuristic teaching in middle school mathematics classrooms, further considers its feasibility, and finally reflects on the implementation of heuristic teaching in the classroom.

II. Educational Measures for Heuristic Teaching

A. Adequate lesson preparation before class to better carry out heuristic teaching

Heuristic teaching requires teachers to guide students at the right time, and how to seize the right opportunity is the top priority in heuristic teaching. I believe that in order to seize the right opportunity to guide students, the following two points need to be achieved.

(1) Research textbooks

Firstly, in the process of lesson preparation, special attention should be paid to the connection of knowledge. At the beginning of the classroom, how to naturally and not rigidly introduce the learned content requires teachers to form a knowledge network, have a full understanding of the knowledge content before and after learning, and lay the groundwork at appropriate opportunities. When introducing new knowledge, it is necessary to first review previous relevant knowledge, which is more conducive to students understanding the connections and differences between different things, and also to students forming a large knowledge system. Secondly, attention should be paid to the key and difficult points of knowledge. During the teaching process, when encountering obscure and abstract theories, students should be gradually guided to think independently, and the correct direction of thinking should be guided step by step to reveal the essence of knowledge. In the process of gradual guidance, students should be inspired to think and draw conclusions. Finally, attention should be paid to the connection between knowledge and reality. In the process of imparting knowledge, guiding students to connect knowledge with practice can more effectively guide them to master knowledge.

In summary, conducting heuristic teaching requires teachers to have a profound understanding of the textbook, form a knowledge framework, and cleverly design teaching

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methods, so that teachers can better play their leading role in the teaching process.

(2) Research students

In the teaching process, different educational methods should be used for different students. In class management, students should be fully understood and studied, and hierarchical education and comprehensive development education should be provided for students. In educational activities, different students have different needs for education, and not all students are suitable for a teaching plan. In this case, teachers should develop different education plans for different students, teaching according to their aptitude, which can guide students to have their own unique development in different aspects.

Therefore, a thorough understanding and research of students can more effectively tailor teaching to their aptitude and better align with the concept of universal education in quality education. It also greatly helps to unleash the subjectivity of students in teaching.

B. Integrating Problems into Teaching and Conducting Heuristic Teaching

Identifying, posing, analyzing, and solving problems are the basic processes of learning, and problems are an important element that runs through learning. Teachers need to start teaching from a problem perspective, with analyzing and solving problems as the main theme of teaching, highlighting the importance of problems. Heuristic teaching emphasizes the subject status of students, which is exactly the opposite of the previous teacher's one-on-one teaching. This one-on-one teaching will lead to students learning knowledge to death, making it difficult for them to understand with slight changes. Mathematics, as a very flexible subject, is obviously not an acceptable educational model. In the process of heuristic teaching, teachers can guide students to think by discovering problems, stimulate their exploratory spirit to a great extent by guiding them to ask questions, improve their thinking level by guiding them to analyze and solve problems, and cultivate their logical thinking ability. It can be seen that it is necessary for teachers to integrate problems into teaching for heuristic teaching, and problem oriented teaching can better improve the quality of education for teachers.

C. Conducting heuristic teaching through classroom questioning

In classroom teaching, questioning is essential. Questioning can throw questions to students and enable them to think independently. So, what is the significance of classroom questioning for heuristic teaching?

The previous text and the viewpoint put forward by Confucius in "The Analects of Confucius": "If one is not angry, not open, not express, and does not use the three corners to reflect, then there will be no more." It is precisely that questioning can effectively create a seemingly "angry" and "emotional" state for students. When students are in a state that seems to understand but not fully understood, teachers provide certain guidance. In this long-term environment, it can subtly enhance students' independent exploration and independent thinking abilities, and also lay a solid foundation for cultivating their logical thinking abilities in the later stage.

It can be seen that classroom questioning is of great significance for heuristic teaching, and setting classroom questioning reasonably in the classroom can more effectively carry out heuristic teaching.

D. Applying relevant teaching methods to carry out heuristic teaching

In the classroom, heuristic teaching should also pay attention to the use of reasonable teaching methods. The teaching methods used when facing different types of knowledge and different problem scenarios are different. So, what are the several teaching methods that can be used to carry out heuristic teaching?

(1) Point out clear goals and carry out heuristic teaching

Firstly, teachers should establish the training objectives and direction for students, deeply understand the key and difficult points in the classroom, and be familiar with the teaching outline, so as to have a clear understanding of how students can master various knowledge points. Only in this way, having clear goals can better stimulate students' initiative in learning.

(2) Reasonably arrange classroom questioning and carry out heuristic teaching

Teachers should use reasonable questioning at appropriate times to gradually guide students to reveal the essence and contradictions of the problem, stimulate students to think, explore and reflect, and finally obtain the answer or conclusion of the problem through students' thinking and exploration. By asking questions, students can effectively cultivate their logical thinking ability, stimulate their interest in learning, improve classroom learning efficiency, and lay a solid foundation for independent and lifelong learning.

(3) Creating Problem Scenarios for Effective Heuristic Teaching

In the teaching process, teachers should deal with certain problems and create reasonable scenarios based on the types of problems, which is beneficial for students to enter and understand the problems, and can make students feel empathetic. It is also a good way to stimulate students' interest in learning, and can more effectively carry out heuristic teaching.

