A Research on the Relationship between Gender and the Preferences of Course Selection of BNDS AP Students

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G11 AP Statistics

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1 Introduction

In the Chinese education system in previous years, high school education was divided into liberal arts classes and science classes. At that time, there was a saying that you couldn't find five girls in the science class and five boys in the liberal arts class. This shows that there is an uneven distribution of males and females in the arts and science classes, which means that there is a significant deviation in the preference of male and female students for course selection. In addition, traditional social norm make also interfere with the willingness of selecting a course each students really enjoy. For instance, people tend to believe that boys have higher chances to score higher in STEM classes for their better logical thinking skills, which in this situation may show that boys will have a higher rate of choosing science, math, and computer science courses.

2 Background Research

There are three relevant resources that help examine the relationship between gender and course selection of BNDS AP students. In the first related source, researchers examined that relative to boys, girls' choices are far more constrained, as these choices are mediated by the constructions of gendered subjects and occupational identities, and by the larger perception of gender roles for women. [1] The second resource shows that gender is a significant explanatory variable of high-school course choices. Female students are less likely than male students to choose Math and especially the Physical sciences and more likely to choose Life sciences. [2] The third related study is College Major Choice and the Gender Gap, which finds out that choosing a college major is a decision that has significant social and economic consequences. Little is known about how youth choose college majors and why the observed gender gap exists.[3]

3 Methods and Procedures

3.1 Data Collection

We collect our raw data through the AP mock exam sheet to find the AP courses selection by each G11 and G12 BNDS AP student in the 2022 and 2023 school year and the corresponding gender of each student. We then sort each AP course into a general category.

From the raw data we collected, we developed a two-way table to represent the number of students of each gender choosing each kind of AP course:

	Female	Male	Total
English	136	129	265
Language	30	24	54
Art	63	32	95
Social science	132	117	248
Science	52	62	114
Math	148	129	227
CS	30	29	59
Total	590	522	1112

We converted the number of students into proportion according to gender and visualized the data into the following double bar graph.
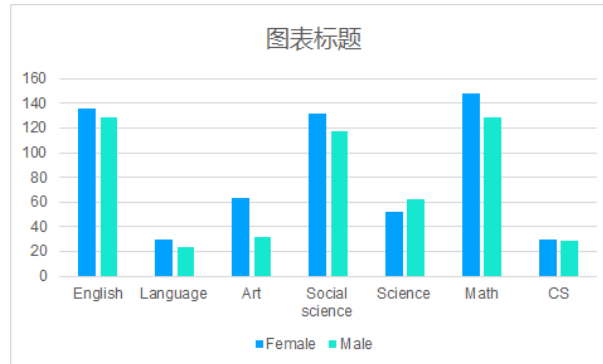
3.2 Hypothesis test

3.2.1 formula

To test whether or not the proportion of the kind of course chosen is independent of the gender of the student, we will perform a chi-square test for independence. The formula we use will be

$$\chi^2 = \frac{\sum \left[(O - E)\right]^2}{E} \tag{1}$$

, where

$$\chi^2 \tag{2}$$

is the chi-square value, O is the observed cell count, and E is the expected cell count.

3.2.2 Hypothesis

H0: The choice of kinds of courses is independent of the gender of the students. Ha: The choice of kinds of courses is not independent of the gender of the students. The alpha level is equal to 0.05.

3.2.3 Check conditions

For we are doing a census and the total number of male and female students in our research are approximately equal, we do not need to check the conditions of random sampling and independence. To make the chi-square test valid, we need to make sure we have a large sample size by checking that all expected cell counts are greater than or equal to 5. The expected cell count for each cell is shown in the following graph, showing all expected cell counts are greater than 5.

	Female	Male
English	140.71	124.28
Language	28.673	25.326
Art	50.444	44.555
Social science	132.21	116.78
Science	60.533	53.466
Math	147.08	129.91
CS	31.328	27.671

3.2.4 Conducting Test

We will conduct the test at a 95 percent confidence interval, so the alpha level of this test will be 0.05. Test statistics: we will use the formula to find the chi-square value.

$$\chi^2 = \frac{\sum [(O - E)]^2}{E} \tag{3}$$

$$\chi^2 \tag{4}$$

= chi-square value, O = observed cell count, E = expected cell count.

3.2.5 Calculations and p-value

We plug in the data into the calculator with the degrees of freedom being (2-1)(7-1)=6. The calculator yields the following results. Chi-square=9.8385137 p-value=0.13206192

4 Result

From the calculator, we found the Chi-square to be 9.8385137 and the p-value to be 0.13206192. Since our p-value (0.13206) is larger than the alpha level (0.05), we fail to reject H0. We do not have enough convincing evidence to show that the choice of kinds of courses is not independent of the gender of the students. At a 95 percent confidence level, we cannot conclude that the choices of BNDS AP students are affected by their gender.

5 Problems in the Project/Suggests for Future

In this project, we faced some problems such as hard to find the gender of the students since the original data didn't include this, how to check the condition of the chi-square test since we are conducting a census rather than using sampling to collect data, and so on. Because we only use the data from the course selection in BNDS for one year, there is still a need to test whether there are differences in gender in course selection in other years. We think there is still a need to find the differences in gender of other programs in BNDS so that we can have a whole picture of BNDS's course selection differences in gender.

6 Conclusion

From the original bar graph we developed, we can see that there are larger proportions of male students choosing Science courses and a larger proportion of female students choosing Art courses. However, from the chi-square test for independence, we perform, we find that there's no statistically significant evidence to prove that the difference shown in the bar graph is not due to sheer chance. Thus, we can conclude that at least in BNDS, gender stereotype does not largely affect the course choices of students to a large extent.

7 Reference

References

[1] Maria Adamuti-Trache and Robert Sweet. "Science, technology, engineering and math readiness: ethno-linguistic and gender differences in high-school course selection patterns". In: *International Journal of Science Education* 36.4 (2014), pp. 610–634.

[2] Meenakshi Gautam. "Gender, subject choice and higher education in India: Exploring 'choices' and 'constraints' of women students". In: *Contemporary Education Dialogue* 12.1 (2015), pp. 31–58.

[3] Basit Zafar. "College major choice and the gender gap". In: *Journal of Human Resources* 48.3 (2013), pp. 545–595.