

Exploration of high school mathematics large unit teaching under the background of "double new"

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Abstract: *Under the background of double new, this paper explores the application of large unit teaching in high school mathematics efficient classroom, aiming to help front-line educators better interpret curriculum standards, control textbooks, improve mathematics teaching efficiency, cultivate students' mathematics core literacy ability, and cultivate all-round students. This paper briefly describes the idea of large unit teaching in high school mathematics, explores the basic steps of large unit teaching, and provides teaching reference for front-line educators by case demonstration method.*

Keywords: *High school mathematics; large-unit teaching; double new background*

1. Introduction

Since the autumn of 2019, the new textbooks have been put into use, and China's general high school education has realized the "double new synchronization" of new curriculum standards and new textbooks. The new curriculum standards and new teaching materials are important standards in the new high school education reform. They jointly promote the development of high school education in China and improve the quality and ability of students. Under the new background of high school mathematics curriculum, what teaching methods should be carried out efficiently, which causes many scholars and frontline educators to study and think. Frontline educators should clearly understand where the "new" of the double new background is, and only in this way can they make corresponding teaching and arrangement design. The teaching of high school mathematics curriculum can follow the pace of The Times of a fundamental change, in order to complete the high quality of high school mathematics teaching better.

After studying the new curriculum standards carefully, we can find that the old curriculum standards have changed greatly: (1) increased the "double basics", basic ideas and basic activity experience, even more emphasis is placed on the importance of mathematical thinking methods and experience; (2) enriched the original basic ability and improved the requirement to the core quality; (3) added "ability to find problems" on the basis of "three abilities", which fully reflects the requirement for cultivating students' innovation and thinking ability to find problems.

Compared with the old textbooks, the new textbooks implemented in 2019, increase the interest and coherence of mathematical knowledge learning, and pay more attention to the overall teaching form of the unit, in order to explore students' potential more fully, cultivate students' awareness of innovation, stimulate students' interesting in learning, and cultivate talents to face to the needs of social development. In addition, the theme between the chapter and the new textbook is more clear, highlighting the logic fully, coherence, relevance and integrity of knowledge. Therefore, large-unit teaching has been favored by many frontline educators^[1]The implementation of the new teaching concept has gradually become a crucial part of the high school section, so it is particularly important to study the application of large unit teaching in the high school mathematics teaching.

Large-unit teaching breaks through the limitations of traditional high school curriculum models, to design classroom activities with the unit as the basic unit, requires teachers to update education teaching process, define the unit theme, use the right way, method of new knowledge and old effectively connected together, also need to design reasonable teaching activities, in order to complete the course objectives, successful implementation of efficient mathematics classroom, help the cultivation of students' mathematical core literacy. In addition, students also need to learn with the unit theme determined by the teacher actively, immersive participate in the unit knowledge connection activities designed by the teacher, and focus on two-way teaching and learning to create an efficient high school mathematics classroom.

2. High school mathematics large-unit teaching basic concept

2.1. The concept of senior high school mathematics large-unit teaching

Large-unit teaching, also known as design teaching, emphasizes the active participation of students and aims to explore deeper learning. High school mathematics large-unit teaching refers to the teachers relying on new curriculum, new teaching material, from the existing level, training direction and basic examination, make suitable for students learning system teaching design, stimulate students learning knowledge of unit consciousness effectively, make the student understanding of new knowledge and related old knowledge deeply, deepen the mathematical basic ideas and methods, help students to build a complete knowledge logic system.

