

# RESEARCH ON THE TRAINING STRATEGIES OF HIGH SCHOOL STUDENTS' MATHEMATICAL COMPUTING ABILITY FROM THE PERSPECTIVE OF CORE LITERACY

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## ABSTRACT

The "General High School Mathematics Curriculum Standards (2017 Edition, 2020 Revision)" proposes that "the core literacy of mathematics subjects is a concentrated reflection of the goals of mathematics curriculum, and also a concentrated reflection of the value of mathematics education" [1]. Among them, mathematical operations, as a part of the core literacy of the mathematics discipline, run through every part of mathematical learning. Whether it is the learning of mathematical knowledge or solving mathematical problems, they cannot be separated from mathematical operations [2]. This article combines its own practical experience to propose the current situation and problems of high school students' mathematical computing ability, analyzes the factors that affect high school students' mathematical computing ability, and then proposes specific strategies to cultivate high school students' mathematical computing ability.

**Keywords:**High school students; Mathematical operation ability; Training strategies.

## INTRODUCTION

Mathematics is a discipline that utilizes symbols and language to study quantity, structure, changes, and spatial models. Through Abstraction and logical reasoning, mathematics reveals the mathematical laws of things and phenomena, which can be seen everywhere in our daily life, and mathematics has become an important tool to solve practical problems. With the rapid development of society, the subject of mathematics has also developed rapidly. Not only have many major mathematical problems within mathematics been solved, but mathematics has also penetrated into all aspects of people's daily lives, creating unprecedented value for society. High school mathematics bears the responsibility of cultivating and strengthening the core literacy of high school students, mainly including mathematical operation ability, logical reasoning ability, mathematical modeling ability, intuitive imagination ability, data analysis ability, and mathematical abstraction ability. Among them, the most crucial and important is the ability to perform mathematical operations, which directly affects the quality of students' grades and indirectly affects the improvement of logical thinking ability.

## THE CURRENT SITUATION OF MATHEMATICAL COMPUTING ABILITY OF HIGH SCHOOL STUDENTS

In daily mathematics teaching practice, it has been found that high school students commonly face problems such as inadequate mastery of basic mathematical knowledge, inadequate training in basic operations, inability to correctly understand the meaning of problems, inadequate examination of problems, resulting in deviations in answers, frequent errors in mathematical operations, and chaotic problem-solving processes. When I am tutoring high school students on vacation to learn mathematics, I often hear students say things like this: they can understand what the teacher is saying in class, but in homework or classroom training, they always do wrong problems and the calculation steps are not clear, they cannot flexibly grasp

the basic skills of calculation, they do not know how to write to explain the questions asked in the questions clearly, and sometimes they may make mistakes in calculation due to carelessness. In the end, they lost their interests in learning mathematics, felt uncomfortable when they saw it, and sometimes even feared and disliked it. In response to this situation, the author conducted in-depth communication with students and frontline teachers, summarized some factors that affect the mathematical calculation ability of high school students today, and proposed corresponding training strategies for these factors. This study aims to effectively improve the mathematical computing ability of high school students and contribute to the research on strategies for cultivating their mathematical computing ability.

## **FACTORS INFLUENCING HIGH SCHOOL STUDENTS' MATHEMATICAL COMPUTING ABILITY**

### **The Influence Of Students' Original Foundations Of Mathematics On Their Computing Ability**

The influence of students' original foundations of mathematics on their mathematical operation ability is enormous. It can be found that if a student's foundations of mathematics is relatively weak, then his operation ability is also relatively weak. On the contrary, if a student has a good foundations of mathematics, his computing ability will also be good. In the teaching practice, it is found that some students can not learn and understand the knowledge in high school, but the previous foundations of mathematics is too weak, which affects the learning of high school mathematics. The consistency of mathematics learning is relatively strong, just like a chain, which must be connected in series one after another to prevent the chain from falling off. In addition, with the continuous increase and deepening of knowledge, students' foundations of mathematics will continue to weaken, and of course, their computing ability will also weaken. For example, when explaining the definition of logarithm in Chapter 4, Section 3 of Volume 1 of High School Mathematics Compulsory Course, students should understand that there is a conversion relationship between logarithm and exponent:  $a^x=N \Leftrightarrow x=\log_a N$  when  $a > 0, a \neq 1$ . If students find it difficult to convert or even understand, it will inevitably have a huge impact on their subsequent mathematical learning. High school mathematics often uses graphics and computing together. Students' lack of foundations of mathematics will lead to logic confusion, unclear algorithm and other problems, and then their computing ability will naturally be low. If students do not have a solid foundations of mathematics, they cannot flexibly use various knowledge points in the process of problem solving, and the final calculation result is bound to be wrong. Therefore, the students' original foundations of mathematics has a greater impact on the development of their computing ability.

