

# Statistical analysis of ninth grade students' math scores—Take a middle school in Zhangqiu District as an example

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**Abstract:** The teaching reform based on the core quality of mathematics is the inevitable trend of the classroom teaching reform. It is particularly important to help students overcome difficulties in mathematics study and find a suitable learning methods to help students to enter a higher education smoothly. Through the conclusion, the corresponding teaching strategies are proposed to help students improve their math performance and reduce the pressure of students to study.

**Keywords:** ninth grade; math score; math test paper; polarization

## 1. Research background

According to the Outline of the National Medium-and Long-term Education Reform and Development Plan (2010-2020), the core task of education reform is to improve the quality of education and realize the all-round development of quality-oriented education and the balanced development of compulsory education. In the process, the elaboration on compulsory education specifically mentions that it needs to pay attention to the needs and health of children. In the teaching process, it is not only necessary to cultivate students' good learning habits and pay attention to stimulate students' interest in learning, but also pay more attention to students' physical and mental health. The compulsory education mathematics curriculum standard also clearly pointed out that the compulsory education stage of mathematics curriculum is the basis of cultivating citizen quality education, mathematics education is not only to face all students, but also pay attention to the importance of students' personality development, make everyone can get valuable mathematics, finally realize different individuals get different development in mathematics. "China education modernization 2035" also points out that cultivating morality, intelligence and physique comprehensive development of socialist builders and successors is the fundamental task of the education work, and education modernization need to pay more attention to good first, comprehensive development, for everyone, according to their aptitude, finally achieve the goal of balanced development of compulsory education quality. However, there are many problems in the math scores of the current grade 9 students, and the problems are gradually increasing. Most students think that learning mathematics is just for college entrance examination and employment, and they do not fully master the basic knowledge and skills in the learning process. Facing all students, promoting the all-round development of students is the core content of curriculum education reform, but the problems of mathematics performance violate the basic concept of mathematics curriculum standards, and have a serious impact on the high-quality and balanced development of compulsory education [1].

Therefore, it is very necessary to carry out the research of the ninth grade mathematics performance. Ninth grade students should not only face the challenge of the high school entrance examination, but also face the critical period and sensitive period of students' growth and development. Therefore, teachers should pay attention to students' math scores and help students establish correct world outlook and values [2].

## 2. Research questions

Zhangqiu District a middle school grade nine students math performance polarization status quo; Analysis of the gender difference of grade 9 math students in a middle school in Zhangqiu District;

Zhangqiu district a middle school grade nine volume of the mid-term examination paper difficulty, differentiation analysis.

### 3. Study design

#### 3.1 Study subjects

In this paper, the mid-term examination results of five classes are selected from a middle school in Zhangqiu city, and 250 students are the research objects.

#### 3.2 Research tools

The research tool adopted in this paper is the first mid-term examination paper of grade 9.

#### 3.3 Data statistics

In this study, SPSS26.0 and Excel.

### 4. Statistical results

#### 4.1 The polarization of grade 9 students' math performance

The polarization studied in this paper is defined by a normal distribution in statistics. Through the frequency distribution map of students' math scores conforms to the law of normal distribution, to judge whether there is the phenomenon of math scores polarization in this class.as shown in the figure:

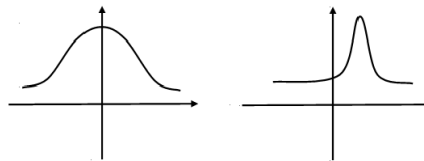


Figure 1: Distribution chart of grades

The left graph, that is, the normal distribution, indicates that the number of students in the class is in the middle score, and the number of students in the high and low segments is small, that is, the students' math scores are more stable. On the right chart, the normal distribution is broken, indicating that the number of students in the class in the high and low scores is increasing, the asymmetry of the curve and the middle axis is not located at the average score, that is, the students' math performance polarization<sup>[3]</sup>.

Table 1: Descriptive analysis of the results of the first volume midterm exams of grade 9

	N	minimum value	maximal value	mean value	standard deviation	skewness		kurtosis	
	statistics	statistics	statistics	statistics	statistics	statistics	Standard error	statistics	Standard error
aggregate score	250	.00	145.50	100.64	33.383	-1.072	.154	.577	.307
Number of valid cases	250								

According to Table 1, we can see that the maximum value of the mid-term exam score of the selected sample is 145.50, the minimum value is 0, and the average value is 100.64.

According to Figure 2 and 3, it can be seen that the mid-term math exam results of the first volume of grade 9 broke the normal law of normal distribution and appeared the phenomenon of alienation appeared. Normal distribution peak is not in the position of the average, led to the performance distribution of the curve without average centered symmetry, performance distribution curve did not present by the average score began to the left and right sides gradually evenly down law, present the number of students is low, the middle of the number of students is less, low number of students more alienation phenomenon.