2.2. Relying on the design concept of the new textbooks, clarify the requirements for large-unit teaching in high school mathematics

The new teaching material fully reflects the value of education and advocates the cultivation of all-developed mathematical people. Clarify the teaching requirements, implement the basic concepts of the new curriculum standards, and take the comprehensive development of the core quality of students' mathematics as the main line. Therefore, when the front-line educators implement the large unit teaching in the high school mathematics classroom, they should establish the correct concept of education, and effectively cultivate the students' core quality of mathematics;

The logical structure of the new teaching material is more complete, comfortable and clear, and the theme content of large unit teaching should be more clear. In-depth study of the internal logical relationship of high school mathematics curriculum content, adjust the teaching content of the same unit theme, supplement or reorganization, so that the teaching design and learning situation combined. The unit teaching content should fully reflect the integrity and coherence of mathematical knowledge and content, highlight the core concepts and the basic ideas and methods contained, design the inquiry and thinking content reasonably, present the knowledge generation and development process, help students explore knowledge actively, so that students can acquire knowledge naturally. Therefore, front-line teachers should guide students to learn knowledge in unit in teaching, experience the generation and development process of knowledge, and deepen students' understanding and application of knowledge.

The new teaching material will follow the cognitive law and effectively cultivate students' mathematical core literacy. The unit theme of the new teaching material is clear, and the designed mathematics learning activities designed are more systematic. It makes substantial innovation in column setting, material selection, situation design, activity mode, problem guidance, language expression and other aspects, to guide students to apply what they have learned, and lay a foundation for the implementation of mathematics core literacy^[2]. Therefore, teachers should integrate students' intelligence level and cognitive situation, design reasonable unit teaching activities, and effectively promote students' recent development area.

Utilizing modern information technology to optimize the structure of mathematics classroom teaching. The new textbook integrates modern information technology, and aims to quickly provide intuitive images, organize and analyze data. Therefore, front-line teachers should reasonably use algebra system, spreadsheet and dynamic geometry software in the teaching process to help students carry out mathematics learning activities, enhance students' mathematical experience, and improve the level of mathematical understanding and learning efficiency.

3. The Basic Steps of Large-Unit Teaching in High School Mathematics

3.1. Clarify unit objectives and establish an educational philosophy

Large unit objectives indicate the direction of students' learning or teachers' teaching, which is divided into unit teaching objectives and unit learning objectives. Among them, the unit learning goal is to determine the unit from the perspective of student development, clarify the knowledge and skills to acquire and the mathematical core literacy, and the expected goal or requirement of a specific lesson from a comprehensive perspective. The target setting of large units should consider students' basic knowledge, cognitive level and actual situation, and the content setting should be clear, specific and operable, so as to effectively stimulate students' interest and enthusiasm in learning.

3.2. Define the content of the unit and guide students in knowledge transfer

The teaching content of large units should fit the basic ability of students. Teachers should start from the whole knowledge, redivide the teaching content according to the difficulty of the unit knowledge, adjust and supplement, optimize the teaching content; At the same time, careful analysis of the cognitive status of students in the classroom, the development of appropriate course content, reasonable control of teaching difficulty, through shallow and deep teaching, can help students understand the key and difficult knowledge, to achieve the teaching effect. The choice of teaching content is no longer limited to the chapters of teaching material setting, teachers can be related theoretical knowledge series, lead students to study the basic knowledge first, again in the students' recent development area gradually increase the course difficulty, help students knowledge development and extension, and permeate related mathematical basic methods, ideas. In addition, it is also necessary to guide students to seek the truth in practice, and effectively cultivate their innovative consciousness and practical ability.

3.3. Design the unit process and plan comprehensively to promote teaching

The teaching process of high school mathematics big unit : First of all, the teacher makes a comprehensive plan for the content of the unit subject, determines the training objectives, and reorganizes the content unit of the textbook from the perspective of the subject, the textbook and the new standard. Under the guidance of core literacy, the unit theme of the learning content is determined to promote the establishment of the core values of mathematics. Secondly, by analyzing the students' cognitive basis and difficulties, rationally designing the teaching content and key points and difficulties, linking the relevant new knowledge with the old knowledge, improving the course content of the unit theme, and helping students transfer the learning content. Third, the evaluation mechanism of unit teaching should be formulated to effectively encourage students to learn mathematics. Classroom teaching should pay attention to the student-centered teaching evaluation, and aim to clarify the expected teaching effect of large unit teaching. Finally, reasonable homework design to help students self-examination and self-correction reflection. Large unit teaching aims to help students understand and master what they have learned, and then build a complete knowledge logic system. In mathematics teaching, we should strengthen the students' understanding and cohesion of the theme content of the unit, so that students can experience the formation, development and application of the knowledge system, and effectively develop the students' recent development area. In addition, it is necessary to deepen the educational concept of mathematics curriculum to help students establish correct mathematical values.

