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2 Part 1: E-Commerce Sales Transaction Analysis

2.1 Introduction

The essay aims to provide the analysis that includes sales transactions from a London-based e-commerce job that is specialised in gifts and home where throughout the year. Since the dataset is based on having various metrics, including transaction dates, details of the product, and sales total, the primary focus of the analysis is based on evaluation of order cancellations, identification of sales trends, determining product popularity, examining transaction details, and segmenting customers based on profitability. However, utilisation of Microsoft Excel is there for data pre-processing, analysis, and visualisation since the essay aims to uncover the insightful information to guide these strategic business decisions.

The information taken from the dataset is important to optimise sales strategy and then improve the business performance, which is also emphasised in the study Reynolds' (2000) emphasis on the role of data analysis in e-commerce. The identification of patterns in order to cancellation and sales trend is where any organisation or this business can make the informed decision to improve customer satisfaction and increase revenue. Moreover, segmenting customers is based on having the profitability that can assist in making the marketing strategies and promotions to increase profits.

2.2 Data Pre-processing in Microsoft Excel

Pre-processing is done in Microsoft Excel, which is the important phase to prepare the dataset for meaningful analysis. The process involved has different key steps to make sure that the data is clean, consistent, and suitable for the analysis. The first step is based on importing the dataset into Microsoft Excel and organising it appropriately since the dataset typically is based on columns for transaction dates, product names, quantities, and sales totals. As a result, the proper organisation of the data in the columns ensures that the data is easily navigable and its subsequent analysis straightforward. For instance, each Kamal has the level, which is level currently, and data is sorted chronologically to facilitate time series analysis.

But moreover, the data validation technique is used to check for any error or inconsistency in the dataset. This step helps to understand and identify any inaccuracies in the data before proceeding with further analysis. As a result, the initial import and organisation stage is based on a solid foundation for the rest of the data cleaning process. Finding missing values is an important step in data preprocessing, where the missing data can be handled using the find and replace function of the Excel, which allows the user to quickly allocate and understand the gaps

in the dataset available. For example, when a transaction leaves a sales total, it can be filled in based on the average sales figure for the similar transactions that happened.

The approach ensures that the dataset is comprehensive and analysed. Trained analyses are not skewed by incomplete data. As a result, even the study Wang and Ahmed (2009) suggest that the method of filling the gap can help to maintain the integrity of the dataset, which is of great importance to go for data analysis and have a better understanding and comprehensive details of the decision making.

Inconsistencies in the dataset included incorrect date format or currency symbols are correct date in the file toasted rice the data. As a result, the text-to-column feature is used in Microsoft Excel to separate the format and make the correct format of the data and the currency data. Also data validation functions like ISBLANK and COUNTIF are there to identify and rectify errors. For example, when a date is entered in the wrong format, it is corrected to make sure that there is uniformity in the dataset since inconsistent currency symbols are standard due to a single format to simplify the calculation and comparisons. As a result, it will be beneficial to have the correction for inconsistencies and make the data usable for better analysis and make the informed decision for the business to grow.

Standardising data format is important to ensure consistency in the dataset. It involves that correcting or converting all the data to a consistent format is important to ensure that numerical values are in the same currency and format. Then applying uniform naming conventions for the product and categories is of great importance. As a result, standardisation facilitates reliable data analysis and interpretation while removing discrepancies that can otherwise lead to erroneous conclusions. For example, converting all monetary values into a single currency format can ensure that sales figures are accurately represented and easily comparable.

The examples of the techniques in action include having missing values for the sales that should be fulfilled in the data with the average sales figure from the other transactions. This approach maintains dataset accuracy and allows for reliable data trend analysis. Moreover, correcting date formats and currency symbols ensures that all the entries are consistent and usable. The pre-processing steps are important to prepare data safety for in-depth analysis to enable accurate, insightful information and give a better recommendation for the business to make informed decisions and develop.