### **The Impact Of Cognitive Structure On Computational Ability**

Cognitive structure, in simple terms, refers to the knowledge structure in students' minds, which can also have a huge impact on the development of students' mathematical computing abilities, enabling them to absorb the nutrients of high school mathematics knowledge with the support of past learning experience. When students' cognitive structure is not perfect enough, problems such as knowledge ambiguity, forgetting, and confusion may occur during the calculation process. At this time, when students face a new knowledge point, they will be confused and have no way to start. The mathematical cognitive structure of students is a constantly developing and changing process. With the continuous growth of cognitive structure, students can better understand and master new mathematical knowledge, thereby continuously expanding their mathematical abilities. A stable cognitive structure enables students to more flexibly apply mathematical knowledge to solve various specific problems. Therefore, teachers should pay special attention to cultivating students' cognitive structure in daily teaching, laying a solid foundation for their mathematical learning and problem-solving. Through guidance,

teachers can help students establish a framework for connecting and organizing mathematical concepts, while encouraging students to think and explore in order to promote their cognitive development and improve their mathematical abilities. In short, students' mathematical cognitive structure is a process of continuous growth and evolution, in which teachers play an important role and should actively cultivate students' cognitive structure to promote their mathematical learning and development.

### **Lack Of Mathematical Thinking Methods**

The development and application of mathematics cannot be separated from the interaction between mathematical ideas and methods. Mathematical thinking is the guiding ideology for establishing mathematical knowledge and solving problems, including various ideas, such as modeling, optimization, reduction, classification, holistic, numerical and graphic integration, and transformation. These ideas can guide us to understand and handle mathematical problems from different perspectives and levels, helping us derive mathematical conclusions and solve practical problems. At the same time, mathematical methods are the ways, means and approaches we adopt in the specific mathematical process, such as the substitution method, method of undetermined coefficients, parameter method, construction method, special value method, etc. These methods provide us with specific steps and techniques for solving problems, helping us solve mathematical problems more efficiently. Mathematical ideas and methods are closely related, supporting and supplementing each other. When we emphasize guiding ideology, we refer to it as mathematical thinking, which guides our perspective and approach to thinking about problems; When we emphasize the operational process, we call it mathematical methods, which provide us with specific problem-solving steps and techniques [3]. By utilizing various mathematical ideas and methods in a reasonable manner, we can better understand and handle mathematical problems, improve the efficiency and accuracy of problem-solving. However, some high school students lack the correct use of mathematical ideas and methods in the problem-solving process. This may lead to a lengthy, complex, and even incorrect problem-solving process. Therefore, teachers should focus on cultivating high school students' ability to use mathematical thinking and methods. Through guidance and training, help students understand and master various mathematical ideas and methods, enabling them to flexibly apply them to practical problems. At the same time, students should also gradually improve their application ability of mathematical ideas and methods through continuous practice, so that they can be more proficient in the process of problem-solving.

### **Education Environment**

In recent years, the party and the state have advocated quality education, but under the pressure of the college entrance examination, China's education still belongs to teaching to the test, with students' achievements as the goal. In the recruitment work, school administrators use student grades as the evaluation criteria and select the best candidates for admission. They also use students' grades as recruitment promotion to attract high-quality students; In daily teaching work, due to the pressure of pursuing higher education, most teachers focus on how to improve students' grades. They spend more time explaining textbook knowledge and delving into past years' college entrance examination questions, making it difficult to have the energy to think about how to improve students' mathematical core literacy. In addition, during the research process, it was found that most teachers choose to skip questions that are very complex in the calculation process when explaining test questions, and tell the students to save time by asking them to complete the calculations themselves after class. The calculation process is very simple and there is no need to pay too much attention in class; In home school collaborative work, parents pay more attention to their children's grades, and when talking to teachers, they ask more about their children's scores and rankings, but rarely pay attention to the teacher's lecture

content; In the daily learning process of students, due to various pressures, the so-called core mathematical literacy that is not related to the exam content will not take the initiative to learn, and more time is spent wandering in the "sea of questions". With such a 'unity of mind' approach, it is naturally difficult to implement the development of core mathematical literacy.