3.4. Improve the unit evaluation mechanism to stimulate students' interest in mathematics

Large unit teaching should pay attention to the integrity and systematization, and the evaluation mechanism is very important. However, in the teaching practice of tight time and heavy task, some teachers excessively pursue the teaching progress, and often cover up or marginalize the evaluation link, which has a great impact on the efficient implementation of large unit classroom. In order to improve the efficiency of large-unit teaching classroom, it is necessary to strictly implement the integrity and structure of large-unit teaching mode, formulate and improve the evaluation mechanism of large-unit teaching, visualize the large-unit teaching links, optimize the mathematics teaching mode, and achieve the^[3] of efficient mathematics classroom. The evaluation mechanism of large unit teaching is based on unit objectives, pay attention to what students learn, how to learn, what is required after learning, the ability to understand the mathematical concepts and solving methods, and self-evaluation, mutual evaluation and evaluation of students in unit learning and adjust them; in addition, the problems in large unit teaching must be found through teaching evaluation and the hypothetical improvement strategy can be put into mathematics teaching practice again to realize efficient and feasible large unit teaching mode and optimize the mathematics teaching effect.

3.5. Design large unit operations reasonably and implement the training objectives

The core of large unit teaching is to help students establish a complete unit knowledge system, penetrate the mathematical thinking method of unit theme, and effectively cultivate students' mathematical core literacy. Therefore, in the design of large unit teaching homework, we can examine the construction of students' knowledge system and mathematical ideas and methods of learning, and the related knowledge points can be integrated into a number of questions to test students' grasp of the

relevant knowledge points and the ability to apply what they have learned. For example, the exponential function and logarithmic function content under the function theme, the main ideas contained in the combination of several forms, classification discussion, etc., in the design of the unit homework, it can prefer to examine the students' understanding and mastery of the function, the ability of combining numbers and shapes, and the ability to classify and discuss the value of different values of parameter A.

4. Select the specific content for analysis

Select the specific teaching content to do a case presentation, such as the class of "conditional probability and full probability formula" on the topic of the probability unit.

First, teachers should consider the following points when setting the unit objectives: First, before the content of this section, students can set the teaching objectives of this section based on the required knowledge; second, this section is the new content of the new textbook, and the teaching key points, difficulties and objectives of this section are set based on the requirements of the new curriculum standard. In particular, the full probability formula and Bayesian formula in this unit come from the probability knowledge of university, which are closely related to the practical problems in real life, and can penetrate the basic ideas in the learning process; third, more attention can be paid when setting specific cases, extract the basic ideas of complex examples, derive the full probability formula from special to general, deepen the transformation idea of decomposition and synthesis and transformation.

Secondly, teachers should review the position of the probability unit theme in this section in high school mathematics, give students time to review the relevant content of the required course, briefly preview the follow-up content of the unit theme, and let students establish a probability system by themselves. Teachers in the classroom can be the required part of the key knowledge and this section new content adjustment, restructuring, combined with the situation to develop reasonable teaching design, effective course teaching, help students to establish a complete probability of knowledge logic system, further deepen the probability unit contains the basic ideas, method, help students cultivate mathematical core literacy.

