Difference in Degrees of Satisfaction Towards the Main Restaurant of Students Across Grades 10-12 in Beijing National Day School International Department

Lenny Liu, Andy Du

May 26, 2023

Abstract

Students' studies and living could not leave restaurants. A good restaurant can keep students fit and increase their study efficiency. At Beijing National Day School, two students are interested in whether or not students across three different grades in the international department have different degrees of satisfaction with the school's main restaurant. After collecting data and conducting a Chi-square test of homogeneity, they concluded that there is no significant difference between the three grades. In the result, suggestions and improvements towards the restaurant are also stated.

Keywords— statistics, Chi-square, restaurant, food, degree of satisfaction

1 Introduction

The objective of this research is to assess and compare different grades' ratings of BNDS's cafeterias as a whole. This is an observational study. The main goal is to find out if students' degree of satisfaction with the school's restaurants surely changes as time passes by and what may be the causes. Besides, the research also aims to provide insights into the quality, cleanliness, service, and price aspects of cafeterias to support informed decision-making and potential improvements in cafeteria services.

2 Background Research

To make sure the question asked to individual students are specific, helpful, and comprehensive, thorough background research has been conducted.

Three research studies are referred:
1)High school students' recommendations to improve school food environments: insights from a critical stakeholder group [1]
2)Factors in the school cafeteria influencing food choices by high school students [2]
3)Increasing the attractiveness of college cafeteria food: A reactance theory perspective [3]

These studies all investigated students' feedback toward their school's canteens. From those researchers' experiences, we gained knowledge about how to make construct suitable questions or questionnaires to ask about students' degree of satisfaction. Besides, these studies also guide us on how to analyze results and give out useful suggestions.

3 Methods, Procedures, and Result

3.1 Find out expected sample sizes

Three grades populations are:
1) Grade 10: 251
2) Grade 11: 236
3) Grade 12: 242

In order to make the sample large enough and also without replacement, we decided to take 10 percent of the population from each grade.
The sample would contain:
1) Grade 10: 25
2) Grade 11: 24
3) Grade 12: 24

3.2 Conduct the survey

The survey consists of two main questions:
1) How do you feel about the school's restaurant? Please answer satisfied or not satisfied.
2) If the participant answers not satisfying, then ask the participant to choose which aspect makes him/her not satisfied: food quality, service, cleanliness, and price.

3.3 Begin the sampling

For grade 12, we conducted a simple random sampling. We randomly asked 24 students in person in the academic building (not during meal time).

For grade 11, we conducted a cluster sampling. We assumed that each student in a class of a computer science teacher is enough diverse and random. Then we designed a questionnaire containing the question exactly the same as the question asked to grade 12 and listed above. Next, we asked the computer science teacher to require all grade 11 students in his two different classes to complete the questionnaire.

For grade 10, we also conducted a cluster sampling. We assumed that each student in a class of a math teacher is enough diverse and random. Then we asked the math teacher to require all grade 10 students in her two different classes to complete the questionnaire.

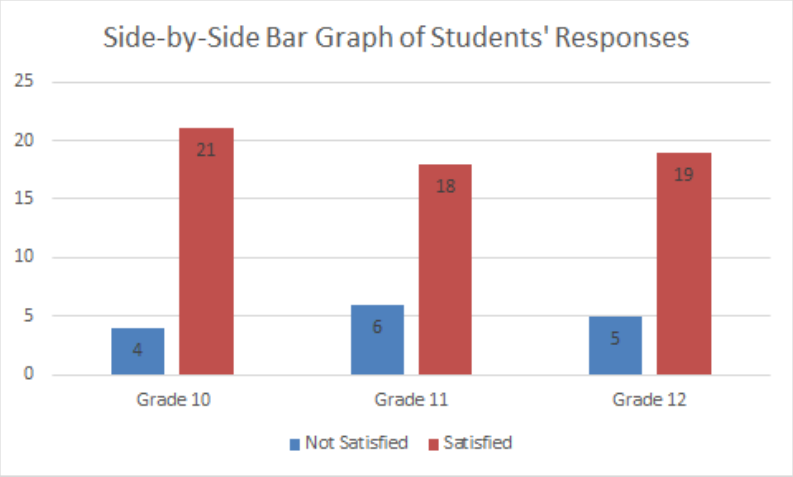

Figure 1: Side-by-Side Bar Graph of Students' Responses

	Not Satisfied	Satisfied
Grade 10	4	21
Grade 11	6	18
Grade 12	5	19

Table 1: Table of The Students' Responses

3.4 Results

The collected numbers of responses are listed below:
1) Grade 10: 31 responses
2) Grade 11: 26 responses
3) Grade 12: 27 responses

