EFFECTS OF ONLINE TEACHING ON STUDENT PERFORMANCE USING COVID-19 DATA. (A STUDY OF NORTHUMBRIA UNIVERSITY)

PREPARED BY:
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WORKSHOP 1/2
16.00-18.00

Northumbria University NEWCASTLE

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INTRODUCTION

- As a result of the coronavirus disease outbreak in 2020, there was a global shutdown of several activities, in which the educational sector was not spared. Universities round the world were affected and so were challenged with an immediate need to change from on-campus delivery of courses to online teaching and learning using a variety of E-learning systems. This unplanned change to instructing students in the virtual format was met with challenges such as user's acceptance, ease of use, service quality and overall satisfaction with usage.

- The Versacorp Team has received data from Northumbria University students and will provide good insight on the effectiveness of online teaching on students' performance using Covid-19 data.

STUDY FRAMEWORK

DCOVA Framework

- Define the data under study to solve a problem or to meet an objective.
- Collect the data from appropriate sources.
- Organize the data collected by developing tables.
- Visualize the data collected by developing charts.
- Analyze the data collected to reach conclusions and present those results.

Objectives

To measure and give recommendations to the university based on student performances through the understanding of the influences of different variables on the student average score, such as;

- To determine if a positive relationship exists between Mode Of Study and Average score.
- To determine if a positive relationship exists between the quality of teaching and students' performance(average scores).
- To determine if a positive relationship exists between the university Mode Of Teaching and the performance of the students (Average Scores).
- To determine if a positive relationship exists between the satisfaction level and student performance.
- Compare how the ease of use of the system by academic staffs affects the performance of the students' vis-a-vis student average scores .
- To use PESTEL and SWOT analysis tools to examine the factors that affects online mode of teaching and recommend strategies to mitigate against those factors.

Importance of the Study

- Mode of Study, mode of teaching, quality of teaching, and the level of overall satisfaction at the university were all considered to see how they affect the student average scores. These identified variables have such a strong and explicit effect on students' academic performance.
- This study will aid the university in developing new strategies to boost student achievements.
- The study will suggest ways the university may engage students more effectively.

Research Approach

This study utilized the quantitative research method in order to accomplish the goals that have been outlined. The data that was acquired would be evaluated using descriptive statistics, and both parametric and nonparametric tests were conducted using the tools provided by SAS and SPSS in order to come to a conclusion regarding the hypotheses.

- The data used for this analysis was from a secondary source which was based on survey responses. (questionnaire).
- The data consists of 1105 responses from Northumbria students.
- The hypotheses stated in the next slide were tested.

HYPOTHESIS

Mann-Whitney U Test

- H1: There is a positive relationship between mode of study and average scores.
- H0: There is a negative relationship between mode of study and average scores.

Anova

- H2: There is a positive relationship between mode of teaching and students average scores.
- H0: There is a negative relationship between mode of teaching and students average scores

Regression

- H3: There is a positive relationship between the quality of teaching and student performance(average scores).
- H0: There is a negative relationship between the university's mode of teaching and student's performance(average scores).

Regression

- H4: There is positive relationship between the overall satisfaction and student performance (average scores)
- H0: There is a negative relationship between the overall satisfaction and student's performance (average scores).

PESTEL Analysis

PESTEL	FACTORS	STRATEGIES
POLITICAL	Restricted internet access in some countries e.g. China and North Korea.	Understanding international political policies.
ECONOMIC	Difficulties affording cost of materials and devices.	Provide enough academic content on the school online library.
SOCIAL	Lack of human interaction	Engage students through online group activities.
TECHOLOGY	Lack of access to the required electronic devices and good internet facility.	Design course materials on variety of platforms.
ENVIRONMENTAL	Increase in energy consumption means students will have to spend more time online.	Access to school library 24/7.
LEGAL	Stringent restrictions on the distribution of learning resources	Course contents are developed to suite different countries.

SWOT Analysis

SWOT	FACTORS	STRATEGIES
STRENGTH	• Freedom in studying to a high degree • Personality of the student is respected	• Establish a positive learning environment. • Reform and re-invent teaching approach.
WEAKNESS	• Absence of enthusiasm • Ineffective and inefficient level of communication	• Encourage learning through group formations and discussions.
OPPORTUNITIES	• Students develop skills to think independently	• Adopt the hybrid teaching method. • Enhance instructor supervision.
THREATS	• Network fluctuation • Resources available on the web are vast and often difficult to navigate.	• Allow access to recorded online lectures. • Put a proper study guide in place.