(4) Using analogies and contrastive methods for heuristic teaching

As is well known, mathematics has a complete knowledge network, which is interconnected and contains many knowledge points that are both different and related. In the process of classroom teaching, teachers compare and analogize the learned content with the previously learned content, which is more helpful for students to understand new knowledge and review old knowledge. With the guidance of this, students can better form a mathematical knowledge system in their minds, which has a great impact on learning efficiency. For example, when discussing the topic of fractions, teachers can review the knowledge related to

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fractions they have learned in the past, which is more helpful for students to understand the knowledge points of fractions. At the same time, comparing fractions and fractions can clearly show their differences and connections, which is excellent for students to understand knowledge. [6] examined the development and refinement of possible mathematical models for the intellectual system of career guidance. Mathematical modeling of knowledge expression in the career guidance system, Combined method of eliminating uncertainties, Chris-Naylor method in the expert information system of career guidance, Shortliff and Buchanan model in the expert information system of career guidance and DempsterSchafer in the expert information system of career guidance method has been studied. [7] discussed that according to the observations in this paper, an existing mathematical model of banking capital dynamics should be tweaked. First-order ordinary differential equations with a "predator-pray" structure make up the model, and the indicators are competitive. Numerical realisations of the model are required to account for three distinct sets of initial parameter values. It is demonstrated that a wide range of banking capital dynamics can be produced by altering the starting parameters.

(5) Reasonably stimulating questions for heuristic teaching

In classroom teaching, teachers should intentionally guide students into questioning, have a pair of eyes to search for problems, guide students to think and doubt, and effectively cultivate students' thinking ability and independent problem-solving ability. Effectively connecting the key and difficult points of classroom knowledge, and improving students' logical thinking level.

In summary, when conducting heuristic teaching in the classroom, using reasonable teaching methods can more effectively achieve teaching objectives, improve teaching quality, and enhance student learning efficiency.

E. Timely teaching feedback to improve heuristic teaching

Teaching feedback is an extremely important part of the teaching process. Many teachers often attach too much importance to the research of topic teaching methods while neglecting the teaching feedback aspect in educational activities, resulting in incomplete deficiencies in the teaching process. Heuristic teaching requires more teaching feedback. When using heuristic teaching in middle school mathematics classroom teaching, timely teaching feedback should be provided to fully understand students' mastery of classroom knowledge, reflect, identify shortcomings in educational activities, and make appropriate adjustments to maximize the effectiveness of heuristic teaching. There are various forms of teaching feedback, including small quizzes in the classroom, grading homework, and distributing feedback questionnaires to students. Only with sufficient feedback can teachers understand the relevance of teaching, reflect, supplement, and modify, which can effectively improve teaching quality.

III. Outlook on Heuristic Teaching

The previous study conducted a series of studies on the implementation of heuristic teaching in middle school mathematics classrooms. After exploring, it was deeply felt that heuristic teaching plays a huge role in the development of education in China, and it was also found that adhering to the use of heuristic teaching in classroom teaching is a challenging task.

A. Rational cognition of heuristic teaching in middle school mathematics classrooms

Through a series of surveys and studies, it has been found that most mathematics teachers unanimously believe that conducting heuristic teaching in the classroom is necessary, and students also express a willingness to cooperate with the teacher's heuristic guidance in their feedback. The same situation was also reflected in the relevant heuristic teaching experiments, where there was no decrease in math scores in the class. On the contrary, many classes showed a certain upward trend in their grades. This indicates that it is necessary to carry out heuristic teaching, which can effectively improve the thinking level of students, enhance the teaching quality of teachers, and enhance the learning efficiency of students.

There are certain conditions for the development of heuristic teaching in middle school mathematics classrooms, which require teachers to have a vast knowledge system, as well as high levels of spiritual cooperation from students and a certain level of systematic understanding of mathematics. Heuristic teaching, on the other hand, does not have a substantial method, but rather a concept that needs to be integrated by teachers throughout the teaching process. Only by integrating the idea of heuristic teaching into the teaching process can we effectively carry out heuristic teaching in the classroom.

Teaching should pay more attention to reflection and attach importance to student feedback. At present, the implementation of heuristic teaching in the classroom is not perfect. Teachers need to always pay attention to feedback and continuously improve their heuristic ideas and methods. Only by gradually and continuously improving can more effective heuristic teaching be carried out.

B. Relevant issues to be overcome in carrying out heuristic teaching in middle school classrooms

In theory, heuristic teaching is an effective way to improve students' thinking level and achieve educational goals in China. However, in terms of implementation, there are still many difficulties to overcome in carrying out heuristic teaching in middle school classrooms.

(1) The spirit and thoughts of students must be consistent with the guidance direction of the teacher. If there is a situation where the teacher continuously guides in the classroom without any cooperation from the students, no matter how appropriate the timing and direction of the teacher's guidance are, it is difficult to carry out effective heuristic teaching. This issue reminds us not only to cultivate students' learning interest in the classroom, but also to pay attention to continuous guidance in life. The so-called "life is a larger classroom" generally means this.

(2) The idea of heuristic teaching is abstract, it is only a kind of thinking, a teaching mode, and has no fixed teaching methods or means. This leads to many teachers not finding the right way to inspire when conducting heuristic teaching,

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but only inspiring for the sake of inspiration, deviating from the original intention of heuristic teaching, which cannot effectively carry out heuristic teaching. In the face of this situation, teachers should find problems on their own, constantly reflect on their teaching, fully listen to student feedback, seriously study heuristic teaching ideas, and apply them to classroom teaching, constantly making progress in a cyclic manner.

The research on heuristic teaching is not yet complete, and there are still many areas that need to be studied and explored. We need to further explore and implement the relevant research on heuristic teaching.

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