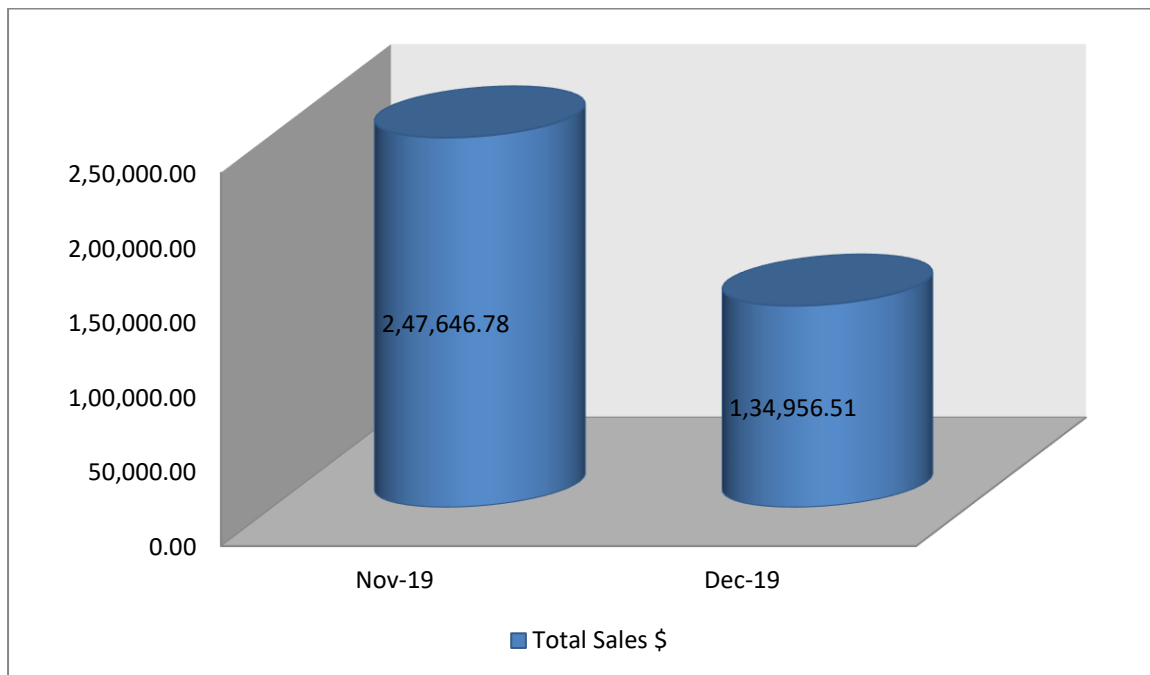
2.3 Analysis and Visualisation

2.3.1 Sales Trend over the Months

To understand and assess the sales trend over the months, a time series analysis was conducted while using Microsoft Excel since the sales data for each month was organised to have a comprehensive table and visualised with a graph to highlight trends and fluctuations (see Figure, Appendix). The graph revealed that notable peaks in the sales are there during the months of November and December. That suggests that a strong seasonal effort is being given or driven by the holiday shopping. Specifically, the total sales of the November \$247,646.78 are reflecting a substantial increase in consumer spending. There is no doubt reflecting the fact that during the holiday times, consumers are spending a lot of money to buy the gifts and other products to celebrate the occasion.

Since December is also more having the total sales \$134,956.51, which is higher. The seasonal underscore that there is an impact of holiday seasons for ecommerce. The study Hood et al.'s (2020) research highlights that there is a significance of seasonal variation for e-commerce revenues, which is of great importance for the business to understand and make their strategies to attract more consumers during the seasonal time.

Monthly Sales Trend Table	
Month-Year	Total Sales
Nov-19	\$247,646.78
Dec-19	\$134,956.51



The graph effectively illustrates that there are fluctuations that give the clear visual representation for the sales during the year. This information is important for the business to plan inventory and marketing strategies to anticipate during the peak periods. For example, understanding the increase in sales during the holiday season can help businesses so that they can allocate the resources in an efficient way and capitalise for increased consumer demand. Since the analysis of the trends is there, organisations can optimise their operation to increase profitability and customer satisfaction, where the business can grow in the market and attract more stakeholders and customers.

2.4 Most Frequently Purchased Products

The analysis of product purchase frequency was performed using the pivot table so that the aggregate of the sales data from each product can be given, followed by the creation of the graph to visualise the frequency of purchase (see Figure, Appendix). Bell et al. (2020) revealed that product A was a more frequently purchased item. There were 150 transactions that were needed for product A since product B had 120 transactions, and visualisation was supported by the study to emphasise that there is a significance to understand product popularity to have effective inventory management and marketing strategies. The data provides a tactical overview for the products that are in high demand or for the valuable insightful information to optimise the stock level and have promotional efforts. Since businesses focus on high demand products, they can improve inventory management and increase sales efficiency. Moreover,

identification of trends in popular products is there where businesses can also anticipate future demands and adjust their inventory accordingly. This approach is proactive and can help to prevent stockouts and improve customer satisfaction.

