

Analysis of Teaching Strategies for Higher Mathematics Calculus

Xiuyan Wang^a, Henan Pei^{b,*}

Dalian Ocean University, Dalian 116300, China.

^a dhdzybwc@163.com, ^{b,*} 492001372@qq.com

Abstract. Many colleges and universities offer advanced mathematics courses, focusing on guiding college students to carry out thinking training, so that they can flexibly master various problem-solving methods and have strong ability to use mathematical knowledge. Among them, the teaching of calculus is very difficult. Combining the actual learning situation of college students, it briefly discusses the related knowledge of advanced mathematics calculus and the difficulty and difficulty of teaching, and deeply explores the ideas and methods of higher mathematics calculus teaching.

Keywords: Advanced mathematics; Calculus; Unary function; Partial integral method.

1. Research background

In advanced mathematics, calculus is a compulsory subject, and the subject knowledge is widely used in the fields of biology, chemistry, economics, engineering, etc., and the teaching requirements are high. However, in the course practice, calculus teaching still faces a series of problems, such as the difficulty of the course and the lack of knowledge of the difficult and difficult points, which seriously restricts the higher mathematics learning of the lower grade students. According to the background of the subject, the teaching requirements, the characteristics of individual students, etc., flexible and innovative teaching of higher mathematics calculus, reducing the difficulty of the course.

2. Higher Mathematics Calculus Teaching

Calculus teaching is also called analytics. The research focuses on differential calculus and integrals. The former is mainly based on differential and its derivative calculation, and can be used to calculate various indicators such as acceleration, curve slope, and function. Integral has the points of definite integral and indefinite integral, which are mainly used to solve area and volume. As the key content in the teaching process of higher mathematics, calculus was first used in the fields of mechanics and geometry [1]. Later, based on the limit theory, various mathematical calculation problems were dealt with by the limit value of infinite size.

3. Higher Mathematics Calculus Teaching Difficulties

3.1 Calculus Teaching Focus

Clear calculus teaching objects, so that teachers can convey calculus related theories and knowledge to students. Combined with the curriculum background, the university students will be guided to choose multiple and flexible modes and methods, and applied to calculus learning to make calculus learning throughout the discipline. First of all, some college students are limited by their own knowledge reserves, learning ability, and weak in logical reasoning. They lack understanding of higher mathematics and cannot penetrate calculus knowledge into the whole process of higher mathematics learning. The characteristics of calculus teaching determines that it is based on the cultivation of logical thinking and mathematical comprehension, which is convenient for college students to master and apply calculus knowledge. Secondly, the use of multiple methods to improve the effectiveness of calculus classroom teaching. Because the calculus is too boring and difficult, some teachers only explain the theoretical knowledge and examples of the textbooks to the students, and ignore the practical exercises, which leads to the low enthusiasm of students in classroom learning [2]. In the teaching of higher mathematics, it is necessary to emphasize the practicality of calculus,

and always focus on the teaching ideas. Thirdly, the calculus learning of college students depends entirely on their own initiative. For the exercises with high difficulty coefficient, there are very few extensions, learning and inquiry, which makes the calculus learning effect poor. Calculus teaching needs to practice appropriate exercises, but also to stop the sea tactics.

3.2 Calculus Teaching Difficulties

(1) The unary function finds the extremum. This part of the content learning difficulty is relatively large, usually can be divided into important limit theorem, infinitesimal, Lobita rule three categories. The compilation of advanced mathematics textbooks is more reasonable, with logical features, and the order of solving is set in turn. However, when learning a unary function to find the limit value, the concepts are relatively scattered, or the single concept has multiple understandings. If the student relies only on the methods in the text to solve the problem, directional errors are inevitable. It is a difficult point in the teaching of advanced mathematical calculus to choose which method to solve the limit value of the unary function. (2) Partial integration method. In this teaching practice, students need to be guided to make a flexible choice of uv in the calculation formula. In the teaching of higher mathematics calculus, the internal law is not directly reflected, so that when the integral is selected, it takes a long time and is prone to error. Summarize the basic rules of the initial function, exponential function, trigonometric function, etc., can correctly distinguish the type of integrand function, according to the relevance presented in the formula, use the icon of "Upper difficulty, left product right guide" The formula uv is selected [3]. (3) Integral variables, intervals, and integrands. For college students, the learning content of this section is relatively difficult. If only relying on a single thinking method, it is difficult to determine the X-axis and Y-axis curves, and it is impossible to flexibly distinguish the various axes, so that it is difficult to determine whether an axis is Matches the integral variable. When learning advanced mathematical calculus, it is difficult to understand the above in a relatively short period of time. The teacher should lead the students to draw a sketch, mark the position of the curved trapezoid, and use the position of the intersection of the curve to determine the range of the horizontal and vertical coordinates of the point in the area. Based on this, the integral variable is preferred.