Thirdly, the teacher briefly points out the core concept and key nature of the probability unit, and then designs the teaching activities to teach the new lesson. Considering the abstraction of conditional probability and total probability formulas, it is difficult for students to understand. Teachers can combine typical teaching concepts to guide students to carry out specific models of abstract problems, further deepen model thinking, help students understand abstract problems, and also promote students' mathematical modeling, data analysis and the development of mathematical abstract core literacy. In addition, teachers should formulate the evaluation mechanism based on unit teaching in this lesson, that is, students can solve practical problems with the probability calculation formula; they can judge the independence of events and the significance of condition concept and the application of conditional probability formula.

Finally, teachers should be close to the learning situation, close to daily life, to deepen students' understanding of conceptual knowledge. Due to many conditions in the specific problem of probability problem against our intuition, students in learning this block content often confused, the understanding of conditional probability definition will have certain deviation, therefore, in homework design more examples in daily life, such as the supermarket feedback customer lottery, home has two children boys and girls, opaque bag ball, etc., with daily life instance to help students to understand the purpose of abstract concept knowledge. The specific teaching design is shown as follows:

4.1. Review the relevant content of probability in the required textbooks to lay the foundation for theoretical knowledge

Due to the long learning interval between the compulsory part and the compulsory part, teachers should do a good job in the teaching design of probability theme, connect the old knowledge review with new knowledge learning, so as to establish students' awareness of large unit learning and help them establish a complete probabilistic knowledge logic system. Main review content has the correlation between events and operation (including, equal, and, product, mutually exclusive, opposite), classical type calculation and probability of six basic properties, from the probability of basic knowledge, make knowledge before and after cohesion, with the help of the classical type of selective

compulsory part of random event probability, and then in a certain context to learn and apply the full probability formula and Bayesian formula.

4.2. Determine the objectives of the large-unit probability course and establish an educational philosophy

The learning of probabilistic knowledge can provide students with important thinking modes and problem-solving methods to understand the world objectively, and also provide a theoretical foundation for the subsequent probability learning. Probability content has rich life background, probability knowledge contains rich dialectical thought; secondly, probability learning can also strengthen students' understanding of the essence of mathematics, and further let students experience the close connection between mathematics knowledge and real life.^[4] Therefore, in the teaching process, teachers can refer to specific examples related to life, help students perceive the whole and the part, dialectical and unchanged, and cultivate students' speculative ability. In the teaching process, teachers can design more teaching activities, give students more practical opportunities, increase students' opportunities to experience knowledge generation, and cultivate students' core literacy such as mathematical modeling, logical reasoning, mathematical abstraction, data analysis and mathematical operation.

4.3. Relying on the teaching objectives of the large-unit, we will set up the teaching objectives of this class

When setting the teaching objectives of Conditional Probability and Full Probability Formula, it is necessary to study the course standard, textbook, course and learning situation. Setting the teaching objectives of this class is: [understand] the conditional probability and calculate the conditional probability of simple random events; [understand] the relationship between [using] and calculate the probability [using] full probability formula; and [understand] Bayesian formula. Learning the probability and total probability formula of learning focus, the probability multiplication formula of teaching difficult conditions, the total probability formula, and the application of total probability events to solve real life problems, select Bayesian formula and application, here to give more attention, the Bayesian formula of university probability knowledge, appears in high school textbooks to establish high school probability knowledge and university probability knowledge. In the process of learning to inform students, the essence of Bayesian formula is the condition of probability.

4.4. Design teaching inquiry activities to enhance students' knowledge experience

Teachers can get close to life question 2: in the possible case of boys and girls, now from a family with two children, how much is the probability that two children are girls in the family? If there are known to be girls in the family, what is the probability that two children are girls? Students can be given some time for in-group discussions. This question is closely related to real life, as well as to the biological knowledge that students learn, which can effectively stimulate students' enthusiasm to actively explore the answer to this question. Students after the discussion, can encourage students to actively on the platform to show the discussion results, then can guide the student to open the textbook, study the textbook with classical knowledge to solve the common learning conditions probability formula, teachers and students and change conditions for A, B events are independent of each other, the same reason. The probability formula of deformation condition, which can be, similarly, is later called

the multiplication formula of probability.
$$P(B|A) = \frac{P(AB)}{P(A)} \quad P(B|A) = \frac{P(AB)}{P(A)} = \frac{P(A)P(B)}{P(A)} = P(B) \quad P(A|B) = P(A)$$
$$P(AB) = P(A)P(B|A) \quad P(AB) = P(B)P(A|B)$$

