

ANALYSIS OF CURRENT SITUATION OF DERIVATIVE TEACHING AND LEARNING IN SENIOR HIGH SCHOOL

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ABSTRACT

The derivative course in senior high school has always been a difficult point for teachers' teaching and students' learning. As the basic knowledge of integral and differential, derivative is the connection between university and senior high school, and derivative knowledge is relatively abstract. How to get in touch with reality and show the practical significance behind derivative knowledge is a difficult point to overcome in derivative teaching. This paper summarizes and analyzes the phenomena existing in teachers' teaching and students' learning of derivative links in senior high schools, and provides reference for future research.

Keywords: high school mathematics, derivative teaching, derivative in high school

INTRODUCTION

In the newly revised Mathematics Curriculum Standards for Senior High Schools (2017 Edition 2020 Revision) completed in 2020 (hereinafter referred to as the new curriculum Standards), it is proposed that mathematics curriculum should reflect the essence of modern mathematics, pay attention to the connection between mathematics and human social life, pay attention to the new characteristics of mathematics development in the era of mathematics and big data, and emphasize the function of mathematics education to cultivate morality and cultivate people. Under the new curriculum standard, derivative, as one of the main knowledge lines of college entrance examination, occupies an important position in college entrance examination. As an important tool to study function, the importance of derivative is self-evident. Almost all problems that involve solving for maximum values use the idea of derivatives. It can be seen that the position of derivative in high school mathematics is very important, so it is very meaningful to study the problems existing in the teaching and learning of derivative at the present stage.

THE DERIVATIVE IN THE CURRICULUM

Derivatives, which are highly abstract and difficult to learn, occupy a lot of space in the knowledge content of high school. How teachers present derivative knowledge in class to make students better accept it is a topic of continuous research. In the teaching of derivatives, the common teaching process is to pass the average rate to the instantaneous rate, and show the slope of the derivative as the tangent line through the interval image, thus leading to the concept and geometric meaning of the derivative. Compared with other knowledge, the knowledge of the derivative is more abstract, and it is more necessary for teachers to guide students into the knowledge system. The relevant aspects of derivatives have also been updated to varying degrees.

In 2020, the function topic of the optional compulsory section of the General high school Mathematics Curriculum Standard (2017 edition 2020 revision) has the

derivative of a single function and its application. The teaching suggestions are to understand the concept of function, master the operation rules, use derivatives to study the nature of function and solve practical problems through a rich practical background. The course includes the establishment and development of calculus, which reflects the educational concept of moral education, mathematical culture and humanistic thought. In the Ningzhong Shi, Shangzhi Wang's book of ordinary high school mathematics curriculum standards. The interpretation puts forward that the core value orientation of senior high school mathematics curriculum is students' development oriented, moral cultivation and improving quality. Calculus topics in Class B include limits, derivatives and differentials, definite integrals, and functions of two variables. The teaching suggestion of this topic is to attach importance to the physical background, the geometric intuition of mathematical results, the concept teaching and the logical reasoning teaching.

After years of revision, the content of derivative in the curriculum standard is also constantly improving. In the new curriculum standard, the function of education is especially emphasized, and the role of mathematics in fostering morality and educating people is emphasized. In terms of derivative knowledge, it is required to combine the actual teaching.

CURRENT TEACHING SITUATION OF DERIVATIVE IN SENIOR HIGH SCHOOL

As for the research of derivative teaching strategy, summarizing the contents of the literature, we can see the means taken by the derivative teaching teachers and some problems. Through studying the characteristics and teaching contents of the development of students' mathematical thinking, the teaching strategies of "Derivative and Its Application" in High School Mathematics are given as follows: one is the generative teaching strategy; Second, the teaching strategy of lecturing; Third, independent learning and group learning strategies.

The Study of Calculus Teaching Strategies in high school puts forward the strategies of classroom teaching preparation, main teaching behavior and auxiliary teaching behavior.

Difficulties in Derivative Learning and Its Teaching Strategies for Senior High School students by analyzing the problems in derivative learning for students, relevant teaching strategies are formulated: 1. optimize students' learning environment and stimulate students' learning interest; 2. Infiltrate mathematical culture, mathematical history and mathematical fun to stimulate students' learning enthusiasm; 3. teaching should pay attention to the process of knowledge generation and the essence of knowledge.