In the continuous development of the current society, education is in constant reform, education researchers should do a good job of investigation follow up, teachers should also do a good job of timely analysis summary, only do real-time feedback teaching work and timely take targeted teaching strategy, can well avoid achievement polarization increasingly serious trend [4].

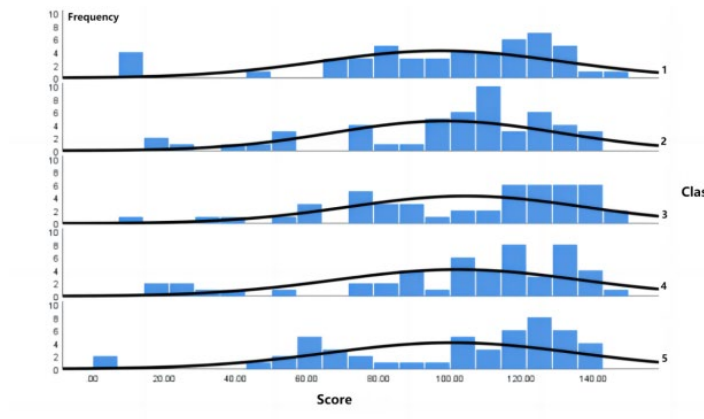


Figure 2: Histogram of mid-term exam results of five classes of Grade 9

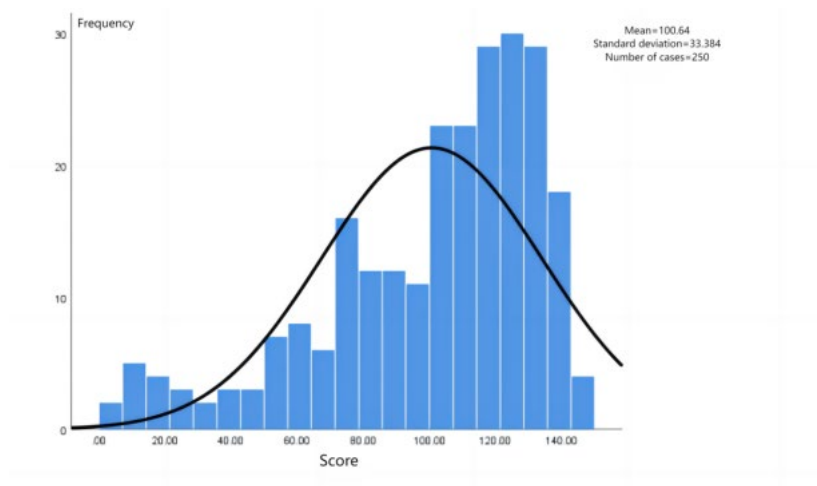


Figure 3: Histogram of the mid-term exam scores of 250 students in Grade 9

4.2 Sex difference analysis of ninth grade students' math performance

Table 2: Test of gender differences in academic performance

		Levin variance equivalence test		Mean-value equivalence t-test					Difference value with 95% confidence interval	
		F	conspicuousness	t	free degree	Sig.	Mean difference	Standard error difference	lower limit	toplomit
total points	Assume equal variance	1.299	.256	-1.032	248	.303	-4.48761	4.34929	-13.0538	4.07864
	Equal variance is not assumed			-1.060	215.710	.291	-4.48761	4.23545	-12.8357	3.86056

From Table 2, the sig value corresponding to the Levene statistic is 0.256, greater than 0.05, so the conclusion that the different gender meet the homogeneity of variance. Therefore, the result of t-test should look at the sig value assuming equal variance, sig = 0.303 > 0.05, so that there is no significant difference in the academic performance of men and women.

### 4.3 Analysis of the difficulty and differentiation of the ninth grade math mid-term examination paper

Table 3: Analysis of the differentiation degree of the nine mid-term examination papers

Group of grades	a1	a2	a3	...	a32	a33
Low grouping	1.7059	3.2353	3.4118	...	0	0
High group	3.7746	4	3.9437	...	2.2817	0.1479
Full score	4	4	4	...	4	3
Low group PL	0.426475	0.808825	0.85295	...	0	0
High group PH	0.94365	1	0.985925	...	0.570425	0.0493
discrimination	0.517175	0.191175	0.132975	...	0.570425	0.0493

According to the data in Table 3, the differentiation degree of a1, a7-a12, a16-a21, a24-a28 and a30-a32 is above 0.4, indicating that the differentiation degree of 22 questions is very good, and only the differentiation degree of a2, a5 and a33 is less than 0.2. The differentiation of the remaining questions is distributed in the interval 0.2-0.4, indicating that the differentiation of the whole paper is OK.

