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The Application Strategies of Situational Introduction in Mathematics Teaching in Senior High Schools in China

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Abstract **– Appropriate problem situation setting is conducive to the smooth introduction of classroom teaching and follow-up teaching content. It is necessary to use situation introduction method in high school mathematics teaching. At present, situational introduction method has been widely used in Chinese senior high school mathematics classroom, but there are still some problems. Based on the analysis of the misunderstandings of situation setting in senior high school mathematics classes in China, this paper discusses the significance of applying situation introduction method in senior high school mathematics teaching, and finally puts forward the strategy of applying situation introduction method in senior high school mathematics classes, which can provide teaching reference for senior high school mathematics teachers.**

Keywords **– High School Mathematics, Situational Introduction, Application Strategies in China.**

I. INTRODUCTION

Situational teaching is a kind of teaching mode which takes situation as its operating mechanism. As a way of introducing mathematics lessons, situational introducing method refers to that in mathematics classroom. Teachers introduce or create a kind of vivid scene with certain emotional color which is consistent with the learning content purposefully, and let students stay in it, so as to arouse students' thirst for knowledge and emotional experience, so as to understand teaching for students. Content provides a framework and explores issues with emotion [1].

The idea of situational teaching can be traced back more than 300 years ago to Comenius' proposal that “everything should be put in front of the senses as far as possible”, advocating real experience and letting students live in vivid situations. Dewey also proposed that "education is life, education is growth, and education is the constant transformation of experience." He advocated learning experience in life, which coincides with the living situation. These ideas provide a theoretical basis for situational teaching [2]. In the 1970s, in China, Mr. Li Jilin pioneered "situational teaching", and her book "Situational Teaching Research" is the foundational work of the theoretical research of situational teaching in China [3][4].

In China, the research and application of situational teaching coincide with the concept of core mathematical literacy put forward by senior high school mathematics teaching in China. Especially in the pre-class lead-in link, the application of situational teaching can enhance students' learning experience, increase students' autonomous learning ability, and help to cultivate students' mathematical learning thinking, so it has made certain progress. However, there are still some misunderstandings in the introduction of practical teaching situations in Chinese senior high schools. Therefore, it is necessary to study the application strategies of situational introduction in Chinese senior high school mathematics teaching.

II. Misunderstandings in the Application of Situational Introduction in Mathematics Teaching in Senior High Schools in China

Before analyzing the teaching methods of situational introduction, this paper firstly discriminates the existing situational settings and clarifies the existing misunderstandings of situational introduction in high school mathematics classroom.

1. *Take a Long Time and Take up too Much Classroom Time*

Classroom introduction should follow the principle of "short and concise, connecting the preceding with the following" to lead to follow-up thinking and transition to new content of classroom learning. Teachers often use video, pictures and other forms to launch. In order to arouse interest, deliberately rendering and enlarging the scenario atmosphere leads to the situation unfolding taking up too much time of non-import link, and the proportion of import part is too large. When this happens, the subsequent teaching time is compressed, resulting in the following three situations:

(1) Catching up with the progress, the new teaching part passes by and the teaching is not specific.

(2) Missing links, such as practice links and summary links.

(3) Speed of lecturing is too fast.

In order to accomplish the classroom task, teachers will improve the speed of lecture, which is not conducive to students' understanding and absorption. These three situations all focus on the situation development. Although they arouse students' interest, they neglect the role of the introduction, which is due to the lack of pertinence in the process of the introduction.

2. *Create out of Nothing*

Mathematics in life is everywhere, but not all courses have corresponding situations. At this time, in order to construct the situation in accordance with this section of the class, there are situations in which nothing happens. Such examples often do not conform to normal logic and belong to meaningless phenomena that do not occur in life. In order to set the situation, it is just the opposite. Students have doubts about the teaching content and think repeatedly, which not only affects the quality of listening, but also is not conducive to students' future life and development. The class time is short, and the interval between classes is long. In the limited lead-in time, teachers should try their best to make the problem situation short, concise and easy to understand, and keep the content of this section in line with the actual situation. If there is no appropriate situation, we can choose other ways of introduction, so we don't have to apply the situational teaching mode blindly.