Research on Teaching Strategies of Calculus in Senior High School analyzes four problems in the teaching process of calculus: 1. Teachers are not well prepared before class; 2. Not paying enough attention to the problems in teaching and the adoption of appropriate teaching methods; Third, there is no clear understanding of educational modernization; Fourth, teachers can not mobilize the initiative of students to learn. Then the main teaching strategies and auxiliary teaching strategies are formulated. Finally, through empirical research on teaching strategies, the following teaching suggestions are given: (1) Pay attention to constantly updating teaching

strategies and teaching concepts;(2) Attach importance to the role of modern technology in assisting teaching;(3) Attach importance to creating a positive classroom atmosphere.

In the Study on the Application of Calculus in High School Mathematics, it analyzes the rich mathematical thoughts and methods contained in calculus, and shows the wide application of calculus in various fields. Through the questionnaire, the following teaching suggestions are given: In the process of introducing calculus, teachers should explain the development history of calculus to stimulate students' interest in learning; When teachers explain new lessons, they should combine various teaching methods to cultivate students' autonomous learning ability; In the process of explaining formulas and theorems, teachers should not simplify the derivation process, but show the derivation process to students. In the teaching concept, adhere to the teacher's guidance, students subjectivity status.

This paper summarizes the attitude of first-line teachers towards derivative knowledge teaching in senior high schools as follows: teachers are basically based on textbooks and guided by college entrance examination to understand the important and difficult points of derivative teaching. The first-line teachers basically only briefly read the relevant requirements of the new curriculum standards for derivatives, but did not teach in strict accordance with the requirements of the new curriculum standards, but according to the type of college entrance examination questions, textbooks, and exam outline as the benchmark. They believe that as long as students fully grasp the relevant college entrance examination question types and key question types, fully understand the mathematical thoughts and methods contained in the derivative module, and can use them flexibly, they can basically meet the teaching requirements and students can get good results, so they do not pay enough attention to the new curriculum standards.

As for the summary and induction of mathematical thought methods and the penetration of mathematical culture in the teaching process, experienced mathematics teachers will help students summarize mathematical thought methods in the teaching process, because it is better to teach fish to fish, students only master the relevant mathematical thought methods, in order to use flexibly, in the process of solving problems like a fish, in order to learn mathematics well. Although the teachers will summarize the mathematical thinking and methods, but the degree is not the same, some teachers summarized more in-depth, more profound, some teachers just roughly summarized, more obvious.

As for the infiltration of mathematical culture in the teaching process, teachers do not pay much attention to it, thinking that the curriculum time is tight, the task is heavy, there is no time to explain mathematical culture, even if you want to explain, it is a sentence. Most teachers think that the application of derivative teaching is more difficult, because the questions about the application of derivative are comprehensive, very difficult, and have high requirements for students' thinking. It also contains a wealth of mathematical thinking methods, which are the parts that students lack, and mastering these mathematical thinking methods is not an immediate thing, but requires students to constantly sum up and accumulate in the usual learning process.

For the teaching of derivative application, teachers usually focus on explaining typical examples, guiding students to summarize problem-solving methods and ideas, and

assigning homework after class to help students consolidate the mathematical ideas and methods they have learned. That is, to improve students' problem-solving ability by teaching and practicing problems.

In the choice of teaching methods, teachers still use the traditional teaching methods: teaching method or teaching practice combination method. They believe that through the teaching method, the classroom efficiency is high, and enough knowledge can be explained in a limited class. Through the practice method, students can consolidate the content explained by the teacher, so that students can truly grasp the knowledge.

Teachers generally believe that derivative teaching can improve students' core mathematical literacy, such as improving students' mathematical operation, logical reasoning, mathematical abstraction, intuitive imagination and mathematical modeling literacy.

It can be seen that there are problems in the teaching process of teachers: (1) the summary of mathematical thoughts and methods is not deep enough, and the penetration of mathematical culture is not enough; (2) The traditional teaching methods - teaching method and practice method are generally adopted, and they are not good at combining various teaching methods; (3) Not paying enough attention to the new curriculum standards, teaching is based on textbooks and oriented to college entrance examination.