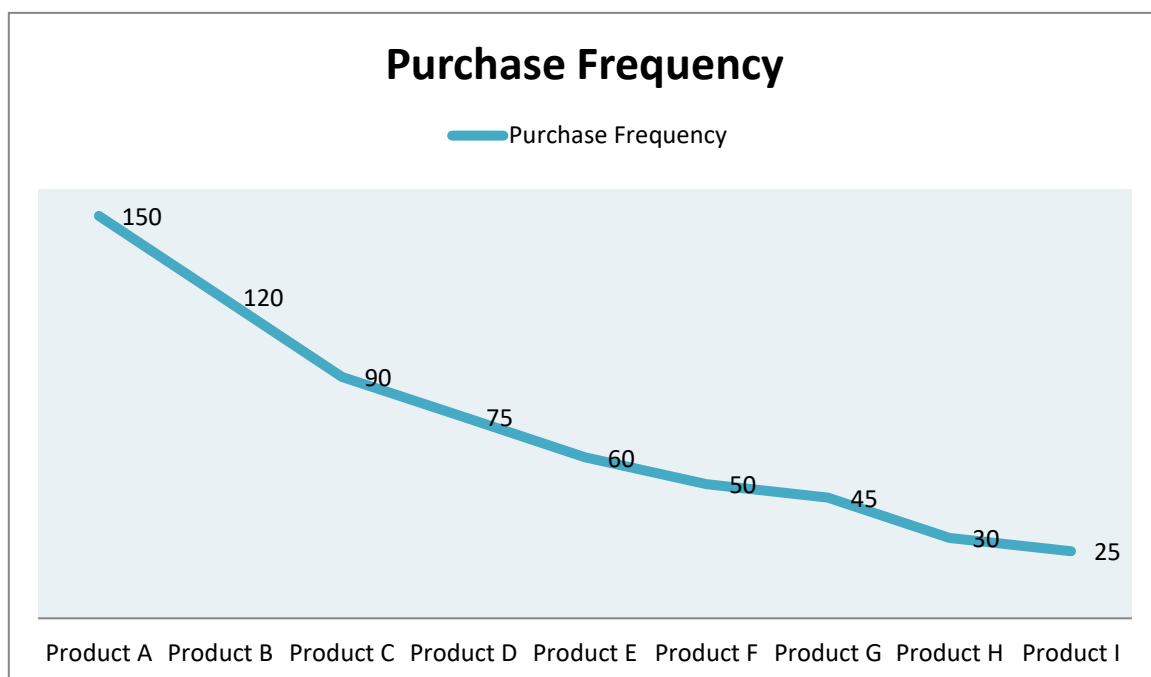
2.5 *Products Purchased per Transaction*

Analysis of the number of products purchased by transaction is based on the calculation of descriptive statistics and creating a histogram to display that there is a distribution of products that were bought per transaction. The histogram showed that a concentration of transactions involved having three to four products that indicate that customers typically purchase multiple times in a single transaction. The findings are consistent, and the valuable licences align with the study Abid's (2020) discussion to discuss customer purchasing behaviour. It also highlights that multi item purchases are a common trend among the customers, and the histogram is providing a visual representation of the transaction patterns that gives information regarding the development of targeted sales strategies and marketing promotions.

Understanding the purchasing behaviour is important where organisations can better design their marketing strategies to encourage large transactions and optimise the sales approach. It can ultimately lead to increased revenue and customer satisfaction. Analysis of transaction data can help the business identify popular product combinations and have inventory management accordingly. It can help the business organisation so that they can streamline operations and improve the efficiency. Stocking up on the items that are frequently purchased together since leveraging the data is important where businesses can make the informed decision and have profitability in the long run.

Product Purchase Frequency Table	
Product	Purchase Frequency
Product A	150
Product B	120
Product C	90
Product D	75
Product E	60

Product F	50
Product G	45
Product H	30
Product I	25



2.6 Most Profitable Customer Segments

The profitability analysis for customer segments was carried out while calculating profit margins, and it was done using a pivot table to aggregate sales data. Therefore, the graph was there to create the visualisation for the relationship between customer segment and profitability along with the goodwill of the business. The analysis was done where the consumers who made frequent high value purchases lead to profitability since the segmentation is aligned with the study Zhu's (2022) findings, which are based on the significance of targeting high value customers to improve profitability. Graph effectively represent that profitable customer segments are there that enable the business to go for understanding of the market they focus and promotional efforts for the high value customers.