3. *Have the Order Reversed*

It is also a common phenomenon to put aside the essence of mathematics in the misunderstanding of situational teaching. The setting of all situations is to serve mathematics teaching and attract valuable ideas. If students indulge in situational content and neglect mathematics learning, or teachers set the situation and classroom content relevance is small, it will makes situational teaching lose its original meaning. None is better than Unnecessary and useless situation. Learn to extract the essence and discard the dross. Class time is short and students learn heavy tasks. It can enable students to recall the content of this session and repeat the situation.

III. THE SIGNIFICANCE OF SITUATIONAL INTRODUCTION IN SENIOR MATHEMATICS TEACHING

1. It is beneficial for students to understand mathematics culture and form mathematical thinking.

Teachers properly introduce the contents of mathematical culture, such as the history of mathematics and the deeds of mathematicians into the process of creating classroom introduction situations. It not only can students accept new knowledge in the process of understanding the cultural background of new knowledge, but also can deepen students' understanding of the essence of new knowledge mathematics. While understanding the mathematics culture, we should form the mathematics thinking and develop the mathematics learning ability. Mathematics learning is not accomplished overnight. Students' thinking exercise, logic cultivation and calculating ability need to accumulate over time. Teachers present the relevant content of mathematical culture to students in the form of words, pictures or animations. Students learn mathematics through familiar words and animations, and then use the learned mathematics to build models to apply to life. Students realize that mathematics is "useful" mathematics. The study of mathematics culture makes students' learning motivation increase subjectively and their internal driving force increase. In the long run, the establishment of a unique learning model is conducive to the formation of mathematical thinking.

2. It is beneficial for students to combine mathematics with other subjects and enhance classroom relevance.

Mathematics is more abstract than physics, chemistry and biology of the same subject. The setting of situation can make mathematics visualized. Teachers should pay attention to the connection with other disciplines when creating situation introduction, so that students can realize the flexibility and wide application of mathematical knowledge. For example, learning space rectangular coordinate system, teachers guide students to cite examples of space positioning, such as GPS, search and rescue, fish detection and so on, through learning sonar and positioning in physics class. Students understand the mathematical expression of locating a point in a specific three-dimensional space. This makes the students' sense of learning experience of physics and mathematics rise, enhance their interest in learning, and improve their classroom attention.

3. It is beneficial to enhance students' interest and relieve the tense atmosphere in mathematics class.

Because of the abstraction of mathematics, most students are tired of monotonous formula derivation. Therefore, students in the classroom are more willing to learn the monotonous mathematics knowledge in real life application of teaching content. When setting up the teaching situation, the teacher combines the practical application in life, and finds the interesting examples which are consistent with the content of this section, then presents them to the students in a funny and humorous way. This can alleviate students' classroom tension caused by worrying about teachers' questions, and improve students' learning enthusiasm and quickly integrate into the classroom content.

IV. THE STRATEGIES OF APPLYING SITUATIONAL INTRODUCTION TO MATHEMATICS TEACHING IN SENIOR HIGH SCHOOLS IN CHINA

1. *Understanding the Learning Situation and Deepening it Moderately*

Students' cognitive level is limited, and they lack cognitive foundation for deeper knowledge in senior high

school. At this time, teachers' instructional guidance is very important. In high school mathematics classroom, teachers should fully understand students' cognitive level. In line with the students' current cognitive level, we should grasp the key and difficult contents of the classroom to expand the situation. Too difficult and too simple importing contents are not the best way to import. In the course of Ellipse and its Standard Equations, students have learned the equations of straight lines and circles, and have preliminarily learned the general methods and steps of solving curve equations. But the students' ability of combining numbers and figures is poor, so it is difficult to learn. In this lesson, the teacher first gives the students the "ellipse" which they usually know. At this time, only black and white lines can be drawn. Students have been exposed to this figure in their life, so they can name the curve after the teacher gives the corresponding image, which is in line with the current school situation. Then the teacher guides the students to say the ellipse that they have seen in life. After the discussion, the teacher summarizes and introduces the teaching situation. For example, introduce the situation with the things around you. Before class, the teacher asks the students to bring some old mineral water bottles and scissors. Let the students cooperate in pairs and inject one third of the water into the mineral water bottle. One student tilted the bottle but did not completely flatten it to keep the posture unchanged. Another student drew a line on the bottle with a signature pen according to the mark on the water surface after tilting, and cut it off along the mark after pouring out the water. The students observed that the edge of the section was elliptical. This situation and "fixing two pins and drawing ellipses with a fixed length of rope" are the same mathematic experiments of this course, which cultivates students' practical ability and achieves the effect of situation introduction.