Description of the data

Independent Variables:

- Study Level
- Mode of Study
- Mode of Teaching
- Their Perception regarding The Quality of Teaching (1-5)
- Their Perception regarding The Ease of Use of Online-teaching tools system (1-5)
- Their Overall Satisfaction regarding Online-teaching tools system (1-5)

Dependent Variable

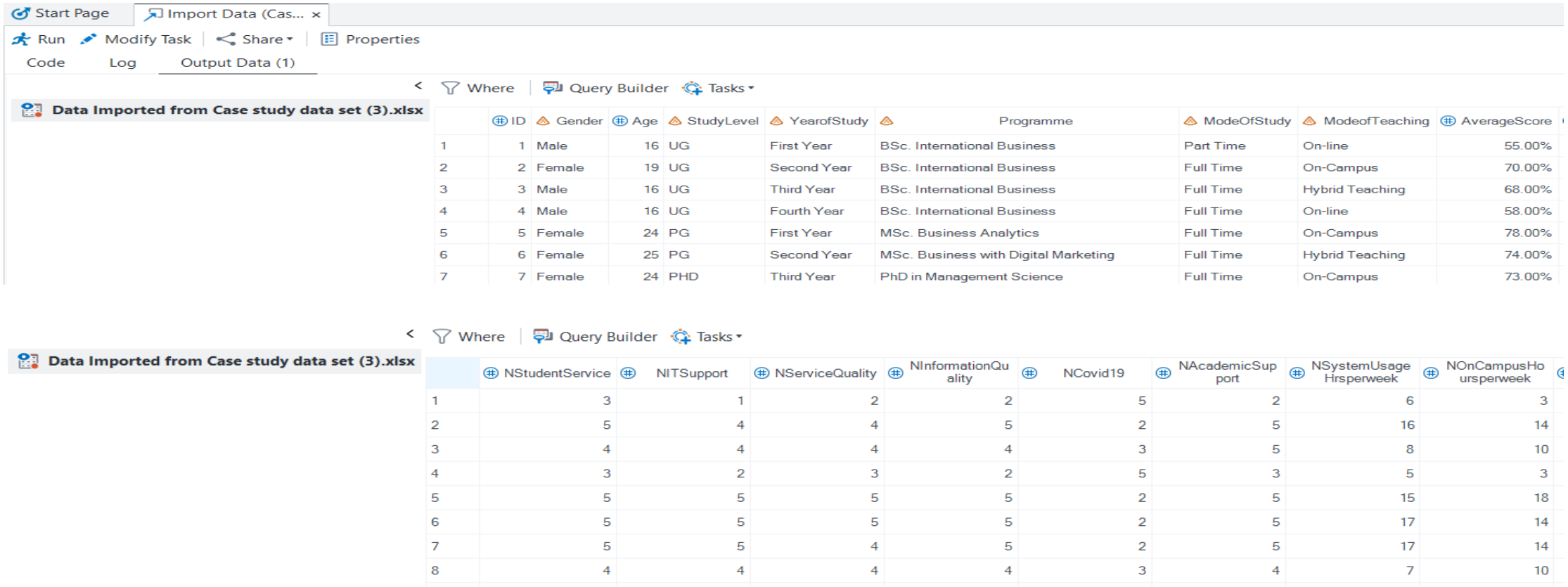
- Average Score of their marks this semester 2020

Where:

- 1 = Very Poor
- 2 = Poor
- 3 = Neutral
- 4 = Good
- 5 = Very Good

SAS ANALYSIS

SAS DATA VIEW



	ID	Gender	Age	StudyLevel	YearofStudy	Programme	ModeOfStudy	ModeofTeaching	AverageScore
1	1	Male	16	UG	First Year	BSc. International Business	Part Time	On-line	55.00%
2	2	Female	19	UG	Second Year	BSc. International Business	Full Time	On-Campus	70.00%
3	3	Male	16	UG	Third Year	BSc. International Business	Full Time	Hybrid Teaching	68.00%
4	4	Male	16	UG	Fourth Year	BSc. International Business	Full Time	On-line	58.00%
5	5	Female	24	PG	First Year	MSc. Business Analytics	Full Time	On-Campus	78.00%
6	6	Female	25	PG	Second Year	MSc. Business with Digital Marketing	Full Time	Hybrid Teaching	74.00%
7	7	Female	24	PHD	Third Year	PhD in Management Science	Full Time	On-Campus	73.00%

