

Data Analysis of the Correlation between College Entrance Examination Math Scores, Autonomous Learning Ability and College Math Scores

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Abstract: The correlation between the mathematics College Entrance Examination results and students' independent learning ability and college mathematics examination results has always been one of the issues concerned by people from all walks of life. Questions such as whether the mode of the deliberate training for getting a high score in the College Entrance Examination has a certain negative impact on students' independent thinking and learning ability have been prompting the continuous reform of the College Entrance Examination system. Based on the simple correlation analysis of the questionnaire results and the chi-square test of some questions, we found: There is no obvious correlation between College Entrance Examination mathematics score and autonomous learning ability, and the correlation between College Entrance Examination mathematics score and college mathematics score is not high. Part of the reason why students get high marks in the College Entrance Examination comes from "heteronomy", while university learning relies more on "self-discipline". Part of the students' use of "sea test tactics" is not to improve the ability of autonomous learning, but only to help improve test scores. And students with stronger autonomous learning ability are more likely to achieve higher scores in College Entrance Examination and college mathematics.

1. Introduction

The degree of correlation between students' college entrance examination scores and their autonomous learning ability is a subject worthy of attention. Under the model of college entrance examination preparation, this paper analyzes the influence of a large amount of problem solving training and simulation examination on students' autonomous learning ability. Survey the opinions of students from different regions and with different admission scores on the same exam paper to determine which factor is more conducive to students' independent study. At present, the help and influence of the headteacher system and the instructor system on students' learning have attracted wide attention from all walks of life. Based on the mathematical subject analysis of the online

questionnaire survey data released on December 13th, solstice on December 7th, 2020, some conjectures and preliminary conclusions are put forward.

2. Survey Objects and Problem Setting Overview

The questionnaires were distributed over the Internet, and the respondents are undergraduates from 2020 to 2017 nationwide. A total of 258 students participated in the survey, 89.5% of whom were students from Huazhong Agricultural University. Students majoring in non-mathematics accounted for 95.35%, belonging to various majors. There are 23 single-choice questions in the questionnaire, and the general questions are as follows: type of College Entrance Examination paper and math score of College Entrance Examination, math score of College Entrance Examination (3 subjects); Ability to study independently in mathematics; Opinions and feelings on the phenomenon of different admission scores in the same examination papers and some opinions on the teaching management mode in high scores and universities and independent learning .

3. Correlation Analysis of the Types of College Entrance Examination Papers, College Entrance Examination Mathematics Scores and College Mathematics Scores

The College Entrance Examination papers are divided into four types: National Examination papers I, National Examination papers II, National Examination papers III and independent examination papers, and the respondents account for 65.89%, 11.24%, 10.85% and 12.02%, respectively.

The mathematics score of the College Entrance Examination is divided into three sections with a full mark of 150, namely 112 and below, 113-135 and 136-150, with the percentage of the full mark taken up by the interval dividing points being 75% and 90% respectively.

The college math scores in the survey are reflected by the average scores of the three courses: Calculus or Advanced Mathematics, Probability theory or probability statistics, and Linear algebra or Linear Algebra and Linear Programming. The maximum score is 100 and the interval is 75 and 90. Linear algebra and Probability theory count only undergraduates whose specialized courses require it.

3.1. National One Volume

3.1.1. Superficial Analysis

According to the data statistics and superficial analysis, the correlation coefficient between the score of the national College Entrance Examination and the score of calculus or advanced mathematics is about 0.146, the correlation coefficient between the score of linear algebra and the score of probability theory is about 0.229, and the correlation coefficient between the score of probability theory is about 0.345. The three data are all less than 0.5, indicating that the correlation between College Entrance Examination mathematics and college mathematics course results is not very significant. However, the three correlation coefficients showed an increasing trend, which indicated that the correlation between the scores of linear algebra and probability theory and the math scores of College Entrance Examination was stronger than that of calculus.