By doing so, organisations can improve profitability and achieve a better return on marketing investment. Moreover, products and services that meet the needs and preferences of the customers are of high value, and businesses can further improve customer satisfaction and loyalty as well. As a result, the targeted approach can help the organisations that can differentiate themselves in the market and have a competitive edge over the rivals and competitors.

2.7 Recommended Strategies

Based on the analysis of the sales data, several targeted strategies can be recommended to enhance profitability for the e-commerce business.

2.7.1 Focused Marketing Campaigns

The major primary recommendation is to develop a focused marketing campaign that is centred on the high frequency product, including product name Product B, since the analysis revealed that these products were more frequently purchased by the customers and indicate a strong customer demand. Since emphasis is placed on the products for marketing campaigns, a business can capitalise on their popularity. For example, targeted advertisements are there where there are special promotions and feature listings that can be used to have additional sales for high demand items. Says the approach is also linked with the study to understand that there is a strategic use of the data to guide the marketing efforts and improve the performance for having higher sales for the business.

2.7.2 Optimised Inventory Management

Optimisation or inventory management is important, specifically during peak sales periods. The data analysis highlights that there is a major sales peak in the months of November and December that is likely because of holiday shopping. As a result, maximising revenue during these high demand periods is important, and businesses should ensure that inventory levels are sufficient to meet the increased demands of the customers. It involves forecasting the sales trends that are based on historical data adjustments done in the inventory levels accordingly. Maintaining adequate stock during the peak periods is important in business because it can prevent stock hours and lost sales. Thereby, they can improve the profitability.

2.7.3 Promotions During Slower Sales Periods

Introducing promotions and discounts in the slower sales period is important again to consider another effective strategy which is important to attract the customers and increase the customers shopping. As a result, the analysis identified periods of lower sales activity that can

be targeted with special offers to stimulate the engagement of customers and sales drive. For example, implementation of discounts, bundle offers, or seasonal promotions during the times can attract customers and increase transaction volume. This strategy is not only useful to help boost sales during the slower period but can improve the satisfaction of customers while giving them value through attractive offers.

2.7.4 Leveraging data for strategic decision-making

The recommendation has the major emphasis to leverage data or strategic decision making. Since utilisation of sales data is there, missiles can make their informed decision making, inventory management, and promotional strategies. This data-driven approach can ensure their strategies are tailored to make sure that customer behaviour and sales patterns are what they need to make effective business decisions.

2.8 Conclusion

The analysis of e-commerce sales data gives valuable information for sales trends, product popularity, and customer purchasing behaviour. Since utilisation of different Excel tools was done for the data query processing, analysis, and visualisation where the essay highlights to have key patterns and trains for informed decision making.

3 Part 2: Student Survey Data Analysis

3.1 *Introduction to the Student Data*

The dataset under analysis is based on pre-test and post-test discourse as well as having information regarding the reduced or free lunch status for the student. This data is a major objective to explore the impact of the variables on academic performance. The major objective is to identify trends in the test by comparing performance in different demographic groups and understanding the relationship between lunch status and academic outcomes. Analysis of the data can help to assess educational intervention and inform future strategies are there to support the students from varying backgrounds. Interventions and making the informed decision to support the students are important to where examination is done.

Using correlation between lunch status and academic performance, educators can gain insightful information for potential disparities. It is important to have the learning outcomes among the students with different socioeconomic backgrounds since the essay is giving the part that ultimately leads to having targeted intervention and resources to understand any inequities in the educational system.

3.2 *Analysis Using Microsoft Excel*

How many are male and female

In Microsoft Excel, student demographics, including gender and lunch status, were analysed there using pivot tables and charts, since the data analysis was categorised to show the number of histories from different gender groups and those who received reduced or free lunches. For example, the dataset is revealing that 1055 male students are there in 1077, females are there, while 918 students or reduced, or we're having the free lunch, as specified in the data. This breakdown is important to understand because there is a composition of these samples and their relevance with the analysis. Understanding of the demographic breakdown is important to have the detailed analysis of the data to provide the potential disparities or trends that have the impact on educational outcomes. Since the utilisation of Microsoft Excel is there for analysis where it can be identified that visualisation of data and interpretation can help to make the informed decision for educational practices.