2. *Infiltration of History and Culture, Truthfulness and Reliability*

The history of mathematics is an important part of the development of mathematics. The tortuous and complicated exploration process and the indomitable spirit of exploration in the history of mathematics are what contemporary students need to learn. Teachers can help students understand the mathematics culture through situational development. At the same time, scene setting should ensure its authenticity. As described in the misunderstanding above, there are problems contrary to life, ethics and science, which lead to confusion in students' memory. Therefore, teachers should make every effort to ensure the authenticity of the examples. Still using the lesson "Ellipse and its Standard Equation" as an example, the teacher asked the students before class whether the students knew how to discover the ellipse, and who was the first to study the ellipse? Students continue to listen with questions. Teachers introduce to students: The earliest is the classic Conic Curve Theory written by Apollo Nisso, an ancient Greek mathematician. This book is an in-depth study of elliptic equicurvilinear curves with extensive and detailed contents, including most of the properties of conic curves. At that time, some mathematicians, including Apollonius, discovered the ellipse by truncating the cone on a plane perpendicular to the side edge [5]. After the introduction, the teacher instructed the students to make cones and cross sections and cut ellipses by imitating the previous methods. Such a mathematical situation includes both the history of mathematics and the infiltration of mathematical culture. Introducing situation into classroom to stimulate students' thirst for knowledge is of great help to students' mathematics learning, and has reference significance for teachers' situational teaching.

3. *Combining Multimedia Teaching Aids to Show Teaching Situations*

In recent years, with the rapid development of multimedia, the application of multimedia in the classroom in various forms is no longer confined to simple video, animation, which also makes the mathematics classroom

more visualized. The use of multimedia makes the teaching content clear at a glance. The presentation of knowledge is concise and clear. It saves time and effort while sublimating the classroom theme. For example, in a unit of space geometry, teachers can release their hands and use three-dimensional animation to show the relationship between points, lines and surfaces. This form guarantees interestingness and saves class time. In the course of Dihedral Angle, students are not familiar with Dihedral Angle and can't imagine the specific spatial structure, which may lead to difficulties in the follow-up of this lesson. At this time, teachers show examples of the two sides of life in multimedia courseware. For example, teachers design flood control animations of dams in multimedia. Or the installation animation of solar water heater - the tilt angle of solar water heater is directly related to the lighting of solar water heater. The angle between the collector tube plane and the ground will be adjusted according to the local latitude, so that the sunlight can be transmitted vertically to the solar water heater to maximize the power of heat generation. Through such a simple living situation, students can more vividly and concretely understand the spatial structure of the dihedral angle, and then further analyze and learn to understand more deeply and clearly.

4. *Keep Pace with the Times and Bring Forth the Spirit of Innovation*

The existing high school mathematics teaching situation is "traceable", and teachers should learn to innovate and sublimate moderately on the basis of classical cases. As talents in the new era, we should adapt to the development of the new era, conform to the trend of the times and train new talents. There is no need to follow the old ways and apply the classic cases blindly. For example, in the course "Ellipse and its Standard Equation", the teacher can show the students the satellite orbit. The teacher narrates that "on May 17, 2019, China successfully launched the 45th Beidou navigation satellite with the Long March 3C carrier rocket at Xichang Satellite Launch Center. The satellite orbit is the ellipse that we are learning today". At the same time, the slide shows pictures of satellites and satellite orbits or videos of launching satellites. This situation of keeping pace with the times, on the one hand, let students understand the current affairs of the country, on the other hand, increase the sense of national pride, in line with the spirit of innovation.

V. CONCLUSION

Situational introduction method is widely used in the classroom as a more commonly used method of high school mathematics introduction. Although there are many application modes of situational import, such as multimedia and short video mentioned above, there is no conflict between them and they can be used in parallel to achieve the best import effect. Teachers should be student-oriented, try to integrate situational introduction into different curricula, cultivate students' good habits of thinking and inquiry, and cultivate students' mathematical core qualities of abstraction, logical reasoning, mathematical modeling and intuitive imagination.

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