### **Teachers Themselves Do Not Attach Sufficient Importance To Mathematical Computing Abilities**

In a relatively compact curriculum, teachers often place more emphasis on the reasoning process while teaching, while neglecting the computational process of the questions. The teaching time in high school is relatively tight and the workload is relatively heavy, so some teachers may only explain the problem-solving ideas and methods of the problem, but they may not explain the process of problem calculation in a timely manner. In this situation, students are influenced by the teacher and neglect the calculation process. On the other hand, due to the lack of a complete problem-solving process, they do not know where they have made mistakes and are unable to correct their mistakes in a timely manner, resulting in a continuous decline in their computational ability. Some teachers do not attach great importance to the problems that arise in students' calculation process, often believing that they are caused by their carelessness. As long as students are careful enough, they will not have any problems again. They also assume that as long as students learn to understand the problem method and calculation process, there will not be too many problems, so they do not provide sufficient training and guidance in calculation. In addition, some teachers rarely penetrate mathematical thinking and methods into students during the teaching process. Teachers only focus on learning knowledge, rarely systematically summarize mathematical thinking and methods, and neglect the learning of mathematical thinking and methods. Over time, students' computational abilities can be imagined.

## **STRATEGIES FOR CULTIVATING HIGH SCHOOL STUDENTS' MATHEMATICAL COMPUTING ABILITIES**

### **Guide Students To Correctly Understand And Memorize Mathematical Concepts, Formulas, And Theorems**

Mathematical concepts, formulas, and theorems are the foundation of mathematical learning and a necessary factor for accurate mathematical operations. Therefore, as a mathematics teacher, we should guide students to correctly understand and memorize mathematical concepts, formulas, and theorems. Firstly, mathematics teachers must guide students in understanding theorems and formulas related to mathematical operations, clarify the conditions and scope of the formulas used, thoroughly understand the essential attributes of concepts, and master the regularity of mathematical knowledge<sup>[4]</sup>. For example, when using the first  $n$  terms of the Arithmetic progression and the formula, you must first understand the meaning of each element in the formula, and then you can use it accurately. Secondly, mathematics teaching must require students to memorize necessary mathematical concepts, formulas, theorems, and commonly used conclusions. This requires teachers to carefully design and improve students' ability to remember formulas, pay attention to teaching methods of memory, and help students form learning methods and memorization methods that help them remember some commonly used calculation results and properties. For example, in high school mathematics, there are formulas related to the operations of "0" and "1" ( $\sin^2 x + \cos^2 x = 1$ ,  $x^0 = 1$ ,  $\log_x x = 1$ ,  $\log_x 1 = 0$ ). In the process of mathematics learning, enabling students to master some basic knowledge required for the calculation process can not only improve their accuracy of calculation, but also improve their speed of calculation.

### **Cultivate Students' Good Mathematical Calculation Habits**

Cultivating students' good mathematical calculation habits is another necessary factor for conducting mathematical operations and should also attract the attention of teachers. First of all, teachers should cultivate students' habit of carefully examining questions before doing them, so that students can accurately extract the known conditions, numbers and hidden conditions in the questions <sup>[4]</sup>. When students encounter mathematical problems related to computation again, they can first think of carefully reading the meaning of the problem, accurately positioning the calculation direction of the problem, and laying the foundation for subsequent problem-solving steps; Secondly, teachers need to cultivate students' habit of carefully writing the problem-solving process, allowing them to gradually develop standardized writing habits in daily teaching processes, and try to ensure that there are no low-level errors such as number or symbol errors in the calculation process. At the same time, teachers should cultivate students' patience with mathematics, ensuring that they are not impatient and think calmly when encountering difficult problems, not proud when encountering simple problems, and take them seriously. The writing process should be concise and logical, and the calculation process on the manuscript should also be clearly written, so as to facilitate rechecking after the calculation is completed; Finally, teachers need to cultivate the habit of students carefully checking after completing calculations. Many students rush to hand in their papers after solving problems, which is a bad habit. In daily teaching, teachers should cultivate the habit of students returning to check the calculation process and results after completing problems, such as using special assignment and estimation methods. Therefore, in order to effectively cultivate the mathematical calculation ability of high school students, teachers must take students as the main body and pay attention to cultivating good mathematical calculation habits of students.

