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THE CREATION OF INTELLIGENT AND WISE CLASSES IN HIGH SCHOOL MATHEMATICS TEACHING

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Abstract: *Intelligent and wise classes in high school mathematics teaching aim to improve students' personality and to promote the development of students' intelligence. The teacher should play the role of guide in creating intelligent and wise classes. Therefore, in teaching and learning activities, teachers should give full play to their educational wisdom to focus on leading students to develop their thinking, and on creating a harmonious and active class. The art of creating intelligent and wise classes is reflected in the intelligence the teacher used in teaching. The purpose of this paper is to provide vivid teaching cases to present how to construct an intelligent and wise class through creating teaching scenarios, capturing teaching information, guiding students by creative generation in teaching and transforming academic form.*

Key words *：intelligent and wise class construction guidance*

INTRODUCTION

Professor Cheng Shangrong synthesized research about intelligence in and out of China, and came to the conclusion that intelligence is a typical character produced and expressed in education situations, and it is directed by virtue and creativity. The purpose of obtaining intelligence is to cultivate and develop the students' capability, mathematics sensitivity and sudden enlightenment. Having the quick wit to respond in class is the primary expression of intelligence. The combination of scientific literacy and humanistic quality provide its foundation and tension. Based on these classroom teaching models, intelligent and wise classes in high school mathematics teaching are aimed at improving students' personality and promoting their intelligence. The teachers play the role of the guide, so they must put into full use their educational wisdom concerning students' development and meanwhile train students' thinking and create a harmonious and efficient classroom instruction model. The art of the creation of intelligent and wise classes in high school mathematics teaching is established by teachers' intelligence to lead the class. This article is to provide vivid teaching cases to present how to construct an intelligent and wise class through creating teaching scenarios, capturing teaching information, guiding students by creative generation in teaching and transforming academic form.

ESTABLISHING TEACHING SCENARIO IS A DRIVING FORCE AND A RICH SOURCE OF LEARNING.

What is the charm of TV series? It lies in the suspense TV series create, which is designed in different scenarios. It fires audiences' desire to explore. A German scholar once said, "You can't eat 15g of salt if it is just salt. But if it is mixed up in a bowl of delicious soup, you can easily get it in the process of enjoying the meal." Teaching

scenarios are just like the soup. The knowledge cannot be absorbed unless it is dissolved in suitable scenarios. How to inspire students' curiosity to probe and how to create an active class? That's the question raised in mathematics teaching. Uninteresting knowledge has a hard time attracting students' attention, while good questions can stimulate their main and their desire to take part in the class activities. Zeng Rong is a Master Teacher in Fudan University. Once he asked a question about the summation of infinite decreasing geometric series in his class. He asked:" What do you think when you see 0.9=0.999? How is it changed by the fraction method? What is the value? Is it equal to 1? Can you prove it? Why? " A series of questions firmly capture the students' curiosity, and lay the foundation to further explore the summation of infinite decreasing geometric series. Without doubt, such interesting and challenging questions inspire students' interest to think more, and scenarios created by these questions become a driving force and a rich source to create Intelligent and wise classes in high school mathematics teaching.

GENERATIVE TEACHING IS AN IMPORTANT WAY TO CONSTRUCT INTELLIGENT AND WISE CLASSES.

All intelligence comes from creativity. Generative teaching under the teachers' guidance is an important expression of classroom creativity. Generation includes predictable generation and unpredictable generation. Predictable generation means that after making full preparations for the classes, including carefully reviewing materials and understanding the students, the teacher leads students to carry on creative activities.

There is an example in the high school mathematics book Ⅳ *Coordinates Representation of Plane Vector Collinear,* published by People's Education Press. Suppose there is a point on the segment P_1P_2. The coordinates of P_1 and P_2 are (x_1, y_1) and (x_2, y_2) respectively.

(1)Find the coordinate of point P if point P is the middle point of the segment P_1P_2.

(2)Find the coordinates of point P if P is one of the points that trisect the segment P_1P_2.