To be specific, The dispersion of calculus or higher mathematics scores in the 136-150 group was more obvious, that is, the proportion of students with scores below 75 points and above 90 points was slightly higher than those with scores below 112 points and those with scores between 113 and 135 points, which also indicated that high math scores in the College Entrance Examination did not necessarily mean good scores in calculus or higher mathematics.

Three groups of students showed significant differences in their scores in the linear algebra and probability theory courses. In linear algebra, nearly all the students in the 136-150 group scored above 75, while about 20% of the students in the other two groups scored below 75. In the probability theory course, about 90% of the students in the COLLEGE ENTRANCE EXAMINATION 136-150 scored above 75, while about 30% of the students in the other two groups each scored below 75. This reflects the fact that students with high COLLEGE ENTRANCE EXAMINATION scores may be better at some aspects of math than the other two groups of students.

3.1.2. Data Chi-square Test

According to the cross contingency table analysis of the three courses of calculus (or higher mathematics), linear algebra and probability theory and the student's mathematics score in the College Entrance Examination of the national Test volume 1 student, the correlation was explored:

(1) Research on the correlation between the math scores of the national College Entrance Examination paper candidates and those of calculus (or higher Mathematics) :

```
import numpy as np
from scipy.stats import chi2_contingency

A volume of calculus grade
correlation analysis

d = np.array([[4.85,13.975,6.175], [21.6,68.4,28.8],[6,12,7]])

chi2_contingency(d)

(0.8204969587161516,
 0.9356792302181195,
 4,
 array([[ 4.80598341, 13.97734005,  6.21667654],
        [22.83803318, 66.42031991, 29.54164692],
        [ 4.80598341, 13.97734005,  6.21667654]]))
```

As shown in the figure above (the first value is the chi-square value, the second value is the P-value, the third value is the degree of freedom, and the fourth value is the theoretical value corresponding to the same dimension as the original data array),The chi-square test was not significant, rejecting the null hypothesis that there was no significant correlation between the scores of the national College Entrance Examination and the scores of calculus (or higher mathematics).

(2) A Study on the Correlation between the Mathematics scores of the National College Entrance Examination and the Scores of linear algebra:

```
(15.799918064351786,
 0.0032997375018262677,
 4,
 array([[ 4.31985294, 13.13235294,  7.54779412],
        [20.73529412, 63.03529412, 36.22941176],
        [ 4.31985294, 13.13235294,  7.54779412]]))
```

As shown in the above results, the Chi-square test is significant, accepting the null hypothesis that there is a slightly significant correlation between the College Entrance Examination score and the linear algebra score of test takers in National paper 1.

(3) A Study on correlation between national College Entrance Examination Mathematics scores and probability Theory Scores shows the analysis results of the cross contingency table, he Chi-

square test is significant, and the null hypothesis is accepted, that is, the degree of correlation between the math and probability theory scores of test takers in exam Paper 1 is obvious.

(4) Conclusion: he results of cross-sectional contingency table analysis based on the selected national test taker data show that there is a small degree of correlation between students' performance in calculus and their performance in the College Entrance Examination, while the performance in explicit algebra and probability theory is more relevant to their performance in the College Entrance Examination.

3.2. Hart Data Presentation

In general, charts can show the relationship between data more intuitively than words. According to survey, mathematics scores of the College Entrance Examination were replaced by 110 with a range of 112 points and below, 120 with a range of 113 to 135, and 140 with a range of 136-150. 70 replaces a range of 74 or below, 80 replaces a range of 75 to 90, and 95 replaces a range of 91 to 100. The 0 or space in the table indicates that the student has not studied this course.