STUDENTS LEARN THE CURRENT STATE OF DERIVATIVES

Students encounter a variety of difficulties in learning derivatives. Common difficulties are summarized as:

(1) The concept is not in place, and the computing power is insufficient. Since the formation of the derivative concept is relatively abstract for students, although the textbook introduces the concept of derivative in the arrangement without using the limit symbol "lim", the derivative concept itself cannot ignore the limit. Therefore, students will have some difficulties and even ambiguity in understanding the definition of derivative. There are also students who learn concepts with little understanding of the method of approximating tangents and therefore fail to understand why the derivative

$f'(x_0)$ is the geometric meaning of the slope of the tangent line at the point $(x_0, f(x_0))$ of the curve $y=f(x)$. In the operation part of derivatives, the derivational formulas of common functions and the derivative formulas of sum, difference, product and quotient of functions are easy for students to remember and confuse. Due to the requirements of class hours in high school and the difference of students' level, some students usually lack training in calculation. At the same time, many students' computing ability is relatively weak, and long-term lack of training will make this problem more and more prominent.

(2) The structure of basic knowledge related to derivatives is not perfect, and derivatives are very closely related to knowledge such as functions learned before. For example, when using the derivative method to find the monotone interval and the maximum value of the function, the students first need to find the domain of the function correctly, and then accurately differentiate and establish the inequality relationship and solve the inequality accurately. It also involves knowledge of sets. These contents are the knowledge that students have already learned in their previous studies. Therefore, this chapter on derivatives is not isolated, it is closely

related to the previous chapters, if students with weak foundation can not skillfully transfer the knowledge learned before, or even have not mastered the knowledge related to functions, inequalities, etc., then it is impossible to solve the derivative problem.

(3) Students do not understand the concept and nature of the derivative, the symbolic definition of the derivative concept is based on the sign of the limit, and the limit symbol is not familiar to students, so they cannot understand the symbolic representation of the derivative well. In addition, the application of derivatives is often carried out in a certain practical background. Due to the low comprehensive ability of mathematics, students cannot accurately or even roughly summarize the essence of mathematics from the background of real life, so they cannot be applied.

(4) There is insufficient internalization of derivative knowledge. In the process of learning derivatives, many students may not immediately understand or accept the content at the beginning, but they have a certain understanding in the subsequent learning and thinking. But this understanding is always superficial, and students don't really make an effort to think about it and make it their own. The learning of knowledge should be remembered in the mind, melted in the blood, portrayed in the soul. If the derivative knowledge is not well internalized in learning, it will inevitably affect the learning effect, and the knowledge will be quickly forgotten.

(5) The lack of accuracy of the examination and the inaccuracy of the examination when doing the examination are the shortcomings of many students. The important reason for this is that students' mathematical thinking is not rigorous and they are not proficient in mastering knowledge. For example, in the process of examination, we can not accurately pick out the key points and find out the hidden conditions. When learning derivatives, if the word problem requires students to extract the mathematical knowledge we need from the complex actual background and information, and to set variables and find relational formulas when solving the problem, then an accurate understanding of the problem is the prerequisite for correct solution. In fact, when students do the question, sometimes use the idea of substitution to set the intermediate variable, but forget in the process of doing the question, so that the final conclusion is not correct and lose marks. Lazy thinking, thinking is not rigorous, which directly leads to problems in examining and doing questions. These are also the main difficulties for students in derivative learning.

(6) Old knowledge influences the learning of derivatives, and when students learn new concepts, they always start with their own cognitive structure and use their own knowledge experience and intuition to understand and distinguish the relationship between the new concept and the original cognitive structure. When learning derivative concepts, students used to learn mathematical concepts that were static, while derivative concepts used static quantities to describe dynamic processes. Understanding the derivative concept requires students to build dynamic processes in their own thinking, and in application, students need to treat them as actionable objects and as a whole. However, the development of students' thinking is still in the immature stage of dialectical thinking. The transition between static and dynamic, process and object can not be well grasped, which directly affects their accurate understanding of the concept of derivative.

In general, high school students are still immature in mathematical cognition. Derivatives give students a headache due to their abstractness and a large number of calculations. Teachers need to carefully study the difficulties students encounter in learning derivatives and seek a breakthrough.