Thoroughly understanding the mathematical thought process behind the example and finding different ways to solve it is a good resource for generation. In the teaching of this example, the teacher should make good use of predictable generation to lead students to solve the problem: if you know the midpoint of the segment as well as the abscissa and ordinate of two points that trisect the segment, can you find the coordinates of 3 points that quadrisect the segment? What about the coordinates of 4 points that divide the segment into 5 parts equally? What about the coordinates of the points that divide the segment into n parts equally? Can you deduce and prove the conclusion you come to? Following this pattern, students can develop and exercise their own intelligence under the guidance of the teacher.

Unpredictable generation is about valuable and creative activities produced during the communication between students and teachers, or among students when they are learning. For instance, the students in the third year encounter the following example when reviewing: if $s_n = \frac{5}{4}n^2 + \frac{7}{12}n$ is the sum of the antecedent of the arithmetic progression $\{a_n\}$, how do you find the general term formula for a_n?

Such an example is very common, but it's not easy to solve. If students know $a_n = \begin{cases} s_1 (n=1) \\ s_n - s_{n-1} (n \geq 2) \end{cases}$, they will arrive quickly at the result of $a_n = \frac{5}{2}n - \frac{2}{3}$. In the process of solving this question, one student finds there is a special relationship between $\frac{5}{4}n^2$ and $\frac{5}{2}n$. So he wonders if we can find the value of a_n when s_n is differentiated.

To this unexpected generation, if I don't take it into consideration and just easily deny $s_n' \neq a_n$ and refuse the students' idea, I will never explore the question further: is there

any other way to solve the problem by leading the students from the common problems and contrasting the coefficient of s_n' and a_n ?

After students' exploration, we can find a surprising result that if the general term formula of the arithmetic progression $\{a_n\}$ is $a_n = pn + q$, the sum of the first *n* terms is $s_n = \frac{n(p+q+pn+q)}{2} = \frac{n(pn+p+2q)}{2} = \frac{pn^2}{2} + \frac{(p+2q)n}{2}$, $s_n' = pn + \frac{p+2q}{2}$, and further find the values of q through the constant term $\frac{p+2q}{2}$ of s_n' and the values of p. This finding is worth popularizing to solve such kinds of mathematical problems. However, in the process of generative teaching, the teacher should protect the students' desire to observe, guess, and create. For the students who have a hard time with effective generation, the teacher could use different ways to deal with them. For example, drawing inferences about other cases from one instance, probing into the new question under the guidance of the teacher, referring back to the problem temporally, and evaluating extemporaneously could be used.

INFORMATION CAPTURE IS AN EFFECTIVE COMPLEMENT TO CONSTRUCT INTELLIGENT AND WISE CLASSES.

Sukhomlinski pointed out, "Education is not the skill of being able to foresee all the details of a course, but to capture some valuable details in the light of prevailing circumstances, and skillfully to make corresponding adjustments and changes to which the students are unconscious." Information capture includes information-receiving, analysis, and feedback. Information-receiving refers to information acquisition, which you can gain by the students' speaking in class, role playing, group learning and other activities. You can also acquire information from the textbooks. Regarding such information, teachers can spend more time and wisdom to construct questions to guide students to learn.

There is an example in the high school mathematics book Ⅱ *the Positional Relationship between the Straight Line and the Circle,* which is published by People's Education Press.

If line l passes through the point $M(-3,-3)$, and it's cut off by the circle $x^2+y^2+4y-21=0$, the length of chord is $4\sqrt{5}$, find the equation of line l.

When preparing lessons, I captured the valuable information that the textbook doesn't include the part about the line that passes through the point M with the slope 0. Why does the textbook use a different way to solve the problem? To find the answer, I designed the following exploratory exercise. If a given line l passes through the point M that is outside the circle, and the distance between the line l and the center of the circle is d, please draw the graph and prove how many lines satisfy these conditions. After discussing and exploring and with the teacher's guidance, students find that there are only 2 lines that satisfy the conditions. However, there are 2 different results given in the textbook. In that case, I ask students not to consider the lines without slope. I feel very strongly that if there is some valuable information worth exploring, the class will be wise and brilliant.

