

Variant teaching of mathematics teaching under the background of double reduction

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Abstract: Since the new curriculum reform, although the mathematics classroom teaching has been improved, there is still a utilitarian, exam-oriented short-sighted phenomenon. In order to get high marks, we pursue the tactics of testing the sea, which brings a heavy burden to the students. Because of the characteristics of flexibility and richness, mathematics variant teaching is one of the effective ways to reduce the burden of students and implement the double reduction policy. Therefore, this paper will explain how to develop variable teaching under the background of double reduction from three perspectives of variable teaching objectives, variable teaching process and variable homework design.

Keywords: Double Minus; Variable Instruction; Variable Objectives; Variable Processes; Variable Assignments

1. Introduction

Since the new curriculum reform, although China's mathematics classroom teaching has been greatly improved, but the overall pattern of exam-oriented education and its negative nature not only has not changed in essence, but also in some aspects^[1]. For example: there is still a phenomenon of eager for quick success and instant benefits in mathematics teaching, the teaching arrangement of mathematics teachers is alienated by the test demand, leading to the formation of mathematics classroom from the students, teachers and students listen to the full classroom situation and the increasing amount of mathematics homework and so on. These phenomena subtly influence students' ideological cognition of learning, and make them have a utilitarian tendency to learning. In order to get high marks, most people pursue the standard answer, blindly brush, fall in the sea of questions and remedial classes and so on, so that students tired, affect the physical and mental development of students.

In July 2021, the General Offices of the CPC Central Committee and the State Council issued the Opinions on Further Reducing the Burden of homework and After-school Training for Students in Compulsory Education. The guideline clearly points out that to reduce the excessive homework burden and after-school training burden of students in compulsory education^[2], obviously the formulation of this policy is closely related to the current improper classroom teaching arrangements and other phenomena. With the Examination-oriented education of the single teaching goal and teaching process, teachers cannot arouse the enthusiasm of students, classroom prone to negative silence, form a negative classroom atmosphere, which reduces the teachers' teaching enthusiasm, and teaching enthusiasm will be difficult to stimulate the enthusiasm of students' learning, thus aggravating the vicious circle, lead to low efficiency of classroom teaching. On the one hand, in order to strengthen and consolidate students' memory and understanding of knowledge points, on the other hand, to prepare for the entrance examination, we need to assign more exercises and bring homework burden to students. Because of the characteristics of abstraction and complexity, this point is particularly obvious in the mathematics discipline. Thus, in order to reduce the burden of students and achieve the goal of improving quality and efficiency, the improvement of mathematics classroom teaching is urgent, and mathematics variant teaching has pointed out one of the effective directions for us.

2. Implications for Variable Teaching and Learning

2.1. Contribute to reducing the burden of homework on students

In order to carry out the double reduction policy and the fundamental task of cultivating people, it is necessary for teachers to optimize mathematics classroom teaching and carry out mathematics variant

teaching. Variable teaching from different angles of mathematics problems, different orientation, different levels of discussion and thinking, in the process of exploration, help students through thinking and two pulse, establish effective variant exploration system, show mathematical knowledge from the application of a series of process, consciously, purposefully guide the student from the nature of the "change" mining "constant", from the nature of the "constant" explore "change", make all knowledge achieve mastery through a comprehensive study, make thinking in the knowledge, fly smoothly^[3].

2.2. Facilitating the development of students' quality of thinking and the implementation of the core qualities of the Mathematics subject

Due to the existence of exam-oriented education, in order to seek high marks, classroom teaching is often filled with knowledge points and conclusions. Especially the math class is more obvious, such as: some math teacher's mantra, do not deduce to prove, we recite down can use it. Such classroom teaching makes students' learning stay in the memory, recitation, mechanical application and other shallow surface learning. In the short term, students' performance may be temporarily improved under the routine teaching training, but from the perspective of sustainable development, it will be rigid and solidify students' thinking, leading to the bad habit of not using their brains and not thinking. The formation of bad habits will further weaken the students' summary and reasoning ability. The lack of ability to be exercised and developed will not be conducive to students to cultivate the core qualities of mathematical subjects such as logical reasoning. This kind of shallow learning is obviously not conducive to the development of students, and variant teaching is one of the right ways to solve. This is a kind of teaching method to guide students to think deeply, raise questions, and enter into deep learning. It can enable students to dig out the essence from behind the problem, learn to examine the problem with the overall view, learn to find the connection and transfer of knowledge to promote understanding. To a certain extent, this reduces the possibility of excessive aggregation and solidification of thinking, thus improving the divergence of students' thinking. Through the variable teaching with hierarchical, slope, variable topic design, students can fly in the sky of thinking, such as: the human education version of junior high school mathematics textbooks to think about the small card, through this way to make students' thinking open, the importance and necessity of variable teaching. Finally, variable teaching can implement the cultivation and development of students' thinking quality by cultivating creative thinking. Since the teaching materials are indirect experience, the teachers need to play their precise control over the changes of the teaching objects, and carefully design the exploration activities that hide the discovery process. When learners meet difficulties in the process of experience and discovery, teachers give them advice to let them use the existing knowledge to explore, guess and conclude, which expand students' thinking and vision, develop students' mathematical core literacy.