### **Emphasize The Cultivation Of Mathematical Thinking Methods**

Mathematical thinking methods are the essence and soul of mathematics, playing an important role in the formation of students' cognitive structure. It is a bridge that transforms mathematical knowledge into mathematical abilities, helping students apply the knowledge they have learned to solve problems. At the same time, mathematical thinking methods are an important carrier for cultivating students' good mathematical thinking qualities. In the process of solving mathematical problems, each question requires the use of appropriate thinking methods. Therefore, in teaching, teachers should pay attention to the teaching of mathematical thinking methods, penetrate and strengthen students' understanding of mathematical thinking methods. Students should also summarize the thinking methods used in solving each problem and cultivate the awareness of using mathematical thinking methods to optimize operations. Through the guidance of teachers and the efforts of students, students can better solve problems with mathematical thinking methods, and improve the effect and accuracy of problem solving. This cultivates students' understanding and application ability of mathematical thinking methods, which helps them to apply the knowledge they have learned more flexibly and efficiently in mathematical learning <sup>[3]</sup>. Especially for error prone problems, it is necessary to strengthen the infiltration of mathematical thinking methods, so that students can learn to solve problems from the essence of mathematics.

### **Reasonable Selection Of Textbooks And Teaching Aids**

As of 2006, there were 6 sets of standard experimental textbooks for mathematics curriculum in ordinary high schools. Among them, the People's Education Press ordinary high school curriculum standard experimental textbook "Mathematics" (Version A) reflects the foundational, contemporary, typical, and acceptable nature of the textbook. The content arrangement should be tailored to students' characteristics, and be close to the requirements of

the curriculum standard in terms of foundational and acceptable aspects. It inspires students to actively think, prompts key points, and helps deepen students' understanding of the content; The People's Education Press Ordinary High School Curriculum Standard Experimental Textbook "Mathematics" (Version B) pays attention to showcasing the process of knowledge occurrence and development as well as internal practice, promoting students' independent exploration and reflection on the essence of mathematics, paying attention to connecting with middle school curriculum, reviewing old knowledge and learning new things, and smoothly transitioning from middle school to high school. It encourages students to use modern information technology to help them understand concepts and form spatial concepts; Mathematics, the standard experimental textbook for senior high school curriculum published by Beijing Normal University, pays attention to the foundation of mathematics curriculum, inherits the advantages of traditional mathematics textbooks, improves and develops some traditional content processing methods, and develops many vivid curriculum resources to stimulate students' interest in learning, expand their mathematical vision, and improve their mathematical culture; The experimental textbook "Mathematics" published by the Jiangsu Education Press for ordinary high school curriculum standards has a shallow entrance, deep meaning, and is fundamental, interesting, and hierarchical. It pays attention to the internal connections between mathematical knowledge, which is difficult to be appropriate and leaves a relatively broad space for teachers; The ordinary high school curriculum standard experimental textbook "Mathematics" edited by Minyou Qi from Hubei Education Publishing House pays attention to the role of modules and topics in the overall mathematics curriculum in the arrangement of content structure and knowledge system, and the positioning of teaching content is accurate; The experimental textbook "Mathematics" for high school curriculum standards, edited by Jingzhong Zhang and Minzhong Chen from Hunan Education Publishing House, has innovative content structure and presentation methods. The introduction and application of situations are relatively clear and smooth, leaving a large space for students to actively learn overall <sup>[1]</sup>. Each region can reasonably choose textbooks and corresponding tutoring materials that are suitable for students' development based on their actual situation. When choosing tutoring materials, it is not advisable to be too difficult or too easy. Being too difficult can undermine students' confidence in mathematics learning, and if it is too easy to achieve teaching objectives, students should choose exercises that can be completed through hard work.

### **Pay Attention To Cultivating The Professional Qualities Of Mathematics Teachers**

In the teaching process, teachers should adhere to the teaching principle of giving students a glass of water and having a bucket of water themselves. Therefore, in order to cultivate excellent students, teachers must improve their professional literacy <sup>[2]</sup>. Firstly, it is necessary to accurately grasp relevant mathematical knowledge, such as mastering the basic concepts, formulas, properties, etc. of mathematical operations, and be able to proficiently distinguish the similarities and differences between various concepts and principles. Secondly, teachers should also possess the basic skills required for mathematics teaching, such as fluent, coherent, well prepared, vivid and interesting language, the ability to correctly use terminology, use vocabulary understood by students, and accurately regulate intonation, speed, facial expressions, gestures, and other organic coordination; Board writing should be well arranged, color coordinated, scientifically reasonable, organized, and concise, which can stimulate students' imagination and absorption of teaching content, stimulate their interest, and concentrate their attention; Classroom questioning should be carefully designed, student-centered, and the questions asked should be carefully considered, with a focus on being few but precise; Be good at creating corresponding problem situations for students based on their cognitive level and selecting appropriate teaching models; Reasonable use of various