As for the acquisition of information available in classroom activities, it is necessary for teachers to make their analysis in a short time, including validity and correlation analyses, which will directly affect the effectiveness of teaching. Some teachers, due to inadequate preparation, can't capitalize on the proper timing for students' creative generation, or they may spend unnecessary time and effort following the generation of a tangential idea or question.

For example, I have listened to two classes with the same subject: *Chord through Focus of a Parabola*. Both teachers explained the example: Draw a line with a dip angle of 60 degrees. It passes through the point F which is the focus of the parabola $y^2=2px(p>0)$,

the chord joints two points A and B (point A is under the X axis), so $\frac{|AF|}{|BF|} =$ _____ . Most of the students who solved the problem in both classes used the special case method. That is: if p=2, using given conditions to find the coordinates of points A and B, then find the value of the two radius and their ratio.

There were students in both of these two classes who questioned if they could solve this problem through the general method. Given the same information, the two teachers used different ways as following: Teacher A: "We will need a large amount of calculation If we solve it with the general method, and obviously it's more difficult. Here we recommend the special case method to obtain the answer." Teacher B: "This problem can be resolved through the general method, and although we need a large amount of calculation, I know that you are not afraid of a challenge in learning. Let's work together to address this issue." Teacher A's analysis of this information was that it is not worth wasting time because of the large amount of calculation. While Teacher B's feedback was different, he encouraged the students to have the spirit of fearless determination and at the same time he guided the students to solve it by the general method. As a result, they obtained a series of opportunities for beautiful generation, while at the same time they arrived at the ratio formula of focal radius, Chord Length and the formula of focal radius.

Information capture is at the forefront of generative teaching, and is an effective complement to construct wise classes.

FORM CONVERSION IS A POWERFUL GUARANTEE OF CONSTRUCTING INTELLIGENT AND WISE CLASSES.

Academic form is used when compiling textbooks and publishing papers. It is formalized with rigorous deduction and logical inference, and it shows some simple and brief formalized content. Educational form is to take formalized content and transform it into a format that is easy to accept and understand through teachers' efforts. It's all math

teachers' responsibility to shape and convert math academic form into educational form. Teachers should process math knowledge creatively by virtue of their wisdom in order to transfer the original "cold and static" math knowledge into "vigorous and dynamic" teaching content, making mathematics come alive for students. Only in this way can a smarter class be built.

There is an example in the high school mathematics bookⅢ *the basic algorithmic statement,* which is published by People's Education Press.

Exchange the value of two Variables A and B, and output the value before exchanging.

Procedure: INPUTA, B

PRINTA, B

X＝A

A＝B

B＝X

PRINTA, B

END

As for the exchangeable variables program, suppose A and B are two cups filled with water. If we want to put the water of A into B, and we also want to load the water of B into A, we need to find an empty cup X. First pour cup A's water into the empty cup X, then pour the water of cup B into cup A, and finally pour the water of cup X into cup B. Such comprehension methods which accord with the common sense of daily life can help students to digest the above procedures.

There is another example in the high school mathematics bookⅠ, *Finding the Approximate Solution of the Equation with Dichotomy*, which is published by People's Education Press. When the teacher explains the materials, they may make an analogy to

Fortune 52, which is a popular entertainment program on CCTV, to lead the students to guess the price of goods. As a result, the students can gain further insight into the materials. What they should do is just change the expressions in the materials, such as when they take the original area's average and divide by two, or take the game's critical phrase "more or less" and change it to a comparison between zero and the product of the function value according to the end of the line, then choose the area. This kind of game-like explanation can help us transfer mathematical form into an easily received educational form, thus students will never get bored with abstract and formalized conceptual contents, providing a strong guarantee to build Intelligent and wise classes.

CONCLUSION

A single teaching scenario, a single creative generation, a single piece of captured information could play an important role in creating a wise class, so mathematics teachers in high school should be good at creating, capturing and leading in the process of teaching. Only in this way can we help the students be full of passion in the learning process, and let mathematics class be filled with vitality and wisdom.