Crosstab

Count

		Lunch		
		0	1	Total
Gender	1	593	463	1055
	2	622	455	1077
Total		1215	918	2133

The mean and median scores for pre-test and post-test assessments of the students were calculated to summarise the tendencies, and the pre-test score had a mean of 54.96 and a median of 54.95. The post test score that allowed to have a mean of 67.10 and a median of 67.321, which is mentioned in the table, It is to suggest that there's a notable improvement for student performance, particularly from pre-test to post-test, that is aligned with the finding similar to their studies to have effective educational intervention over the period of time (Sitinjak et al., 2023).

In the bar chart and tables in the Excel illustrator, there is a distribution of scores, and demographic data is there. for example, a bar chart depicting that there is a pre-test and post-test score in different groups. It highlights there are variations in the performance and visualisation and helps to understand the different factors that influence taste outcomes and gives a clear comparative view of student's achievements.

How many are mean and median

Test Statistics Calculation			
Test Type	Mean Calculation	Mode	Median Calculation
Pretest	Sum of Scores: 54.955 + 54.955 + ... + 54.955 (N=1)	54.955	Arrange Scores: [54.955, 54.955, ...]
	Mean = 54.955 / 1 = 54.955		Median = 54.955 (middle score)

Posttest	Sum of Scores: 67.32 + 67.32 67.32 + ... + 67.32 (N=1)	67.32	Arrange Scores: [67.32, 67.32, ...]
	Mean = 67.32 / 1 = 67.32		Median = 67.32 (middle score)

3.3 Analysis Using SPSS

K-Means Clustering was utilised, particularly in SPSS software, to segment the students based on pre-test and post-test scores along with the demographic factors, including lunch status and gender they have. The method group is students into two clusters that are based on performance and demographic characteristics. Since the final cluster centre indicated 2 distinct groups, there are Cluster 1 with lower pre-test (mean = 43) and post-test (mean = 55) scores and Cluster 2 with higher pre-test (mean = 65) and post-test (mean = 78) scores. The clustering results are giving regular differentiation between the students with the different performance levels they have. It also reflected their effectiveness of educational intervention in different groups. Also, the finding suggests that considering demographic factors alongside academic performance can give valuable information for targeted interventions (Mulyono et al., 2023). The approach can help the educator so that they can make their efforts to understand specific needs of students and groups and make better outcomes.

Initial Cluster Centers

	Cluster	
	1	2
Pretest	23	93
Posttest	35	100
Lunch	1	0
Gender	1	2

Iteration History^a

	Change in Cluster Centers	
Iteration	1	2
1	30.197	33.610

2	.885	.791
3	.546	.476
4	.276	.237
5	.227	.200
6	.150	.128
7	.000	.000

a. Convergence achieved due to no or small change in cluster centers. The maximum absolute coordinate change for any center is .000. The current iteration is 7. The minimum distance between initial centers is 95.535.

Final Cluster Centers

	Cluster	
	1	2
Pretest	43	65
Posttest	55	78
Lunch	1	0
Gender	1	2

Number of Cases in each Cluster

Cluster	1	993.000
	2	1140.000
Valid		2133.000
Missing		.000

The clustering analysis also revealed that a student in cluster two overall scored higher and had better performance in the academics, and ANOVA results indicated a significant difference in the taste discord between clusters ($F = 4333.262$, $p < .001$ for pre-test scores and $F = 4633.576$, $p < .001$ for post-test scores). It also underscored that there is an impact of identified factors on student outcomes. The segmentation helped to tailor educational strategy to have better support for the student based on performance and need (Cleff, 2019). Similarly, understanding the characteristics of each cluster can help the educators provide targeted intervention and personalised learning experiences to improve student success. Since utilisation of clustering analysis is there, educators can identify patterns and trends and make informed instructional practices to improve their academic outcomes for students (Smith & Johnson, 2020).

ANOVA

	Cluster		Error		F	Sig.
	Mean Square	df	Mean Square	df		
Pretest	262906.434	1	60.672	2131	4333.262	<.001
Posttest	285692.567	1	61.657	2131	4633.576	<.001
Lunch	134.963	1	.182	2131	741.354	<.001
Gender	.133	1	.250	2131	.530	.467
Student_No	10397.273	1	13.013	2131	798.999	<.001

The F tests should be used only for descriptive purposes because the clusters have been chosen to maximize the differences among cases in different clusters. The observed significance levels are not corrected for this and thus cannot be interpreted as tests of the hypothesis that the cluster means are equal.