multimedia assisted teaching methods. The appropriate use of these basic teaching skills can help teachers improve classroom efficiency and effectively promote the development of students' mathematical computing abilities. At the same time, in the new era, every teacher should establish the concept of lifelong learning, continuously improve their professional literacy, so that they can keep up with the pace of education and provide a continuous source of motivation for students' development<sup>[2]</sup>.

## CONCLUSION

In summary, the main body of cultivating high school students' mathematical calculation ability lies in the students themselves. Students need to attach great importance to the cultivation of their core literacy, learn to fundamentally improve their mathematical calculation ability, and on the other hand, it also needs to attract the attention of schools and teachers. In daily classroom teaching, actively guide students to master basic calculation ability, flexibly use rich teaching methods, and improve teaching effectiveness to help students master the corresponding problem-solving ideas and methods, and during the consolidation process after class, teachers should also leave sufficient time for students to train their mathematical calculation abilities, in order to comprehensively cultivate students' mathematical calculation abilities.

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## 核心素养视角下高中生数学运算能力的培养策略研究

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摘要:《普通高中数学课程标准(2017年版2020年修订)》中提出“数学学科核心素养是数学课程目标的集中体现,也是数学育人价值的集中体现”<sup>[1]</sup>。其中,数学运算作为数学学科核心素养的一部分,贯穿于数学学习的每个部分,无论是数学知识的学习还是解决数学问题,都离不开数学运算<sup>[2]</sup>。本文结合自身的实践经验,提出当前高中生数学运算能力的现状及存在的问题,分析出影响高中生数学运算能力的因素,进而提出培养高中生数学运算能力的具体策略。

关键词:高中生;数学运算能力;培养策略

## 一、引言

数学是一门利用符号和语言研究数量、结构、变化和空间模型的学科。通过抽象化和逻辑推理的方法,数学揭示了事物和现象的数理规律,这些规律在我们的日常生活中随处可见,并且数学也成为解决实际问题的重要工具。随着社会的快速发展,数学学科也得到了迅猛发展,不仅数学内部的许多重大数学问题得以解决,而且数学也渗透到人们日常生活的方方面面,为社会创造了空前的价值。高中数学承担着培养和强化高中生核心素养的责任,主要包括数学运算能力、逻辑推理能力、数学建模能力、直观想象能力、数据分析能力和数学抽象能力。其中,最关键且最重要的是数学运算能力,它直接影响着学生成绩的好坏,间接影响着逻辑思维能力的提升。

## 二、高中生数学运算能力的现状

在日常数学教学实践中发现高中生普遍存在的问题是:数学基本知识掌握不到位,基本运算训练不达标,不能正确理解问题的含义,审题不细导致答题出现偏差,数学运算过程中常出现一看就会一做就错的情况,解题过程混乱等。笔者假期辅导高中生学习数学时,常常听到学生说这样的事情:上课时都能听懂老师所讲的内容,但在课后作业或是在课堂训练中,总是做不对题并且运算步骤不清晰,不能灵活掌握运算基本技能,不知道要如何书写才能阐述清楚题目中所问的问题,有时候还会出现本来会的题却由于粗心而计算错,最后使得自己失去了数学学习的兴趣,看到数学就不适,有时甚至畏惧和讨厌数学。

针对这一现状,笔者向学生们和一线老师们进行了深层次的沟通,总结出了影响当今高中生数学运算能力的一些因素,并针对这些因素提出了相应的培养策略。本研究希望能够切实地提高高中生的数学运算能力,同时为高中生数学运算能力的培养策略研究添砖加瓦。

## 三、影响高中生数学运算能力的因素

## 1. 学生原有数学基础对运算能力的影响

学生原有的数学基础对于数学运算能力的影响是巨大的,可以发现,如果一个学生的数学基础相对薄弱,那么其运算能力也就相对薄弱。反之,如果一个学生的数学基础很好,那么其运算能力也会很好。在教学实践中发现,有些学生其实并不是高中的知识学不会、理不清,而是之前的数学基础太过薄弱,以至于影响高中数学的学习。数学学习的连贯性比较强,就如同串链条,必须一环紧接着一环串联,才不会掉链子,另外随着所学知识的不断增多、加深,学生的数学基础会不断减弱,当然,他们的运算能力也会随之减弱。例如,在讲解高中数学必修第一册第四章第三节对数的定义时,学生应当理解对数和指数间有这样的转换关系:

当 $a > 0, a \neq 1$ 时,  $a^x = N \Leftrightarrow x = \log_a N$ 。如果学生很难转换甚至理解不了,那么必然对接下来的数学学习产生巨大的影响。高中的数学经常会将图形和计算等方面混合使



用，学生的数学基础不足就会导致逻辑混乱，不清楚算法等问题的出现，那么运算能力自然就会低下。学生的数学基础不扎实，就不能在做题过程中灵活运用各个知识点，最终运算结果必然也是错误的。因此，学生原有的数学基础对他们运算能力的发展影响较大。

## 2. 认知结构对运算能力的影响

认知结构，简单来说是学生头脑中的知识结构，它也会对学生数学运算能力的发展产生巨大的影响，使学生在过去学习经验加持下汲取高中数学知识营养。当学生的认知结构不够完善时，在运算过程中便会出现知识模糊、遗忘、混淆等问题的发生，此时当学生面对一个新的知识点时便会自乱阵脚，无从下手。学生的数学认知结构是一个不断发展和变化的过程，随着认知结构的不断壮大，学生可以更好地理解和掌握新的数学知识，从而不断扩展自己的数学能力。一个稳固的认知结构使学生能够更加灵活地运用数学知识来解决各种具体问题。因此，教师在日常的教学应特别注重培养学生的认知结构，为他们的数学学习和问题解决奠定坚实的基础。通过指导和引导，教师可以帮助学生建立连接和组织数学概念的框架，同时鼓励学生思考和探索，以促进他们的认知发展和数学能力的提升。总之，学生的数学认知结构是一个不断成长和演变的过程，教师在其中起着重要的角色，应积极培养学生的认知结构，以促进他们的数学学习和发展。

## 3. 数学思想方法的欠缺

数学的发展和应用离不开数学思想和数学方法的相互作用。数学思想是建立数学知识和解决问题的指导思想，包括多种思想，如建模思想、最优化思想、化归思想、分类思想、整体思想、数形结合思想、转化思想等。这些思想能够引导我们从不同的角度和层面去理解和处理数学问题，帮助我们推导数学结论和解决实际问题。同时，数学方法是我们在具体的数学过程中采用的方式、手段和途径，如换元法、待定系数法、参数法、构造法、特殊值法等。这些方法为我们提供了解题的具体步骤和技巧，帮助我们更加高效地解决数学问题。数学思想和数学方法是密切相关的，它们相互支持和补充。当我们强调指导思想时，我们称之为数学思想，它指导我们思考问题的角度和思路；当我们强调操作过程时，我们称之为数学方法，它提供给我们具体的解题步骤和技巧<sup>[3]</sup>。通过合理运用各种数学思想和方法，我们能够更好地理解和处理数学问题，提高解题的效率和准确性。然而，一些高中生在解题过程中缺乏正确的数学思想和方法的使用。这可能导致解题过程冗长、复杂，甚至错误。为此，教师应注重培养高中生的数学思想和方法的使用能力。通过指导和训练，帮助学生理解和掌握各种数学思想和方法，使他们能够灵活运用到实际问题中。同时，学生也要通过不断的练习和实践，逐步提升数学思想和方法的应用能力，使其能够更加熟练地运用到解决问题的过程中。

## 4. 教育环境

近年来，党和国家倡导素质教育，但在中高考的压力下，我国教育仍然属于应试教育，一切以学生成绩为目标。在招生工作中，学校管理者以学生成绩高低作为评判标准，择优录取，同样也会以学生成绩作为招生宣传来吸引优质生源；在日常教学工作中，基于升学压力，大多数教师把工作重心放到如何提升学生成绩上，较多时间用于讲解教材知识和钻研历年中高考真题，很难有精力在去思考如何提高学生的数学核心素养，另外，在调研过程中还发现，大多数教师在讲解试题的过程中遇到了运算过程非常复杂的题目也选择跳过，并告诉学生为了节省时间请同学们课后自己去完成，运算过程很简单，课堂上不需要过分关注；在家校合作工作中，父母更多关注的也是孩子的成绩高低，与教师聊起自家孩子更多询问的是孩子分数和排名情况，很少关注