	NStudentService	NITSupport	NServiceQuality	NInformationQuality	NCovid19	NAcademicSupport	NSystemUsageHrsperweek	NOnCampusHoursperweek
1	3	1	2	2	5	2	6	3
2	5	4	4	5	2	5	16	14
3	4	4	4	4	3	5	8	10
4	3	2	3	2	5	3	5	3
5	5	5	5	5	2	5	15	18
6	5	5	5	5	2	5	17	14
7	5	5	4	5	2	5	17	14
8	4	4	4	4	3	4	7	10

Fig.1

SAS PROCESS FLOW

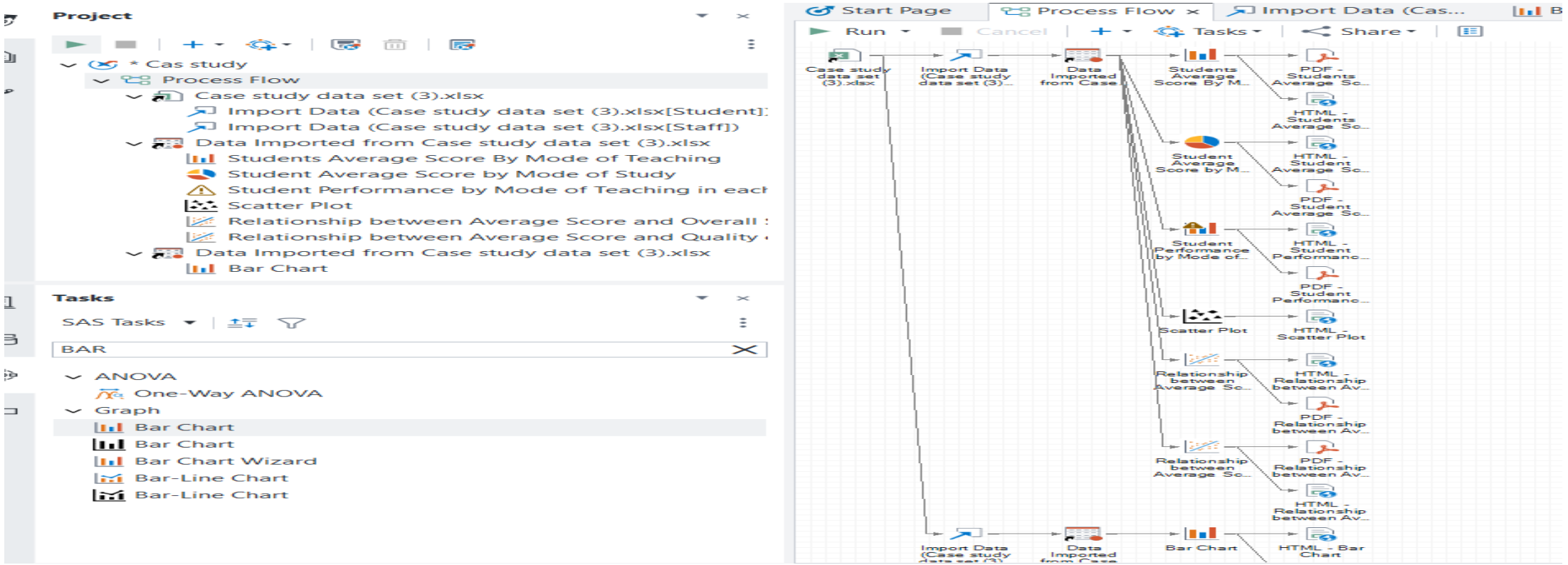
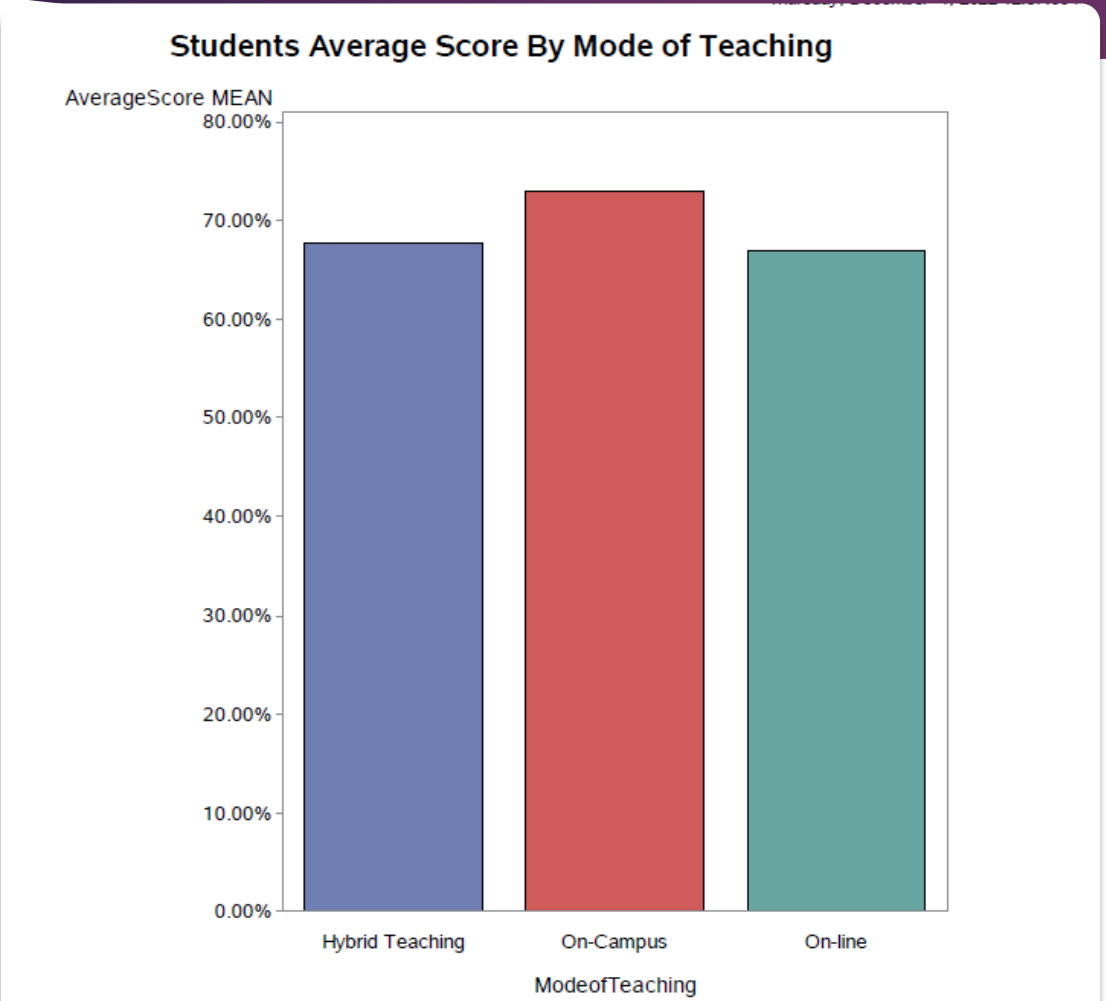