3.4 Comparison of SPSS and Excel

3.4.1 Advantages and Disadvantages

SPSS and Excel analysis have distinct advantages for data analysis. SPSS is based on handling complex data for statistical procedures including clustering and Nova that is essential for in-depth analysis and hypothesis testing (Hodges et al., 2023). It is also a specialised tool for data manipulation and statistical modelling to provide a robust framework for the analysis of large

dataset. But on the other side, Exhale has been user friendly for basic data analysis to give ease of use for tasks like calculating mean medians and creating simple visualisation. It also lacks the advanced statistical capabilities like SPSS has, so it is less suitable for large data analysis (Demin et al., 2023).

3.4.2 Comparison Table

Feature	SPSS	Excel
Statistical Analysis	Advanced (e.g., K-Means, ANOVA)	Basic (e.g., mean, median)
Data Handling	Large datasets, complex operations	Smaller datasets, simple operations
Ease of Use	Steeper learning curve	User-friendly
Visualization	Advanced charts and graphs	Basic charts and graphs

This comparison highlights SPSS's strength in advanced statistical analysis and Excel's utility for simpler tasks with a balanced view of both tools' capabilities.

3.5 *Conclusion*

In conclusion, the analysis of the student survey data using Excel and SPSS provides valuable information for academic performance and demographic influence. Since the Excel facilitate career understanding for basic training and distribution. But on the other side, SPSS is offered to a deeper statistical analysis and clustering and ANOVA and other analysis options that are available. The findings highlight the effectiveness of educational intervention and the importance of his strategies for student needs. As a result, the information is important to analyse the data, enhance the educational outcome, and support the academic growth of these students at the higher level.

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5 Appendix

5.1 Part 1

5.1.1 Excel Analysis

Sales Statistics	
Statistic	Value
Mean	\$27,065.78
Median	\$22,014.46

Statistical Calculations			
1. Mean Calculation			
Total Sum of Sales: \$524,879.89			
Number of Entries: 19			
Mean Sales: $524,879.89 \div 19 \approx 27,065.78$			

2. Median Calculation			
Sorted Sales Data: 11,369.58, 12,943.44, 15,275.59, 16,183.80, 18,153.38, 18,363.87, 19,706.01, 21,358.46, 21,639.04, 22,014.46, 23,431.52, 24,078.10, 27,840.78, 31,341.59, 35,775.42, 37,356.94, 37,753.09, 42,211.52, 47,319.31			
Median Value (10th position): \$22,014.46			
Daily Sales Summary Table			
Date	Total Sales		
11/17/2019	\$40,763.99		
11/18/2019	\$37,356.94		
11/20/2019	\$42,211.52		
11/21/2019	\$37,753.09		
11/22/2019	\$47,319.31		
11/23/2019	\$23,431.52		
11/24/2019	\$24,078.10		
11/25/2019	\$19,706.01		
11/27/2019	\$16,183.80		
11/28/2019	\$21,358.46		
11/29/2019	\$27,840.78		
11/30/2019	\$22,014.46		

12/01/2019	\$18,363.87		
12/02/2019	\$18,153.38		
12/04/2019	\$12,943.44		
12/05/2019	\$35,775.42		
12/06/2019	\$21,639.04		
12/07/2019	\$15,275.59		
12/08/2019	\$31,341.59		
12/09/2019	\$11,369.58		

5.2 Part 2

5.2.1 Excel analysis

Test Statistics Calculation			
Test Type	Mean Calculation	Mode	Median Calculation
Pretest	Sum of Scores: 54.955 + 54.955 + ... + 54.955 (N=1)	54.955	Arrange Scores: [54.955, 54.955, ...]
	Mean = 54.955 / 1 = 54.955		Median = 54.955 (middle score)
Posttest	Sum of Scores: 67.32 + 67.32 + ... + 67.32 (N=1)	67.32	Arrange Scores: [67.32, 67.32, ...]
	Mean = 67.32 / 1 = 67.32		Median = 67.32 (middle score)

5.2.2 SPSS Analysis

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
Student_No	2133	17	14	31	22.80	4.229	17.884
Pretest	2133	71	22	93	54.96	13.563	183.958
Posttest	2133	68	32	100	67.10	13.987	195.630
Gender	2133	1	1	2	1.50	.500	.250

