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Discussion on the Skillful Use of Mind Maps in High School Mathematics Teaching

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Abstract: With the continuous development of China's education, the social requirements for high school teaching are constantly improving. The teaching of high school mathematics is a key point in the high school curriculum, but also a major difficulty. Due to the strong logic and abstraction of the content of high school mathematics, some students find it very difficult to learn. In order to solve this problem, high school mathematics teachers can make use of mind maps to teach, so that students can exercise their thinking ability, and realize the improvement of comprehensive ability in mathematics. This paper analyzes the shortcomings of high school mathematics classrooms under the background of new curriculum reform and discusses the significance and methods of applying mind maps in high school mathematics classrooms, so as to put forward reasonable suggestions for realizing the efficient teaching of high school mathematics.

Keywords: High school mathematics; Mind maps; Teaching strategy

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1. Introduction

With the deepening of the new curriculum reform, the traditional idea of teaching to the test is gradually being eliminated. The education philosophy of the new era believes that good education should be student-centered and focus on students' needs. Teachers make teaching plans and carry out teaching activities according to students' needs. In high school mathematics teaching, the reasonable use of mind maps can help students break through the bottleneck of math learning. Teachers can use mind maps to exercise students' logical thinking ability, so as to improve learning efficiency. The application of mind maps is not only a means for teachers to improve the quality of math teaching, but also an important embodiment of the development of quality education, which is of great significance to high school mathematics teaching.

2. The concept of mind map

In the 1960s, Tony Bozan put forward the concept of a "mind map." At first, people only used mind maps to take notes, and later it was widely used in various aspects because of its excellent summarizing ability. Foreign

research on the use of mind maps in education has matured, and it has been proved that mind maps can not only make teachers teach more efficiently but also greatly help students cultivate their logical thinking ability. In China, with the deepening of the new curriculum reform, society has put forward higher requirements for teachers' classroom teaching, and the traditional teaching methods can no longer keep up with the trend of the times, and it is difficult to meet the current teaching needs. In such a background, mind maps are gradually introduced into the classroom. Based on this, this paper analyzes the application of mind maps in high school mathematics teaching and explores the practical significance and application strategies of mind maps in high school mathematics teaching, so as to improve the quality of high school mathematics teaching [1].

3. Difficulties in high school mathematics teaching

3.1. Low degree of knowledge systematization

Compared with junior high school mathematics, high school mathematics is not only much more logical and complex, but the amount of knowledge has also increased dramatically. In front of the vast amount of obscure and difficult-to-understand mathematical knowledge, students still lack systematic knowledge acquired in the classroom. In the high school stage, time is tight and full of heavy tasks, and most teachers take the way of explaining the topic to deepen the students' impression of the knowledge points, and the abstract mathematical formulas are only for students to memorize without explaining their formation process. This lack of systematic teaching ignores the systematic correlation between mathematical knowledge, not only is it not conducive to students' understanding of knowledge and summarization, it is more difficult to stimulate students' enthusiasm for learning.

3.2. Weak self-directed learning ability of students

Mathematics in high school has strong requirements for students in terms of logical thinking ability. However, weak mathematical thinking has become a common problem for many high school students. Although the new curriculum reform puts forward to take students as the main body, under the pressure of the college entrance examination, the high school math classroom is still dominated by teachers. Most teachers use the "sea of problems tactics," to improve students' proficiency through a large number of problems; the explanation also mainly revolves around the difficult points and complex problems, neglecting the sorting and connection of knowledge. In the long run, students' thinking is prone to be fixed, they will be at a loss when there is a slight change in the type of problem, which is extremely unfavorable to the cultivation of students' divergent thinking [2].

3.3. Weak independent learning ability of students

Under the influence of traditional exam-oriented education, most teachers still regard improving students' test scores as the main goal of teaching. Under this opinion, teachers spend a lot of time on theory teaching and problem-solving, leaving little time for students to think independently and learn on their own, thus students' ability to learn independently is weak [3]. Before students fully digest the knowledge learned in the classroom, one test paper after another is already prepared. This teaching method ignores the penetration of mathematical thinking and the cultivation of students' independent learning ability, which has little effect on the improvement of learning efficiency. It can also easily lead to the decline of students' independent learning ability, mechanized listening to lectures and solving problems limit the students' thinking, so students' interest in learning cannot be improved, and even some students with a weak foundation cannot keep up with the progress of learning; problem-solving is too inefficient, and it is easy to resist the psychology of mathematics.

3.4. Poor interaction between teachers and students

The most common problem in high school math classrooms is that the classroom atmosphere is too dull. Many students usually have poor math scores and lack the confidence to answer questions actively. Some teachers focus on explaining the knowledge points and are not willing to spend class time on teacher-student interaction. Both teachers and students are the subjects of the classroom, and only by realizing the effective interaction between the two main subjects can we ensure the efficiency and completion of the lecture. If teachers unilaterally ignore the interactivity of the classroom, it is difficult for students to fully integrate into the classroom atmosphere. In particular, the content of mathematics is relatively dry, if the teacher does not pay attention to the classroom interaction between teachers and students and only carries out one-sided explanations, the students are prone to wander outside the classroom, resulting in a significant reduction in learning efficiency [4].