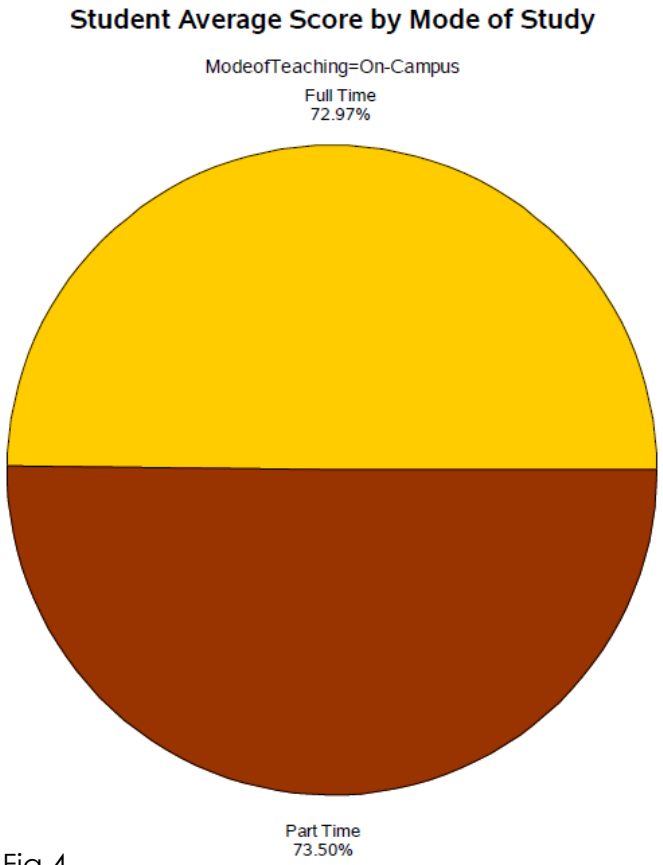
Fig.2

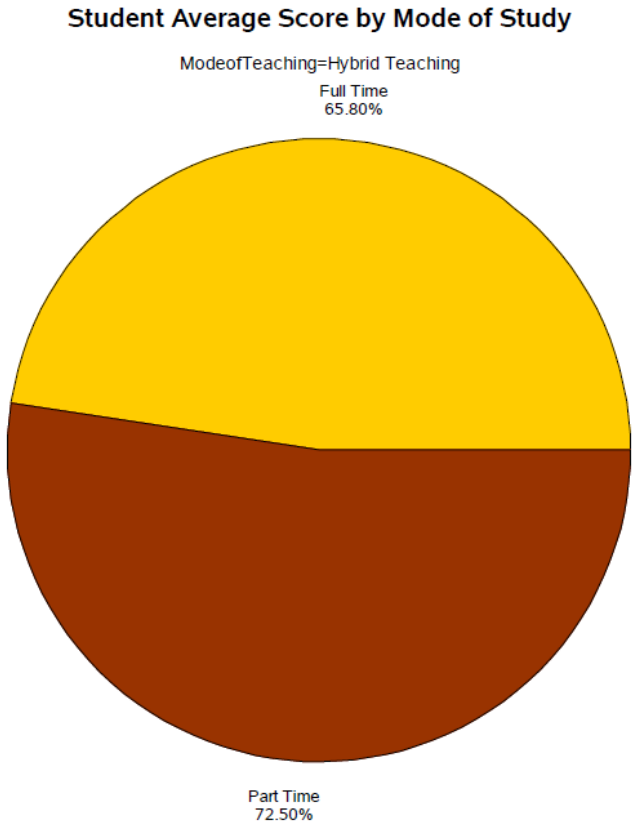
GRAPHICAL REPRESENTATION OF VARIABLE DISTRIBUTION USING SAS



- This chart indicates that based on mode of teaching, on campus students had the highest mean average score of over 70%. There was no significant difference between hybrid and online mode.

▶Fig.3





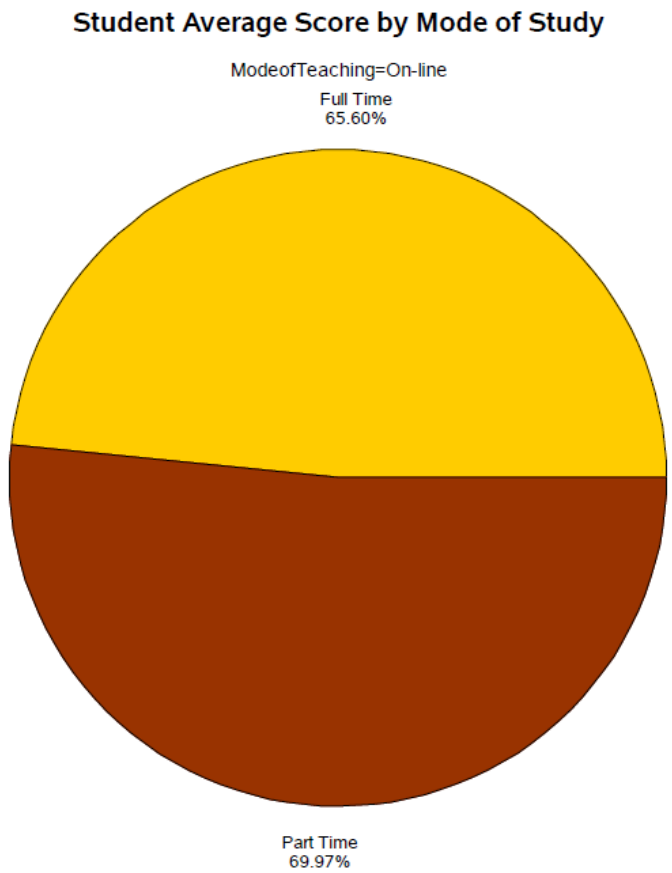


Fig.4

- From the pie charts above, we can conclude the full time and part time student who studied on campus have highest average of 72.97% and 73.50% respectively compared to the average score of student who studied online or hybrid.
- Again, the lowest average scores were recorded by students who studied online.