教师讲课内容；在学生日常学习过程中，由于各方面的压力，所谓与考试内容不相关的数学核心素养也不会主动花时间去了解，更多时间是遨游在“题海”中。如此“上下齐心”，数学核心素养的发展自然很难落到实处。

#### 5.教师自身没有对数学运算能力有着足够的重视

在课程相对紧凑的情况下，教师往往在授课的时候更加重视推理过程，而对题目的运算过程相对而言较为轻视。高中教学时间相对紧凑，任务量也相对来说比较重，所以有些教师可能只讲解题目的解题思路和方法，而对于运算过程选择一笔带过，对题目运算的过程讲解地并不到位。学生在这种情况下一方面受到了教师的影响忽视运算过程，另一方面由于得不到完整的解题过程使得自己不知道自己到底错在了哪里，没有能够对自身错误的地方及时纠正，才造成了运算能力不断下降。一些教师对学生运算过程方面出现的问题也并没有十分重视，往往认为这是学生一时的粗心大意而造成的，只要学生足够的细心就不会再出问题，并且默认只要学生学会了解题方法运算过程就不会有太大问题，所以并没有在运算方面给予学生以足够的训练和指导。另外，还有一些教师在教学过程中很少向学生渗透数学思想方法，教师只注重知识的学习，很少对数学思想方法进行系统的归纳总结，忽视数学思想方法的学习。久而久之，学生的运算能力可想而知。

### 四、高中生数学运算能力的培养策略

#### 1.引导学生正确理解并熟记数学概念、公式和定理

数学概念、公式和定理是数学学习的基础，也是准确进行数学运算的必要因素，因此，作为数学教师，应该引导学生正确理解并熟记数学概念、公式和定理。首先，数学老师必须要指导学生理解和数学运算相关的定理及公式，要明确所用公式的使用条件和范围，要彻底理清清楚概念的本质属性，掌握数学知识的规律性<sup>[4]</sup>。例如，运用等差数列前 $n$ 项和公式时，必须先理解公式中的各个要素所代表的含义，然后才能准确运用。其次，数学教必须要要求学生熟记必要的数学概念、公式、定理以及常用结论，这就需要教师精心设计提升学生对公式的记忆能力，注意记忆的教学方法，帮助学生形成自身牢记一些常用运算结果和常用性质的学习方法和记忆手段。例如，比如高中数学中有关“0”和“1”运算公式（ $\sin^2 x + \cos^2 x = 1$ ， $x^0 = 1$ ， $\log_x x = 1$ ， $\log_x 1 = 0$ ）。在数学学习的过程中，让学生掌握运算过程所需要的一些基本知识，不仅可以提高学生运算的准确率，而且可以提高他们运算的速度。

#### 2.培养学生良好的数学运算习惯

培养学生良好的数学运算习惯是进行数学运算的另一必要因素，也应该引起教师的注意。首先，教师要培养学生做题之前认真审题的习惯，使得学生能够准确提炼出题中的已知条件、数字和隐藏条件等<sup>[4]</sup>。当学生再次遇到计算类的数学问题时，能够首先想到要仔细阅读题意，准确定位题目的计算方向，为后续的解题步骤铺垫思路；其次，教师需要培养学生认真书写解题过程的习惯，在日常教学过程中让学生慢慢地养成规范的书写习惯，尽量保证在运算过程中不要出现数字或者符号错误等低级错误。同时，教师要培养学生对待数学的耐心，做到让学生遇到难题不急躁、冷静思考，遇到简单题不骄傲，认真对待，简洁地书写过程，逻辑清晰，稿纸上的演算过程也要清楚地书写，以便于运算结束之后进行复查；最后，教师需要培养学生在运算结束后认真检查的习惯，很多学生在解题结束后就着急交卷，这是一种不好的习惯，教师在日常教学过程中就应该培养学生完成解题后回头去检查运算过程和运算结果的习惯，比如可以采用特殊赋值法和估计法等。因此，要想切实培养高中生的数学运算能力，教师必须以学生为主体，注重培养学生们良好的数学运算习惯。