3. Objectives of Variable Teaching and Learning

When it comes to variant teaching objectives, we should first understand the meaning of variant teaching. According to Zhang Lianzhou, "the variant teaching of mathematics is a teaching form in which it changes some connotations of the provided mathematical objects and the presentation forms of mathematical problems from multiple aspects through different angles, different sides and different backgrounds, so that the non-essential characteristics of mathematical content are invisible and the essential characteristics remain unchanged^[4]." So where does it come from and where does it go? The goal of variable teaching must be related to change, but we should not blindly emphasize change and ignore the same things. In the "change", find "unchange", teachers create new knowledge according to the trajectory and law of knowledge change, not only solve the immediate problems, but also take this as the carrier to master the thinking strategies and methods to solve a kind of problems, and develop the general concept of the discipline^[5]. In a word, the goal of variable teaching should be to go beyond the exam-oriented utilitarian short-sighted education under the long-term view, so as to achieve the goal of improving quality and efficiency.

4. Variable teaching process

4.1. Problem situation, introducing exploration

Mathematics teaching is the teaching of thinking gymnastics. In the teaching process, teachers should not only observe the change process of students' thinking, patiently use the variable teaching to guide and inspire students, but also pay attention to whether the design of the problem difficulty falls in the

development area of students. Teachers need to guide students to experience the inquiry process of finding problems to solving problems. To stimulate students' curiosity to learn mathematics, establish confidence in learning mathematics, and lay a good foundation for the following variant exploration, teachers create problem situations, bury thinking traps and provide scaffolding.

4.2. Reproducing variations and experiencing exploration

In variable teaching, teachers should pay attention to childish thinking, that is, on the one hand, let students experience the exploration process of knowledge, on the other hand, pay attention to emphasize the display of mathematical thinking process. For example, the concept requires the creation of the situation, provides the material, and reveals the formation process of the concept; and the theorem requires the simulation of the discovery process; the teaching of the examples and exercises requires exploring the variation, internalization the idea of solving the problem, deepening the exploration, and summarizing the sublimation^[6]. In other words, in the process of suggestions, discovery, experience, analogy and induction, teachers should attract students' attention to join these. In these processes, students lay basic knowledge, basic skills, basic mathematical ideas and accumulate personalized experience in mathematical activities. These help them to improve their ability to find, put forward, analyze and solve problems, develop their necessary character and key abilities, and truly implement the core quality of mathematics.

4.3. Participation of the main body, so that students can change

Intellectual factors and non-intellectual factors are the key factors affecting the quality of teaching. If the quality of teaching is qualified or even excellent, then the two are indispensable. Because these factors are inseparable from the participation of the subject, if students do not have good learning motivation, their cognition, attitude and emotion will be unable to integrate into teaching, so it is difficult to realize independent learning, and finally lead to bad teaching effects. Therefore, the importance of subject participation is self-evident, it can bring vitality to the classroom, so that students become the implementers and supervisors of their own learning, do the master of learning, rather than the slave of learning. If variant teaching only makes teachers "change", then classroom teaching is a lonely one-man show, boring. Therefore, while teachers should "change", they should pay more attention to leave students with "change" space. In addition to providing different angles and different aspects of the problem situation, constantly changing the form and content of the problems, and changing different solutions, teachers should also emphasize the subjectivity of students, pay attention to making the students free hands, ears, mouth, brain, liberate time, liberate space, make the students learn to change the condition or in different problem situation, find out the contact, thus put forward new problems. Let the students "change". This not only awakens the students' awareness of active participation, and it is conducive to mobilize students' thinking. A deep understanding of knowledge methods help them to truly understand the nature of these knowledge methods, instead of sticking them into questions without thinking, which helps to cultivate students' problem awareness, make the students have their own opinions on some mathematical problems and put up with new questions and ideas independently. It also helps to foster students' awareness of active application, enable students to associate with hidden clues to certain mathematical phenomena to facilitate problem solving^[7]. It makes the students' innovative consciousness be further awakened, create a democratic, relaxed, good and equal classroom atmosphere, and form a friendly, mutual assistance, inclusive and cooperative interpersonal relationship.

5. Variable homework design

For students, homework is one of the important magic weapons to consolidate knowledge and investigate their ability. For teachers, it is one of the ways to test students' mastery of knowledge points and adjust their teaching plans. Homework is conducive to promoting teachers' teaching and students' learning, which is one of the evaluation tools and plays an important role in the teaching process. However, in order to make students achieve the purpose of practice makes perfect, some teachers may be easy to lose discretion, did not grasp the degree leads to excessive homework, especially science such as math homework, there is no problem, more consideration is how much problem. This kind of blind practice of only advocating the quantity of practice without paying attention to the quality of practice often makes students fall into the tactics of setting questions, and have no time to think, do not really understand the true meaning of knowledge and the ability to master knowledge. In the end, it may backfire, most probably not practice makes perfect but practice makes stupid, practice makes boring.