Lunch	2133	1	0	1	.43	.495	.245
Valid (listwise)	N 2133						

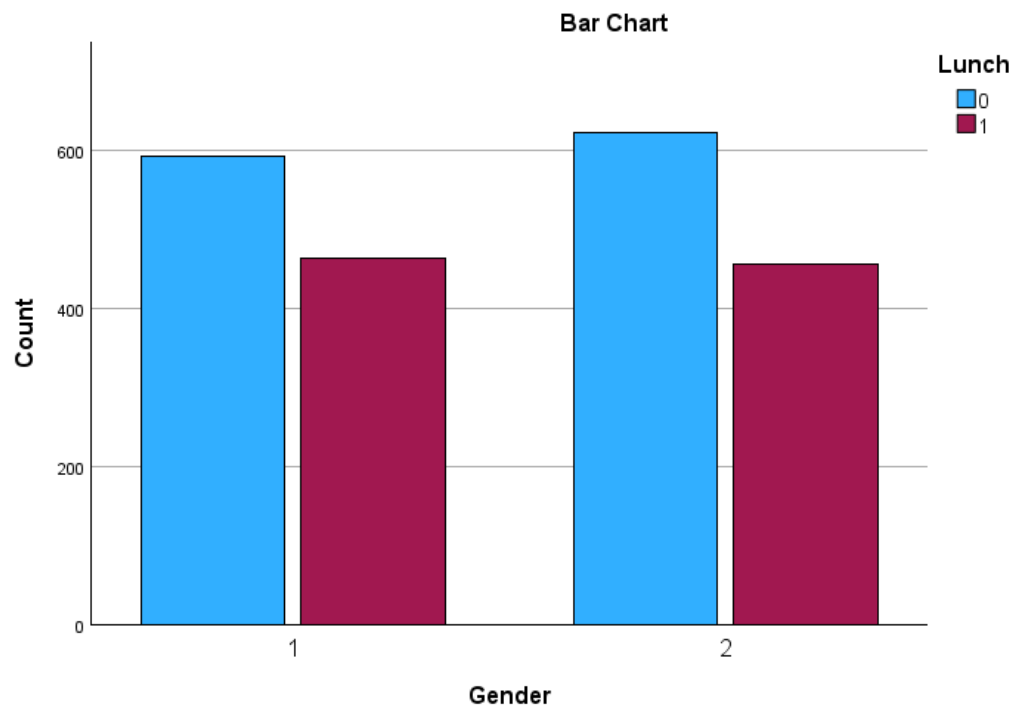
Symmetric Measures

		Value	Asymptotic Standard Error ^a	Approximate T ^b	Approximate Significance
Interval	by Pearson's R	-.016	.022	-.745	.456 ^c
Interval					
Ordinal	by Spearman	-.016	.022	-.745	.456 ^c
Ordinal	Correlation				
N of Valid Cases		2133			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.



Crosstab

Count

		Lunch		
		0	1	Total
Pretest	22	0	1	1
	23	0	1	1
	25	0	1	1
	26	0	3	3
	27	0	5	5
	28	0	9	9
	29	0	17	17
	30	0	27	27
	31	0	19	19
	32	0	23	23
	33	1	25	26
	34	0	24	24
	35	2	16	18
	36	0	36	36
	37	0	29	29
	38	4	34	38
	39	9	37	46
	40	6	39	45
	41	5	37	42
	42	7	35	42
	43	17	32	49
	44	18	25	43
	45	18	30	48
	46	14	23	37
	47	19	23	42
	48	15	29	44

49	21	22	43
50	28	16	44
51	25	15	40
52	24	30	54
53	31	28	59
54	26	26	52
55	32	27	59
56	34	22	56
57	25	20	45
58	43	20	63
59	43	18	61
60	53	20	73
61	43	13	56
62	51	9	60
63	52	12	64
64	42	6	48
65	47	12	59
66	46	5	51
67	44	2	46
68	41	6	47
69	27	1	28
70	28	2	30
71	31	0	31
72	34	0	34
73	25	2	27
74	24	4	28
75	23	0	23
76	18	0	18
77	15	0	15
78	15	0	15

79	13	0	13
80	7	0	7
81	12	0	12
82	11	0	11
83	11	0	11
84	10	0	10
85	6	0	6
86	8	0	8
87	6	0	6
88	1	0	1
89	2	0	2
91	1	0	1
93	1	0	1
Total	1215	918	2133