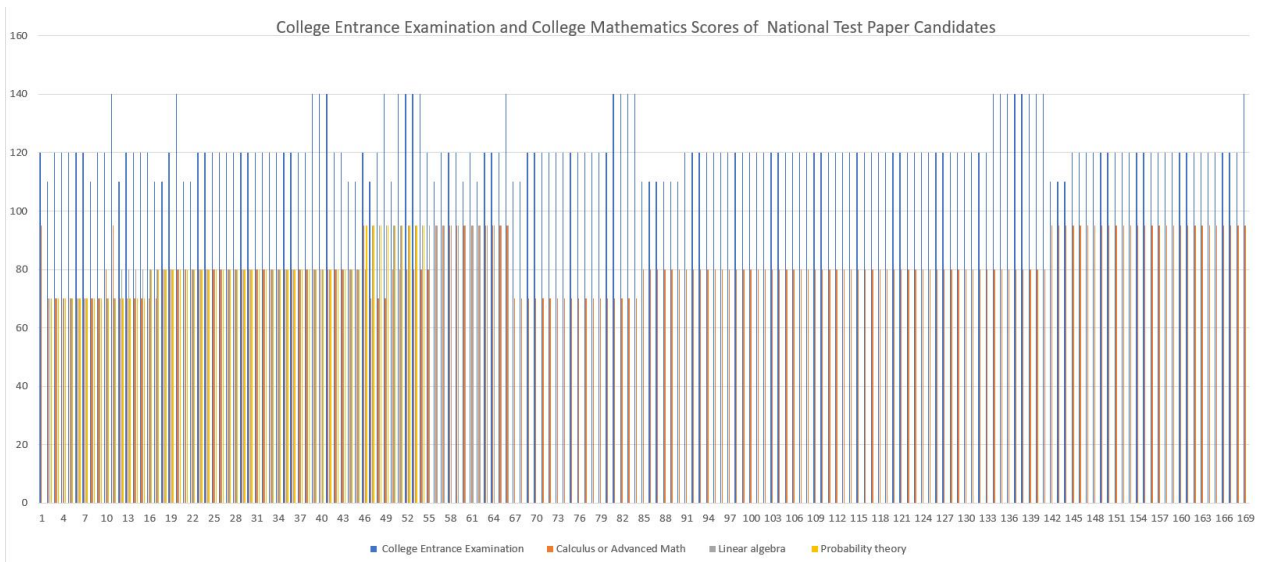


Figure 1 National college entrance examination papers and university mathematics scores.

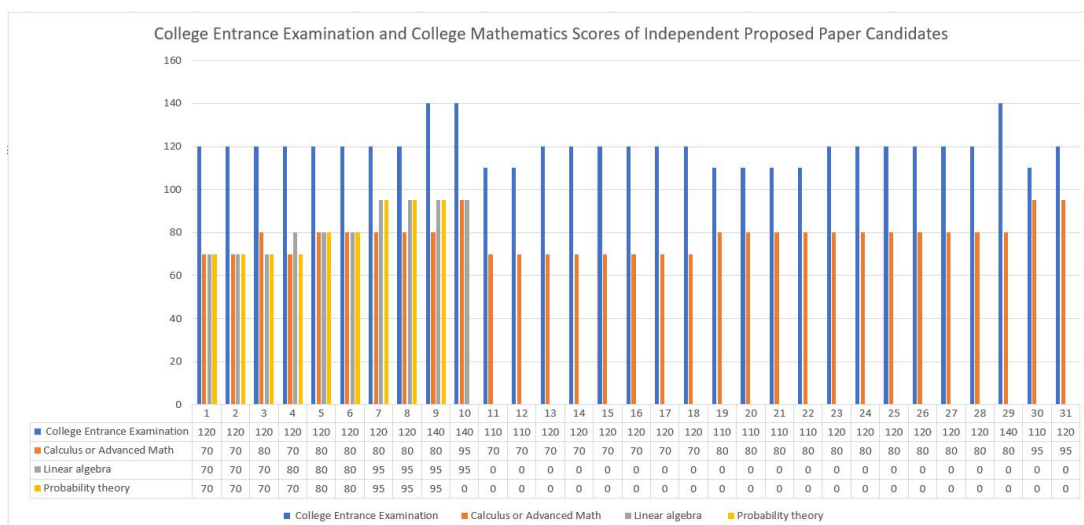


Figure 2 Students' scores of college entrance examination in the independent proposition paper and university mathematics.