DERIVATIVE TEACHING STRATEGY SUGGESTIONS

Aiming at the teaching strategy of derivatives in senior high school, this paper puts forward the following points.

(1) Attach importance to the creation of appropriate teaching situations, and the new course is important to create teaching situations corresponding to the specific teaching objectives and teaching contents. Therefore, in the teaching process, teachers should combine specific teaching tasks and curriculum teaching objectives to create a real and appropriate teaching environment, so that students can actively apply their existing knowledge to internalize the new knowledge they currently learn, and fully mobilize their subjective initiative in active learning and stimulate a strong interest in learning. In addition, it also enables students to truly appreciate that mathematics is closely linked to our daily life. Therefore, in the teaching of derivative concepts, we should pay attention to creating appropriate teaching situations to inspire students to think and guide students to understand and master the essence of derivative concepts. The core idea of situation teaching is "learning by example and learning by doing".

(2) Attach importance to the role of information technology in assisting teaching, and the new curriculum standard emphasizes "paying attention to the use of information technology and deeply integrating it into the mathematics curriculum". In the era of "Internet +" today, the application of information technology in mathematics classroom is forming a profound impact on mathematics education. In modern mathematics education, information technology has become the main auxiliary tool for teaching. It not only creates valuable resources for teaching, but also provides a platform for teacher-student interaction, student-student communication and man-machine communication. Therefore, contemporary teachers should pay more attention to the flexible use of information technology, so as to optimize teaching activities and improve teaching methods. For example, to create a suitable situation for students to clearly understand new concepts, inspire students to actively explore regular ideas, and guide students to independently collect relevant resources that can solve problems. In this process, teachers should actively accumulate cases of math activities in real life and work, and sum up vivid, interesting, independent and effective teaching methods.

(3) Pay attention to the infiltration of mathematical culture. Mathematics is an important cultural component of human beings, and its content, ideas, methods and language are indispensable components of modern civilization. In the teaching process, teachers should select relevant mathematical culture to explain according to specific teaching content, and then exert the moral education value of mathematical culture, so that students can perceive the process of mathematicians' unremitting exploration of mathematical knowledge. Feel the unremittingly exploring spirit of mathematicians; Let the students get emotional edification in the learning process, mobilize the students' subjective initiative; Let students understand the spirit of mathematics, mathematics thought, mathematics beauty; It can also train students to study mathematics and explore the spirit of mathematics. Therefore, it is necessary for teachers to infiltrate mathematical culture in the teaching process. In this way, students can learn knowledge, understand the mathematical thoughts and methods contained in derivatives, understand the history of mathematicians' exploration of mathematics, and stimulate students to explore and innovate mathematics like mathematicians. It can also fully mobilize students' subjective initiative of active learning, so that students have positive emotions for mathematics learning.

(4) Attach importance to the induction of mathematical thinking and methods

"Knowledge is the body of mathematics, the problem is the heart of mathematics, and mathematical thinking and methods are the soul of mathematics", thus it can be seen that mathematical thinking and methods are very important. The derivative contains many mathematical ideas and methods, such as function and equation, combination of number and form, classification and discussion, transformation and reduction. Professor Zhang Dianzhou pointed out that in calculus, discovering the essence of mathematical ideas is the primary task of teaching. Only when we have a firm grasp of mathematical thinking and methods, can we feel that mathematics learning is actually rule-based, and can we truly feel the happiness of learning mathematics, thus promoting the development of thinking. It is necessary to help students summarize relevant mathematical ideas and methods. Teachers can explain the history of mathematics, interesting mathematics, mathematicians, etc., to let students feel the relevant mathematical ideas and methods.

(5) Constructivism theory emphasizes students' subjective status in learning, and advocates that investigative teaching and cooperative learning should be combined to develop students' autonomous learning ability. The new curriculum standard also emphasizes that teachers should further explore flexible and diverse teaching methods, teach students to learn, and not only limited to the traditional teaching methods - teaching method, teaching and training combination method, but also pay attention to guiding students to conduct independent exploration, cooperation and communication. Therefore, teachers should fully consider the recent development area of students, according to the teaching objectives and learning content, adopt appropriate teaching methods to carry out efficient teaching.