Table 4: Analysis of the difficulty of the first mid-term examination papers of Grade 9

	N	minimum	maximum	mean value	standard deviations	Full score of test questions	item difficulty
a1	250	0	4	2.8	1.83671	4	0.7
a2	250	0	4	3.776	0.92153	4	0.944
a3	250	0	4	3.776	0.92153	4	0.944
a4	250	0	4	3.584	1.22349	4	0.896
a5	250	0	4	3.824	0.82203	4	0.956
a6	250	0	4	2.272	1.98539	4	0.568
...	...	...	...	...	...	...	...
a31	250	0	2	1.044	0.96529	2	0.522
a32	250	0	4	0.79	1.45512	4	0.1975
a33	250	0	3	0.042	0.33419	3	0.014
Number of valid cases	250	0	145.5	100.644	33.38352	150	0.67096

According to table 4 can be seen in grade nine mid-term exam paper difficulty is 0.67, paper topic is easier, more emphasis on basic class topic, that some students' basic knowledge is not strong, less in the paper problem, the problem accuracy is low, so the teacher in the next teaching can be appropriate use of layered teaching method, help students improve performance.

## 5. Countermeasures analysis

### 5.1 Treat the normal distribution of grades rationally

The normal distribution of grades refers to the performance of a special form of probability distribution. Carol believes that the phenomenon of approximate normal distribution is scientifically objective, because from a statistical point of view, students' test scores belong to random variables, through a large number of practical and theoretical analysis shows that most random variables obey or approximately obey normal distribution<sup>[5]</sup>. Because the normal distribution of grades is scientific and objective, the admission score line and test difficulty can be determined in various types of examinations, and it is also convenient for the selection of excellent and backward screening. However, if we rely too much on normal distribution, it will hinder the improvement of teaching quality, which is not conducive to stimulating students' learning motivation, and will also affect the authenticity of mathematical tests to a certain extent. Teachers should set up a correct teaching view and objectively look at the law of normal distribution of achievements.

### 5.2 Conduct appropriate stratified teaching

Examination as a selective examination, examination paper has a certain degree of differentiation, differentiation for students, teachers in the teaching process can appropriate hierarchical teaching method, for poor academic performance students emphasize the emphasis on basic knowledge, the students get better students to improve learning, focus on the analysis of the answer skills and problems, can also be a homework stratification<sup>[6]</sup>. However, in the stratified teaching, we should pay attention to the change of students' psychology to prevent students from showing resistance.

### **5.3 Guide students to prepare for college study**

Grade 9 students are about to face the pressure of entering the high school entrance examination, which requires them to consolidate the old knowledge while mastering the new knowledge. However, the heavy academic pressure makes the students unable to effectively master the new knowledge, nor to do the review work well. As we all know, the difficulty of grade 9 students is deepening, and the mathematics subject shows a straight line and spiral trend in content and difficulty, so there is no doubt that the heavy workload of grade 9 is heavy. At the same time, facing the entrance examination also means that the need for three years of junior high school to learn the content of a systematic review and assessment, so it is also a common phenomenon to complete a large number of simulation papers for "brush" operation<sup>[7]</sup>. Given the burden and pressure on students, the polarization of ninth grade is more and more serious. Therefore, teachers need to adjust the teaching content appropriately and actively and correctly guide students to learn, so as to reduce the pressure for students while reducing the burden and increase the efficiency, so that students can successfully adapt to the learning mode of ninth grade mathematics<sup>[8]</sup>.

## **6. Conclusion and outlook**

### **6.1 Study Conclusion**

Zhangqiu district a middle school grade nine students math performance polarization status quo. Through the normal distribution curve and description statistics of the mid-term examination results of grade 9 mathematics, it can be found that there is alienation and polarization.

Analysis of the gender difference of grade 9 students in a middle school in Zhangqiu District. Through the difference analysis, it can be found that the gender of students has no significant influence on mathematics academic performance, indicating that math performance is not affected by gender.

Zhangqiu district a middle school grade nine mid-term examination paper difficulty, differentiation degree analysis. Through the analysis of the difficulty of the examination paper, it shows that some students' basic knowledge is not firm, the answer rate of difficult problems is low, and there is a lot of room for the improvement of students with better grades. Through the analysis of the test paper shows that the differentiation of the ninth grade of a middle school in Zhangqiu District is ok, which has a high reference level for the analysis of students' results.

### **6.2 Deficiency and outlook**

Given the length, time and the research level of the researchers, this research has some limitations.

#### **1) Study samples**

Due to the limited experimental conditions, the study sample selection range in this paper is relatively narrow. In this study, only the data of grade 9 in a middle school in Zhangqiu city was extracted, which did not involve schools in other regions. Therefore, the survey results of this paper do not represent the current situation of mathematics performance of grade 9 in middle schools in other regions of China, and the suggestions and countermeasures may not be applicable to schools in other regions of China. It is suggested that future studies can expand the scope of research and extend the selection of research subjects to different regions and schools at different levels.

#### **2) Data analysis**

The data analysis software for this study was used in relative simplicity. In the data statistical analysis of this study, basically only Microsoft Excel software, Microsoft Word and SPSS26.0 software were used to analyze and compare the study data, so the analysis results obtained are insufficient in terms of analysis validity and time efficiency. It is suggested that more professional statistical analysis tools can be selected in future studies.

#### **3) In addition**

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