It can be seen that there is a high correlation between the scores of the three college mathematics courses, that is, if scores in one college mathematics course of a student are high, then his scores in the other two mathematics courses are probably better. In addition, the phenomenon that the correlation between College Entrance Examination mathematics scores and college scores is not very significant indicates that compared with College Entrance Examination mathematics scores, college mathematics scores may be more related to personal learning habits and self-discipline and other factors, and the specific discussion will be carried out later.

4. Autonomous Learning Ability

The questionnaire includes "whether we will actively discuss math problems with teachers or classmates after class", "whether we will actively preview before class", "whether we will actively answer the questions raised by teachers in class", "whether we will actively summarize and reflect after class", "whether we will pay attention to the extracurricular contents mentioned by teachers and refer to relevant information by ourselves" and "the frequency of learning mathematics every week during college". This series of questions is meant to reflect the autonomous learning ability and interest in mathematics learning of students. The results show that:

(1) The frequency of students actively discussing problems with teachers or students has a slightly negative correlation with College Entrance Examination mathematics scores. The proportion of students who "never actively discuss mathematics problems with teachers or students" in the high score group is about 2% higher than that in the low score group (it may be related to high score group students' preference for independent thinking, or it may be related to their lazy learning), but the probability of often being asked questions is slightly higher than that of the other two groups.

(2) According to the situation of preview before class, the frequency of preview of low, middle and high score students is decreasing group by group, and about 21.0%, 27.4% and 34.5% of the students in the three groups had never preview before math class, which indicates that some high score students may be slack in the preview of college mathematics.

(3) In the low, middle and high score groups, 23.3%, 29.0% and 48.3% of the students "will take the initiative to answer the teachers' questions" in class, respectively. It can be seen that there is a big gap among the three groups in this respect. The reason is probably that the students in the low and middle score groups are not as confident as the students in the high score group. At the same time, 67.2%, 74.4% and 86.2% of the students think that "I am confident that I can learn college mathematics well" in the three groups respectively, which directly reflects that the students with higher scores in Mathematics in College Entrance Examination have more confidence in themselves in mathematics.

5. Conclusions

The overall results show that: (1) to a certain extent, the mathematics scores of College Entrance Examination are related to the ability of autonomous learning, but it is not obvious. (2) The correlation between the mathematics scores of College Entrance Examination and college mathematics scores is not high.

Based on the survey data and daily observation, the possible conjectures are put forward:

First, the teacher in charge system and parents' supervision in senior high school objectively play the role of "heteronomy" (that is, passive "heteronomy" under various pressures and requirements), so that the influence of "self-discipline" (or autonomous learning) factor in the College Entrance Examination mathematics score is not significant; when parents are not around to supervise, the system gives students a lot of space Freedom and time freedom, at this time, the students with a strong sense of "self-discipline" and a clearer goal are more aware of active learning and improving

their ability, so they are easier to achieve higher scores in the university curriculum examination. According to the results of the survey, some students in the high score group may slack off during the College Entrance Examination, while those in the middle group generally work harder. Conclusion: part of the reasons for students to get high scores in the College Entrance Examination come from "heteronomy", while university learning relies more on "self-discipline", so students with higher scores in Mathematics in the College Entrance Examination may not have strong autonomous learning ability and higher scores in mathematics.

Second, in senior high school, some students did not exercise their self-learning ability substantially when using the sea test tactics, that is, they did not take the initiative to think and summarize. They just write a lot of questions to help them improve proficiency to get higher scores in the College Entrance Examination mathematics. Therefore, the College Entrance Examination mathematics score is not very related to the self-learning ability.

Third, Students who are more interested in mathematics, prefer autonomous learning and thinking, and can be more flexible and active in summarizing and reflecting under a large number of problem-solving training modes can get higher scores in the College Entrance Examination (not only mathematics subjects), and are generally more confident, At the same time, students who are less interested in mathematics, less active in learning and thinking, and most of the time passively follow the progress of teachers or schools to do problem-solving training are less likely to get high scores in the College Entrance Examination mathematics, and their self-confidence is often lower.

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