Engels once said that mathematics is a science of studying the relationship between spatial form and quantity, which has a high degree of abstraction, strict logic and wide application. It plays a unique and irreplaceable role in the development of human rational thinking, scientific spirit and the development of individual intelligence^[8]. Therefore, under the background of double reduction, the rationality of mathematical homework design is more important. How to maximize the investigation of the essence of knowledge points within the reasonable range of the number of questions and implement the core quality of the subject? The author thinks that design variant operation is one of the ways.

5.1. For the type of class, the variant design

Before the variant homework design, we should first know what type of class homework, so as to facilitate the "remedy to the case". Mathematics class type generally includes concept class, formula class, exercise class and so on. Here is a corresponding example for reference.

There are no concept questions involved in the mathematics entrance examination, so the formation process of mathematical concepts is often ignored in teaching. It is often directly given first and then explained, but for the formation process of mathematical concepts, its connotation and extension of the disclosure process, is more important than the definition of mathematical concept itself. In the formation process of the concept, the variation can be used to guide students to actively participate in the formation process of the whole concept, which requires teachers to create problem situations, let students "discover" and "create", and cultivate students' ability of observation, analysis and summary^[9]. For example, solid geometry of high school mathematics about prism, straight prism, prism, pyramid, pyramid, platform and geometry related concepts looks more and miscellaneous. If you don't use variant teaching, a class is easy to produce confusion. If not use the concept variant topic consolidation, students' understanding of the concept is likely to stay on the superficial understanding. This may be led to concept of fuzzy concept of various geometry grasped into a mess, students are unable to learn deeply and implement the discipline core literacy. Therefore, for concepts like this, we can consider the use of concept discrimination group, such as: investigate the related concepts of prism:

- There are two planes parallel to each other, the rest of the planes are parallelogram geometry is prisms.(hold a part as the whole)

Answer: The geometry that satisfies such conditions may be a prism, or it may not be a prism.

- The side prisms perpendicular to the bottom surface are positive prisms.(put Zhang's hat on Li's head)

Answer: the prism perpendicular to the bottom is the straight prism rather than the prism, this problem put the concept of straight prism on the head of the prism, is easy for students to confuse.

- The bottom side is a positive polygonal prism is a positive prism.(interpret out of context)

Answer: Only adding a "straight" word in front of the prism is the concept of a positive prism.

5.2. Chain design, a question to check multiple knowledge points

In one question, multiple knowledge points should be designed to be related to each other, and the difficulty is step by step. At the same time, the core knowledge points and the related knowledge points are investigated, so that students can understand and master a kind of questions. This kind of chain design questions, because there is a certain difficulty can be selected for students to complete. Students can exchange their own views while discussing, and they can teach other students what they are good at. In the process of teaching, I not only let other students gain something, but also have a deeper understanding of this kind of knowledge points. Finally, we will think about the remaining difficult problems together and brainstorm them to form a good learning atmosphere, which is conducive to enhancing the interpersonal relationship between students.

5.3. Reflection after solving, so that students can independently change their formulas

Based on my own learning mathematics experience, when the specific mathematical problems were solved, the author and the students generally throw them aside, and not consciously to pick up the problem and reflect on the solution process. But relative to the teacher explain the solution after reflection, students' independent reflection on the development of students' ability is more valuable^{[10][11]}. According to the communication between Jiang Shoufu and Zhang Fei and the teachers participating in the training

of key high school mathematics teachers in Jiangsu Province, 97 effective copies were collected. The survey results showed that the proportion of students who always insisted on them and often required them to change their questions independently was 3.1% and 7.2% respectively^[12]. This shows the importance of students independent reflection for learning and self-reflection. The process is helpful for students to understand the knowledge, to master the method, to get better absorption internalization and better summary. On the other hand, it help to in-depth study method, cultivate advanced thinking, make students learn to transfer to other problems, so as to achieve the purpose of burden, play the role of quality and efficiency. Then it also reflects that teachers do not pay enough attention to students' reflection, which needs to be further strengthened. Therefore, the design of mathematical variation homework under the background of double reduction can consider adding post-solution reflection link. The post-reflection here not only refers to the post-reflection of teachers' variant teaching and variable homework design, but also allows students to reflect after solving problems, so that students can develop the habit of post-reflection. In the process of this practice, teachers not only need to improve their own awareness of post-solution reflection, but also have the consciousness of requiring students' independent reflection and independent transformation. In addition, teachers need to improve their professional quality, reflect on the variation methods, and tell students the reflection and variable methods in the homework comments. Due to the limitations of students' own knowledge and ability, they are highly likely to encounter bottlenecks and give up midway. So teachers should consciously and insist into the reflection and variation method in teaching, adhere to check the students' reflection and variable homework, and give corresponding guidance and help, help students, help students to establish the confidence of independent variation, cultivate the habit of independent variation, so that the students find the correlation between the topic, perceive the connection between knowledge, truly grasp the knowledge and methods. Through the reasonable question quantity and topic design, the students have mastered the knowledge and methods.

6. Conclusion

In order to cope with the challenge of double reduction policy, mathematics teachers can think and design teaching from three perspectives: variable teaching objectives, variable teaching process and variable homework design.

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