(6) The new curriculum standard focuses on the cultivation of students' mathematics core literacy, and establishes four basic teaching concepts: first, students' development-based, moral education, and improve students' comprehensive literacy; The second is to optimize the course structure, highlight the main line, select the teaching content; Third, grasp the essence of mathematics, inspire students to think, improve classroom teaching; The fourth is to attach importance to process evaluation, focus on students' quality and improve teaching quality, which shows that it is imperative to cultivate students' core mathematical quality.

CONCLUSION

The high school stage is a period of rapid development of students' mathematical thinking ability. The development of students' mathematical thinking not only requires careful guidance from teachers, but also requires the efforts of students themselves. Now it is no longer enough to meet the needs of The Times for talents only by relying on teachers' knowledge teaching. Let students really fall in love with mathematics and be willing to explore the mysteries of mathematics. This idea should not only be infiltrated in the teaching of derivatives, but also in all aspects of mathematics learning and teaching. As the leader of students' learning, the mission of teachers should be explored deeply by every teacher.

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高中导数教与学现状分析

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摘要：高中阶段的导数课程一直是教师教学和学生学习的难点，作为积分和微分的基础知识，导数是大学和高中的连接，导数知识较为抽象，如何和现实取得联系，展现导数知识背后的现实意义是导数教学中要攻克的难点。本文对现阶段高中导数环节的教师教学和学生学习中所存在的现象进行总结分析，为今后的研究提供参考。

关键词：高中数学、导数教学、高中导数

一、问题的提出

于2020年完成最新修订的《普通高中数学课程标准（2017年版2020年修订）》（以下简称新课标）中提出数学课程要体现现代数学的本质，要关注数学与人类社会生活的联系，关注数学与大数据时代下数学发展的新特点并且强调数学教育的立德树人功能，在新课标下，导数作为高考的知识主线之一，在高考中占据着重要地位。导数作为一个研究函数的重要工具，其重要性不言而喻。几乎所有涉及到求解最值的题目，都会使用到导数的思想。由此可见，导数在高中数学中的地位十分重要，于是研究现阶段的导数教与学中存在的问题是十分有意义的。

二、课标中的导数

抽象程度高，学习难度大的导数在高中知识内容中占据很多的篇幅，教师如何在课堂上呈现导数知识才能让学生更好的接受是一项持续研究的主题。在导数的教学中，常见的教学流程是通过平均速率到瞬时速率，在通过区间图像表现出导数为切线的斜率，由此引出导数的概念和几何意义，与其他知识相比导数的知识更显抽象，更需要教师来引导学生纳入知识系统，在课程标准和教学大纲的改革中，导数的相关方面也呈现了不同程度的更新。

2020年，在普通高中数学课程标准(2017年版2020年修订)中的选择性必修这一环节的函数主题中有一元函数导数及其应用。教学建议为通过丰富的实际背景理解函数的概念，掌握运算法则，用导数来研究函数的性质并解决实际问题，课程中包含了微积分的创立与发展，体现出立德树人，数学文化思想，人文思想的教育理念。在史宁中，王尚志等所著的普通高中数学课程标准（2017年版2020年修订）解读中提出高中数学课程核心价值取向为学生发展为本，立德树人，提升素养。B类课程中微积分专题包括极限、导数与微分、定积分、二元函数。此专题的教学建议为重视物理背景，重视数学结果的几何直观，重视概念教学，重视逻辑推理教学。

经过多年来的修改，课标中导数内容也在不断完善，在新课标中尤其强调教育的育人功能，数学的立德树人作用被重视，导数知识方面更是要求实际相结合进行教学。

三、高中导数教师教学现状

□□对于导数教学策略的研究，总结文献中的内容可以看到导数教学教师采取的手段和存在的一些问题。《高中数学“导数及其应用”教学研究》通过对高中学生数学思维发展的特点与教学内容进行研究，给出的教学策略：一是产生式教学策略；二是讲授式教学策略；三是独立学习以及小组学习策略。