4. The application strategy of mind maps

4.1. Mind maps applied to teaching design

The design of teaching programs is the basis and fundamental to the implementation of teaching activities. Especially for mathematics subjects with fragmented teaching content, the design of teaching programs has a direct impact on classroom quality. However, many teachers design lesson plans based on their previous teaching experience and the core literacy of high school mathematics, ignoring the student's subjectivity and failing to consider the student's needs, resulting in the design of teaching programs that are detached from the student's needs and lack reasonableness, which seriously affects the quality of the classroom. To address this problem, teachers can flexibly use mind maps in the design of teaching programs, centered on the center of teaching activities, divided into three stages—before class, in class, and after class, so that the entire teaching program will be clear with the help of mind maps. Before class, teachers can design a pre-study guide in advance; in class, teachers can lead students to make mind maps by combining teaching content; and after class, they can reflect on the entire teaching process, summarize, and make targeted improvements [5].

4.2. Mind maps applied to pre-study learning

In the study of high school mathematics, pre-study is a more important part. Pre-study is an important method for students to independently construct a knowledge framework, and it can also help students improve their ability to explore. However, few students develop a scientific and reasonable pre-study program, they simply understand the knowledge points of the next class only after the completion of the daily task, which does not help much to improve learning efficiency. Students can use a mind map in the pre-study process to summarize the content. Through the enumeration of the mind map, students can learn in advance which knowledge points have been mastered and which knowledge points are still difficult to understand, so that they can be targeted to learn, build their own mathematical knowledge framework, improve their ability to explore and understand, strengthen their mathematical thinking, therefore, the comprehensive ability of mathematics has been comprehensively improved.

4.3. Mind maps applied to new lesson delivery

Under the requirements of the new curriculum reform, the subjective position of students has been emphasized repeatedly. In the teaching of new math classes, teachers can use mind maps to maximize the students' subjective initiative. In the traditional math classroom, teachers often follow the requirements of the syllabus to directly instill boring formulas, theorems, concepts, etc., and accumulate and consolidate knowledge through a large number of problems. In this mode, students' thinking is easily fixed, which is inconducive to

the cultivation of their radioactive thinking. In response to this phenomenon, teachers can make the original scattered mathematical knowledge systematically presented to the students through the enumeration of mind maps, so that students turn passive listening to lectures into active thinking according to the mind map, from shallow to deep, cultivate students' divergent thinking, exercise their logical thinking ability, and effectively enhance the learning effect of the classroom [6].

4.4. Mind maps applied to revision

Review is also an important part of high school math learning. Review can help students to check the gaps, make up for the deficiencies, and consolidate the knowledge they have already learned. However, most students tend to solve problems as a way of reviewing, paying too much attention to the exercises, which is not very helpful to the improvement of the comprehensive ability of mathematics. For after-school review, teachers can use mind maps as a way to summarize and sort out what has been learned and organically combine the scattered knowledge points so as to help students build a mathematical knowledge network. At the same time, through the construction of mind maps, students can strengthen the correlation between the knowledge points, better realize the application of knowledge, and achieve the effect of learning by example. Lastly, the theme of review can be centered on the review, putting forward a clearer review objective, which is more conducive to the refinement and supplementation of knowledge.

4.5. Mind maps applied to problem-solving

In high school mathematics, the exercises are the most important link, but also the main way to deepen and refine mathematical knowledge. However, in the training of math problems, many students face the situation of not being able to start and find the solution to the problem, and the deviation of thinking. The reason for this problem is that students have a weak grasp of knowledge and unclear solution ideas. In the traditional math exercise class, most of the teachers focus on explaining the wrong problems with low student interaction. In this mode, students' thinking ability is not exercised and they often only learn a type of problem, and they cannot find the solution when there is a slight change in the type of problem. Teachers should pay attention to students' solution ideas and analysis process in the problem-solving process and guide students to analyze according to the topic with the help of mind maps, consolidate and strengthen the relevant knowledge points, and realize the exercise of their mathematical thinking. Ultimately, the thinking network is constructed by the students to complete the strengthening of problem-solving thinking. Through the construction of the mind map, the problem-solving model based on mathematical knowledge can be formed to help students recognize the essence of the problem, thus improving the efficiency of problem-solving [7].

4.6. Mind maps applied to classroom notes

Classroom notes are a learning method that effectively deepens students' memory and improves learning efficiency. Especially for complex mathematical formulas and symbols, it is easy to forget them without classroom notes. However, in the traditional mathematics classroom, students basically only organize their classroom notes through the teacher's writing on the board, mechanical recording of the board not only wastes classroom time but also causes the loss of the process of thinking about the problem, resulting in the inability to improve classroom learning efficiency [8]. To solve this problem, teachers can guide students to organize their notes through the form of mind maps, with the help of multi-color graphics, lines, etc., to summarize the knowledge of the class and sort out the knowledge points to form a systematic network diagram. In this way, it not only saves time in class but also personalizes the classroom notes. Students can learn each knowledge point through the mind map notes, and its related knowledge points, exercises, and solutions are also presented at a

glance in front of the eyes. The application of mind maps in classroom notes can effectively improve the quality of students' notes, promote the dispersion of students' thinking, allow students to deepen their thinking while taking notes, and improve students' ability to learn independently [9].

5. Conclusion

In summary, as a thinking tool with strong inductive summarizing ability, mind maps can sort out fragmented mathematical knowledge and form a visual thinking network, which can help students understand and analyze mathematical knowledge, enhance the correlation between mathematical knowledge, and improve the efficiency of solving problems as well as the quality of classroom notes. Therefore, high school mathematics teachers should recognize the shortcomings of the current education model in the mathematics classroom, optimize classroom teaching according to the requirements of the new curriculum reform, synthesize the characteristics of the mind maps, and effectively use it in three stages of before class, in class, and after class, to maximize the value of mind maps and improve the effectiveness of mind maps in mathematics lectures.

Disclosure statement

The author declares no conflict of interest.

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