In case the sample size for each grade exceeds our expected sample size, we would use a random number generator to randomly delete individuals. All three grades are processed individually. First, we would label each individual's response in the sample of one grade from 1 to its sample size. Then, we would use a random number generator to generate a number from 1 to its sample size, ignoring repeats. Then we would delete the individual's response whose label corresponds with the number generated until the sample size is equal to what we expect.

The final sample is shown in table 1. The side-by-side bar graph is shown in figure 1.

To find out if there is a significant difference in the degree of satisfaction across the three grades, a Chi-square test of homogeneity should be conducted. The significant level α is defined to be 0.05.

We define:
P_{10} = the proportion of grade 10 students answering not satisfied.
P_{11} = the proportion of grade 11 students answering not satisfied.
P_{12} = the proportion of grade 12 students answering not satisfied.

Make a null hypothesis and an alternative hypothesis:
$H_0 : P_{10} = P_{11} = P_{12}$
H_a : at least one proportion in H_0 does not equal to others

Check conditions for the Chi-square test of homogeneity:
1) All the samples from the three grades are randomly sampled;
2) The sample sizes of the three grades are all equal to 10 percent times their populations.
3) All expected cells are approximately equal or greater than 5. To see expected cells please refer to table 2.

To Analyze the result, three parameters are calculated:
1) $\chi^2 = 0.60931226$
2) p-value = 0.73737689
3) degree of freedom = 2

	Not Satisfied	Satisfied
Grade 10	5.1396	19.863
Grade 11	4.9315	19.068
Grade 12	4.9315	19.068

Table 2: Table of The Expected Cells of Students' Responses

	Food Quality	Service	Cleanliness	Price
Students Answering "Not Satisfied"	8	0	2	5

Table 3: Table of Distribution of Reasons of Students Answering "Not Satisfied"

We fail to reject H_0 since the p-value $= 0.73737689 < 0.05$. We don't have enough evidence to suggest that the degree of satisfaction towards the school's restaurant is different across the three grades. The sample shows that all three grades have similar degrees of satisfaction.

4 Problems and Future Expectation

Our main potential problem for this research is that it may contain voluntary bias when collecting data from grades 10 and grade 11. This is because we used questionnaires for these two grades. Though the two teachers asked all students in their two classes to complete the questionnaire, we still couldn't guarantee that everyone completed it. This may cause our result to mainly contains responses from students who have extreme feelings towards the restaurant (either very satisfied or very unsatisfied). However, as long as the survey only contains two options - not satisfied and satisfied - the bias may not have a significant influence on our conclusion. In future related projects, randomly selecting students using the student name list and precisely doing the survey in person can avoid voluntary bias.

5 Conclusion

From the data and the calculation, we have sufficient evidence to conclude that there is no significant difference in the degree of satisfaction towards the school's main restaurant among students from three grades. This means that for students in grade 11 and grade 12, though they have been studying in the school for approximately two or three years, their satisfaction with the restaurant doesn't decrease much as time passes by.

Since we asked those students who report "Not Satisfied" the reason that makes them think so, the data can be referred to table 3. From the table, we can tell that most students who answered "Not Satisfied" think that the food quality is not good enough; The second most chosen option is price, meaning that a portion of students think that the prices are beyond their expectations. Only a few students think the restaurant is not clean, and nearly no students dislike the service. Therefore, we would suggest the restaurant to maintain its cleanliness and service while improving its food quality and lower food prices.

References

[1] Yuka Asada, Alejandro G Hughes, Margaret Read, Marlene B Schwartz, and Jamie F Chriqui. High school students' recommendations to improve school food environments: insights from a critical stakeholder group. *Journal of School Health*, 87(11):842–849, 2017.

[2] Christine Shannon, Mary Story, Jayne A Fulkerson, and Simone A French. Factors in the school cafeteria influencing food choices by high school students. *Journal of School Health*, 72(6):229–234, 2002.

[3] Stephen G West. Increasing the attractiveness of college cafeteria food: A reactance theory perspective. *Journal of Applied Psychology*, 60(5):656, 1975.