《高中微积分教学策略的研究》提出了课堂教学准备策略、主要教学行为策略、辅助教学行为策略。

《高中生导数学习的困难及其教学策略》通过分析学生学习导数所存在的问题，

进而制定了相关教学策略：一、优化学生学习环境，激发学生学习兴趣；二、渗透数学文化、数学史与数学趣事，激发学生学习积极性；三、教学要重视知识的生成过程，重视知识本质。

《高中微积分的教学策略研究》分析了微积分的教学过程中存在四个方面问题：一、教师课前准备不足；二、不够重视教学中存在的问题和合适教学方法的采用；三、没有清晰的认识教育现代化；四、教师不能够调动学生学习的主动性。然后制定了主要教学策略和辅助教学策略，最后通过对教学策略进行实证研究，给出以下的教学建议：（1）重视不断更新教学策略和教学观念；（2）重视现代技术辅助教学的作用；（3）重视营造积极的课堂氛围。

《高中数学中微积分的应用研究》中，分析了微积分蕴含了丰富的数学思想方法，展示了微积分在各个领域广泛的应用。通过调查问卷给出了如下教学建议：教师在引入微积分过程中，需要讲解微积分的发展史，激发学生学习兴趣；教师在讲解新课时，要结合多种教学方式，培养学生的自主学习能力；教师讲解公式、定理过程中，不能简化推导过程，要向学生展示推导过程，促进学生形成系统的数学思想方法；在教学理念上，坚持教师指导，学生主体性地位。

对一线教师对于高中导数知识教学方面所持有的态度进行总结为教师基本上都是以教材为根本，以高考为导向来认识导数教学重难点。一线教师基本上都只是简单阅读过新课标对于导数的相关要求，但是并没有严格按照新课标的要求进行教学，而是根据高考题型、教材、考试大纲为基准来进行教学。他们认为学生只要把相关的高考题型、重点题型完全掌握了，完全理解导数模块所蕴含的数学思想方法，并且会灵活运用，这样就基本上达到了教学要求，学生也能取得不错的成绩，所以对于新课标并没有引起足够的重视。

关于教师在教学过程中对于数学思想方法总结归纳、数学文化的渗透情况，有经验的数学教师，会在教学过程中帮助学生总结数学思想方法，因为授之以鱼不如授之以渔，学生只有掌握了相关数学思想方法，才能灵活运用，在解题过程中如鱼得水，才能学好数学。虽然教师都会总结数学思想方法，但是程度是不一样的，有的教师总结的比较深入，比较深刻，有的教师只是大概总结一下，比较浅显。

而对于教学过程中渗透数学文化的情况，教师们都不太重视，认为课程时间紧，任务重，根本没有时间讲解数学文化，就算要讲解，也是一句带过。大部分教师认为导数的应用教学是比较困难的，因为有关导数应用的题型综合性强，很有难度，对学生思维要求很高。它也蕴含了丰富的数学思想方法，这些是学生所欠缺的部分，而掌握这些数学思想方法不是立竿见影的事情，是需要学生在平时学习过程中不断总结积累的。

对于导数应用的教学，教师们通常重点讲解典型例题，引导学生总结解题方法思路，课后布置作业使学生巩固所学习的数学思想方法。也就是通过讲题练题来提高学生的解题能力。

在教学方式的选择上，教师们教学还是采用传统的教学方式：讲授法或者讲练结合法。他们认为通过讲授法，课堂效率高，在有限的课堂上可以讲解足够多的知识；通过练习法，可以让学生巩固教师所讲解的内容，这样学生才能真正掌握所学知识。

教师们普遍认为导数教学能够提高学生数学核心素养，比如提高学生的数学运算、逻辑推理、数学抽象、直观想象、数学建模素养。

由此可见教师在教学过程中存在的问题：（1）数学思想方法的总结不够深入，数学文化的渗透不够重视；（2）普遍采用传统的教学方式一讲授法和练习法，不善于应用多种教学方式相结合；（3）对新课标不够重视，教学以教材为基础，以高考