4. Higher Mathematics Calculus Teaching Strategies

4.1 Flexible use of Mathematical Language and Symbols

There are many types of symbols involved in higher mathematics, including many special symbols, as well as calculus. The flexible use of mathematical symbols, language, etc., helps to cultivate the mathematical qualities of college students. At the same time, it is also possible to express profound mathematical ideas and flexibly use various mathematical operations and problem-solving methods [4]. For example, $\int_a^b f(x)dx = F(b) - F(a)$ is a basic calculus formula, which refers to the fact that a continuous function has the same amount of change in $[a, b]$ as any of its original functions on $[a, b]$. It presents the relationship between the definite integral and the original function of the integrand, making the calculation of the definite integral more concise. The flexible use of mathematical language and symbols can help students understand concepts and theorems and help them relate the laws to problem solving. For example, referring to the conversion element integration rule, try to express the calculation program using a mathematical language.

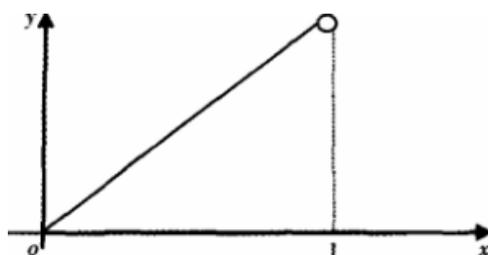
4.2 Using a Combination of Numbers and Shapes

The geometric relationship is used to visualize the quantitative relationship, thus revealing the intrinsic relationship between conditions and conditions, conditions and conclusions. It makes the abstract mathematical concept more vivid, intuitive, and vivid, fully revealing the essence of mathematical problems. In daily teaching, the focus is on cultivating students' digital and visual thinking, and using intuitive graphics to make students' thinking more open and help them analyze and solve mathematical problems. For example, the Rolle Mean Value Theorem is represented

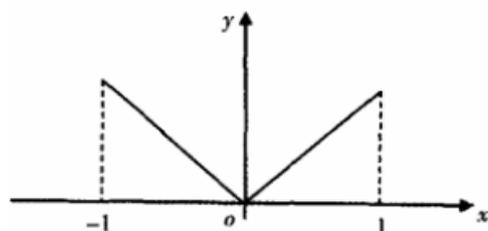
graphically, presenting conditions, conclusions, and proof theorems directly in front of students. In this way, students are proficient in using, using, and proving this theorem in a relatively short period of time. In this process, it is likely that the conclusion cannot be met because the single condition

cannot meet the requirements. $y = \begin{cases} x & 0 \leq x < 1 \\ 0 & x = 1 \end{cases}$, $y = |x|$, $x \in [-1, 1]$, and $y = x$, $x \in [0, 1]$

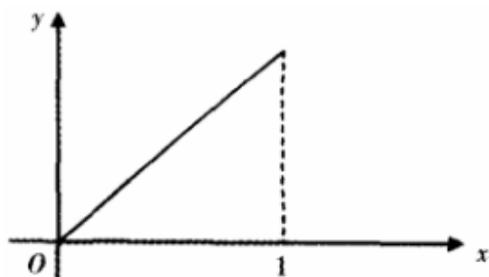
respectively cannot satisfy the three conditions in the theorem. The geometry is shown in Figure 1. It can be seen that it cannot find ξ in the respective definition domain, so that $f(\xi) = 0$.



(a)



(b)



(c)

Fig. 1 Geometric representation visual quantity relationship

4.3 Pay Attention to the Relevance of Each Knowledge Module

There are many knowledge modules in calculus, and because of the limitation of arrangement, the reverse correlation between key concepts is not reflected. By showing the background of the concept, clarifying the connection and difference between the two concepts, constructing the knowledge network on this basis, paying attention to the correlation between the various knowledge points. When reviewing a single concept, it is also possible to review multiple theorems and laws simultaneously with point and face. When the upper limit integral function $\phi(x) = \int_a^x f(t) dt$ is changed, the correlation between the limits, continuous, derivative, differential and other indicators is considered, and the important concepts in the upper limit integral function and calculus are fully combined. By discussing the continuity and the conductivity of this function, it is proposed under what conditions the derivative or the relationship between its derivative and the integrand function, so that students can draw correct conclusions. Summary theorem: If $f(x)$ is continuous over $[a, b]$, then

$\phi(x) = \int_a^x f(t) dt$ is continuous on $[a, b]$ and can be guided. In this way, the derivative of the variable upper limit integral function is solved.

4.4 Good at Summarizing Calculus Teaching Methods

Higher mathematics calculus contains a lot of calculations, clear the focus of the course, and lead students to quickly master the calculation principles and methods. When explaining the partial integration method of indefinite integrals, if the textual knowledge is the main one, the students only grasp the examples in a simple way, and it is difficult to truly master such solving methods [5]. Therefore, in the teaching of higher mathematics calculus, students should be guided to practice, through the case teaching method, to guide students to summarize, transform, comb the calculus related theorems, concepts, proficiency in various formulas, and apply to calculus learning and problem solving, reduce the difficulty of the course.

5. Conclusion

Higher mathematics calculus teaching is difficult and professional, requiring teachers to change past teaching ideas and strategies, and flexible use of mathematical language and symbols. Through the combination of numbers and shapes, operations are performed to clearly show the correlation between various knowledge modules. Combing the course ideas, cultivate the combination of number and shape thinking, be good at summarizing calculus learning methods, experience, etc., help students to easily grasp the relevant calculus knowledge points, stimulate higher mathematics learning interest, and learn rich calculus knowledge in limited classroom time. And be able to apply proficiently.

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