In order to help students understand and apply the formula of conditional probability, teachers and students can learn example 2, it is known that only one prize ticket, while a, B and C randomly select 1. Is the probability of winning related to the order of the lottery? Students subjectively feel that the first draw has the high probability of winning, but with the help of the conditional probability through the specific calculation, they found that no matter who draws first, the probability of winning is equal. With the help of this example, it can help the students to deeply realize that the subjective understanding and the objective judgment will have a certain deviation, which can deepen the students' understanding of the random phenomena, and establish the awareness of using the probabilistic methods to solve the problems. Similar questions have thinking questions: the bag contains a red ball and b blue ball, each time randomly touch 1 ball to record the color is not put back, the probability of touching the red ball for the first time, then the probability of touching the red ball for the second time

will change? The students subjectively thought that the probability of touching the red ball would increase for the second time. After calculation with the help of the addition formula and multiplication formula of probability, it is found that the probability of touching the red ball the second time will be affected by whether the red ball is touched the first time. Through calculation, we know that the probability of touching the red ball the second time is the same as the probability of touching the red ball the first time. Thus to the full probability formula, easily known full probability formula can express complex events as parallel events of several mutually exclusive events, and then solved by the addition and multiplication formulas of probability. In the process of guiding students to learn example 2 and thinking questions, it can effectively guide students to turn abstract problems into concrete models, infiltrate the model ideas, help students understand abstract problems, and also promote the development of students' core qualities such as mathematical modeling, data analysis and mathematical

$$\frac{a}{a+b} \frac{a}{a+b} P(B) = \sum_{i=1}^n P(A_i)P(B|A_i)$$

4.5. Design reasonable unit assignments to help students apply what they have learned in practice

After guiding students to explore and learn important knowledge points, reasonable unit assignments should be designed to help students deepen their understanding of the meaning of the conditional probability and full probability formula. Can choose the textbook in example 1 contest questions, example 3 bank card password problem, example 4 students A, B restaurant dining problems and example 5 lathe production parts of the defective problem, these four problems are closely related to real life, can achieve the purpose of daily life examples to help students understand abstract concept knowledge. Homework requires students to solve Example 1-3-4, experience the conditions of probability and probability multiplication formula, and group together to solve Example 5, focusing on the method and answer of the second problem (teachers can reveal the problem in Bayesian formula in advance), which can effectively cultivate students ' independent thinking learning habits and awareness of solving practical problems, and can also effectively improve students ' ability to solve problems in the team.

4.6. Improve the unit evaluation mechanism to motivate students for continued learning

Set up a complete unit evaluation mechanism^[5], Effective evaluation promotes students' knowledge learning and ability cultivation. Teachers should pay more attention to what students learn, how to learn, what ability they need to have after learning, and pay attention to students' ability to understand mathematical concepts, master knowledge points and problem solving steps. Innovative evaluation modes such as multiple comments, student's self-evaluation, mutual evaluation and teacher-student evaluation can be adopted to find out students' weaknesses in unit learning in time and help them adjust and improve.

5. Conclusion

The large unit teaching of high school mathematics is in line with the design concept of the main line of the new teaching material unit, which aims to help students establish a complete knowledge logic system and cultivate students' mathematical core mathematics literacy. In teaching practice, teachers should be comprehensive teaching background, students cognitive factors, determine the teaching objectives and content, optimize the teaching design, the evaluation mechanism and homework design, help students better learn mathematics knowledge and thinking methods, and guide students to use, strive to cultivate high quality, all-round development of students, build efficient mathematics classroom.

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