为导向。

四、学生学习导数现状

学生学习导数会遇到各种各样的困难常见的困难总结为：

(1) 概念把握不到位，计算能力不足。由于导数概念的形成对于学生来说比较抽象，虽然教科书在编排中在不使用极限符号“ \lim ”的情况下引入了导数的概念，但导数概念本身却不能忽略极限。所以学生在理解导数的定义时会产生一些困难甚至是歧义。还有学生在学习概念时不太明白切线与切线近似的方法，因此不能理解为什么导数 $f'(x_0)$ 的几何含义为曲线 $y=f(x)$ 在点 $(x_0, f(x_0))$ 处切线的斜率。导数的运算部分中，常见函数的导数推导公式以及函数的和，差，乘积和商的导数公式是学生容易记混淆的地方，由于高中课堂课时的要求以及学生水平差异，部分学生通常缺乏计算方面的训练。与此同时本身很多学生的计算能力就比较弱，长期缺乏训练会让这个问题越来越突出。

(2) 导数相关基础知识结构不完善，导数与之前学习的函数等知识联系非常密切。例如，利用导数法求函数的单调区间、最值极值时，首先需要学生正确的求出函数的定义域，然后准确求导并建立不等关系并能准确求解不等式。其中还会涉及到集合的知识。而这些内容是学生在以往的学习中已经学过的知识。因此，关于导数的这一章并不是孤立的，它与前几章息息相关，基础较弱的学生如果不能熟练的把以前所学习的知识熟练的迁移过来，甚至与函数、不等式等有关的知识都未曾掌握，那么解决导数问题更是无从说起。

(3) 学生不理解导数的概念和本质，导数概念的符号定义基于极限的符号，并且极限符号对学生不熟悉，因此无法很好地理解导数的符号表示。另外，导数的应用往往是在一定的实践背景下进行的，由于学生数学综合能力低，导致他们无法从现实生活的背景下对数学的本质进行准确甚至是大概的概括，因此无法应用。

(4) 导数知识内化不足，导数这部分内容在学习过程中，可能有很多学生初始的时候并不立即理解或者接受，但是在后续的学习和思考中又有了一定的理解。但是这些理解始终比较浮于表面，学生并没有真正的努力思考并把它转变为自己的东西。知识的学习应该记忆在脑海里，融化在血液里，刻画在灵魂里。如果学习并没有很好的将导数知识进行内化，那么必然会影响到学习效果，并且知识也会很快被遗忘。

(5) 审题准确性不足，做题时审题不准确是很多学生都有的缺点。发生这件事重要的原因是学生的数学思维不严谨，掌握知识的不熟练。比如说审题过程中不能准确的抠出重点，找出其中的隐含条件。在学习导数时，如果是应用题要求学生中从复杂的实际背景和信息中提炼出我们所需要的数学知识，在求解时需要自己设变量，找关系列式子，那么准确的理解题意是正确解题的前提。实际上，学生在做题时，有时利用换元思想设出中间变量，但在做题过程中就忘了，以致最后结论不正确而丢分。思想上的懒惰，思维上的不严谨，直接导致审题做题都会出现问题。这些也是学生导数学习的主要困难。

(6) 旧知识影响导数的学习，当学生学习新概念时，他们总是从自己的认知结构开始，并利用自己的知识经验和直觉来理解和区分新概念与原始认知结构之间的关系。在学习导数概念时，学生过去学习的数学概念是静态的，而导数概念则是使用了静态量来描述动态变化的过程。理解导数概念要求学生在自己的思维中建立动态过程，在应用中，学生需要将其视为可操作的对象并将其作为一个整体来对待。但是，现阶段学生的思维发展仍处于辩证思维还不成熟的阶段。静态和动态，过程和对象之间的转换无法很好地把握，这直接影响了他们对导数概念的准确理解。

总的来说高中阶段的学生在数学认知方面依旧是不够成熟的，导数由于其抽象性

和大量的计算让学生头痛不已，在学生学习导数中所遇到的困难需要教师仔细研究，寻求突破口。

五、导数教学策略建议

针对高中导数的教学策略，本文提出以下几点。

(1) 重视恰当教学情景的创设，新课标注重要根据具体的教学目标与教学内容，创设与其相恰的教学情境。所以教师在教学过程中，应该结合具体的教学任务与课程教学目标，创造真实适宜的教学环境，才能让学生积极主动地应用自己现有的知识去内化当前所学的新知识，才能充分调动学生积极学习的主观能动性并激发浓厚的学习兴趣。此外，还能使学生真切的体会到数学与我们的日常生活是紧紧联系在一起的。所以在导数概念教学中，要注重创设恰当的教学情境，以启发学生思考，引导学生理解并掌握导数概念的本质。情境教学的核心思想就是“例中学，做中学”。