#### 3.重视数学思想方法的培养

数学思想方法是数学的精髓和灵魂，对学生认知结构的形成具有重要作用。它是将数学知识转化为数学能力的桥梁，帮助学生运用所学知识解决问题。同时，数学思想方法是培养学生良好数学思维品质的重要载体。在解决数学问题的过程中，每道题都需要运用适当的思想方法。因此，在教学过程中，教师应注重数学思想方法的教学，渗透和强化学生对数学思想方法的认识。学生也应总结每道题在求解过程中运用了哪些思想方法，培养利用数学思想方法优化运算的意识。通过教师的引导和学生的努力，学生能更好地应用数学思想方法解决问题，提高解题的效果和准确性。这样培养学生对数学思想方法的认识和运用能力，有助于他们在数学学习中更加灵活和高效地运用所学知识<sup>[3]</sup>。特别对于易错题，更应该加强数学思想方法的渗透，使学生从数学本质上学会解决问题。

#### 4.合理选择教材和教辅资料

截止到2006年，普通高中数学课程标准实验教科书有6套。其中，人教版普通高中课程标准实验教科书《数学》（A版）体现教材的基础性、时代性、典型性和可接受性，内容安排注意适应学生特点，在基础性和可接受性上贴近课程标准的要求，启发学生主动思考，提示关键所在，有助于加深学生对内容的理解；人教版普通高中课程标准实验教科书《数学》（B版）注意展现知识的发生发展过程以及内在练习，促进学生自主探索、思考数学本质，注意与初中课程衔接，温故知新，平稳地由初中向高中过渡，鼓励学生使用现代信息技术，帮助学生理解概念和形成空间概念；北师大版普通高中课程标准实验教科书《数学》注重数学课程的基础性，继承了传统数学教材的优点，对某些传统内容的处理方式有所改进和发展，开发了不少生动的课程资源，以激发学生的学习兴趣和拓展其数学视野，提高其数学文化修养；苏教版普通高中课程标准实验教科书《数学》入口浅、寓意深，具有基础性、趣味性和层次性，注意数学知识之间的内在联系，难以得当，为教师留有较广阔的空间；湖北教育出版社齐民友主编的普通高中课程标准实验教科书《数学》在内容结构与知识体系的安排上注意模块和专题在整个数学课程中的作用，教学内容定位准确；湖南教育出版社张景中、陈民众主编的普通高中课程标准实验教科书《数学》在内容的结构安排和呈现方式颇具新意，情境的引入和运用较为清晰流畅，整体上为学生主动学习留出了较大的空间<sup>[1]</sup>。各地可以根据学生实际情况合理的选择适合学生发展的教材及其相应的辅导资料。选择辅导资料时不宜过难或者过易，过难会打击学生数学学习的自信心，过易达不到教学目标，应该选择那些学生通过努力便可以完成的习题。

#### 5.注重培养数学教师的专业素质

在教学过程中，教师应该本着要给学生一杯水，自己需要有一桶水的教学原则，因此教师想要培养优异的学生，那么教师必须提升自身的专业素养<sup>[2]</sup>。首先，必须准确掌握相关的数学知识，比如掌握数学运算的基本概念、公式、性质等，并且能够熟练辨别各种概念和原理之间的相同点与不同点。其次，教师还应当具备数学教学所需的基本技能，比如：语言流畅、连贯、准备充分、生动有趣，能正确运用术语，使用学生理解的词汇，准确调控语调、语速、表情、手势等有机的配合；板书要布局得当，色彩协调，科学合理，条理清晰，思路简洁，能够带动学生对教学内容的想象和吸收，而且能够激发学生兴趣，集中学生注意力；课堂提问要精心设计，做到以学生为中心，反复推敲提问的问题，做到少而精；善于根据学生的认知水平，为学生创设相应的问题情境，选用合适的教学模式；合理使用各种多媒体辅助教学等。这些基本教学技能的恰当使用，可以帮助教师提高课堂效率，很好地促进学生数学运算能力的发展。同时，在新时代的今天，每位教师都要做到树立终生学习的理念，不断提高自身的专业素养，使自己能够紧跟教育的步伐，为学生的发展提供源源不断的动力<sup>[2]</sup>。

## 五、结论

综上所述，对高中生数学运算能力的培养主体在于学生本身，学生需要高度重视自身核心素养的培养，学会从根本上提高数学运算能力，另一方面也需要引起学校和教师重点关注，在平时的课堂教学中，积极引导學生掌握基本运算能力，灵活运用丰富的教学方法，提高教学效果，帮助学生掌握相应的解题思路和方法，在课后巩固的过程中，教师也应该给学生留有充足的时间来进行数学运算能力的训练，做到全方位培养学生的数学运算能力。

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