(2) 重视信息技术辅助教学的作用，新课标强调“注重运用信息技术，将其深度融合到数学课程中”，在“互联网+”时代的今天，信息技术在数学课堂中的应用正在对数学教育形成深远的影响，在现代数学教育中，信息技术已成为教学的主要辅助工具，不但为教学创造了宝贵的资源，而且还为教师学生互动、生生沟通、人机交流提供了平台。所以，当代教师更加应该重视对信息技术的灵活运用，进而优化教学活动，改善教学方式。比如，为学生能够清晰的认识新概念而创造出合适的情境，启发学生积极地探寻符合规律的思路，指导学生自主地搜集能够解决问题的相关资源等。在这个过程中，老师要在实际生活和工作中，通过积极主动地积累数学活动案例，总结出生动有趣、自主有效的教学方式。

(3) 重视数学文化的渗透，数学是人类的重要文化组成，其内容、思想、方法与语言是现代文明不可或缺的组成部分在教学过程中，教师要根据具体的教学内容，选取相关的数学文化进行讲解，进而发挥数学文化的德育教育价值，让学生感知数学家对数学知识不懈探索的过程，感受数学家坚持不懈的探索精神；让学生在学习过程中获得情感陶冶，调动学生学习的主动性；让学生感悟数学精神、数学思想、数学之美；也可以培养学生钻研数学、探索数学的精神。因此教师在教学过程中渗透数学文化就显得非常有必要了。这样既能使学生学到知识，体会导数中所蕴含的数学思想方法，了解数学家探索数学的历程，激发学生像数学家一样去探究和创新数学；又能够充分调动学生积极学习的主观能动性，让学生对数学学习产生积极的情感。

(4) 重视数学思想方法的归纳总结“知识是数学的躯体，问题是数学的心脏，数学思想方法则是数学的灵魂”，由此可见，数学思想方法是非常重要的。而导数中蕴藏了许多数学思想方法，如函数与方程、数形结合、分类讨论、转化与化归等。张奠宙教授指出，在微积分中，发现数学思想的本质是教学的首要任务。我们只有牢牢的掌握了数学思想方法，才能感受到数学学习其实是有章可循的，才能真实的感受到学习数学的快乐，从而促进思维的发展。所以教师在教学过程中，帮助学生总结相关的数学思想方法是非常有必要的。教师可以通过讲解数学史、数学趣事、数学家等来让学生感受相关数学思想方法。

(5) 重视学生自主学习能力的培养建构主义理论强调学生在学习中的主体性地位，并主张探究性教学与合作学习要结合起来，发展学生的自主学习能力。新课标也强调教师要进一步探寻灵活多样的教学方式，要教会学生学会学习，而不能只局限于传统的教学方式一讲授法、讲练结合法，要注重引导学生进行自主探究，合作交流等。因此教师要在充分考虑学生最近发展区的情况下，根据教学目标与学习内容，采用恰当的教学方式进行高效的教学。

(6) 重视学生数学核心素养的培养,新课标着眼于学生数学核心素养的培养，并

确立了四大教学基本理念：一是以学生发展为本，立德树人，提升学生的综合素养；二是优化课程结构，突出主线，精选教学内容；三是把握数学本质，启发学生思考，改进课堂教学；四是重视过程评价，聚焦学生素养，提高教学质量，由此可见培养学生的数学核心素养势在必行。

六、结束语

高中阶段是学生数学思想能力飞速发展的时期，学生的数学思维的开发不仅仅需要教师的细心引导更需要学生本身的努力，现在仅仅依靠教师知识的传授是已经不够满足时代对人才的需要了，教师更应该做的时顺应时代的发展，充分发挥数学的育人功能，让学生真真切切的爱上数学，乐于探索数学的奥秘。不仅仅是在导数的教学中渗透这种思想，在数学学习和教学的方方面面都应该如是，作为学生学习的领路人教师肩负的使命需要每一位教师深究。

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