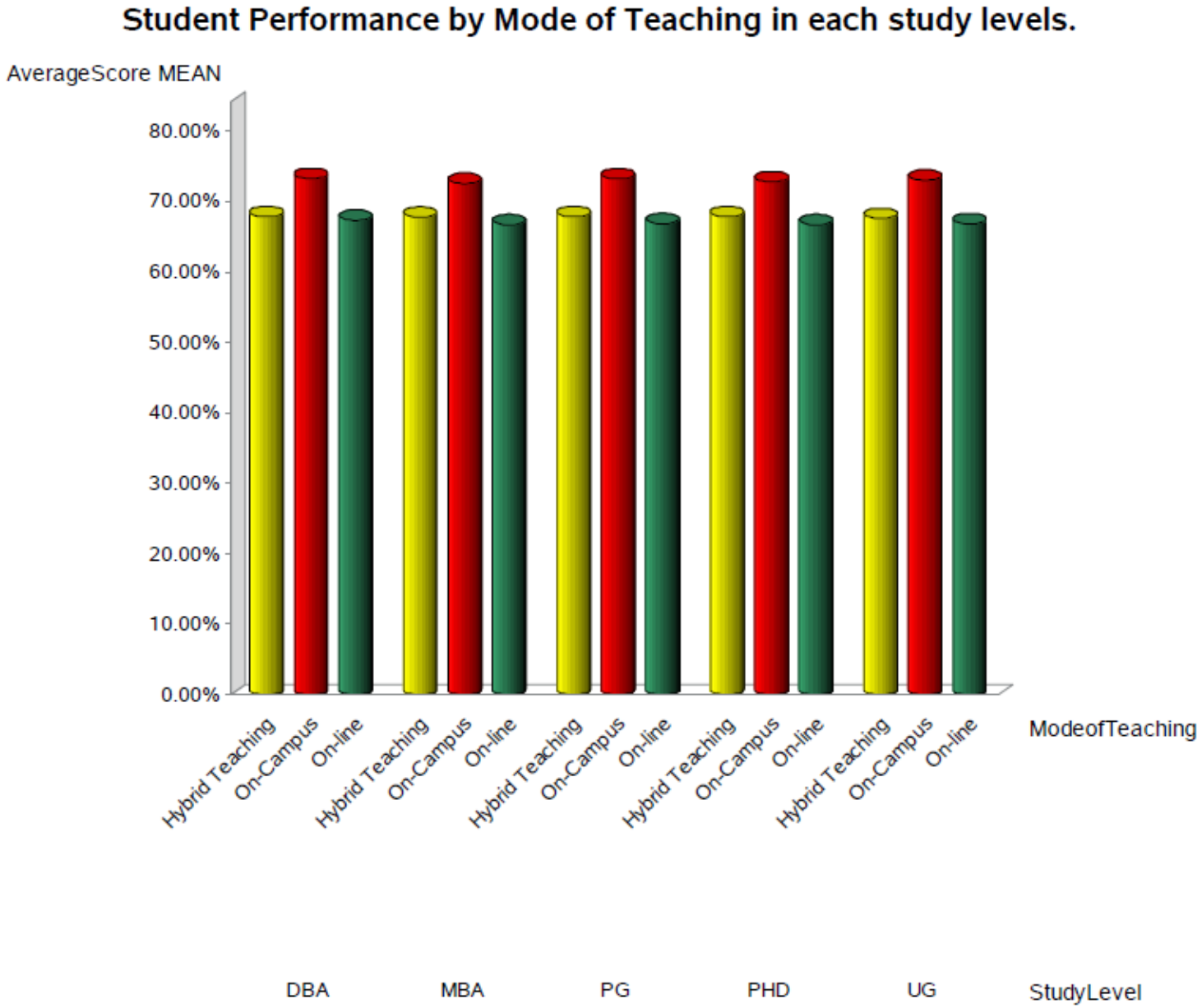


Fig.5

- From the bar chart, online students performed least with average score less than 70% across all study levels.
- Better performances were recorded by the Hybrid and OnCampus students.

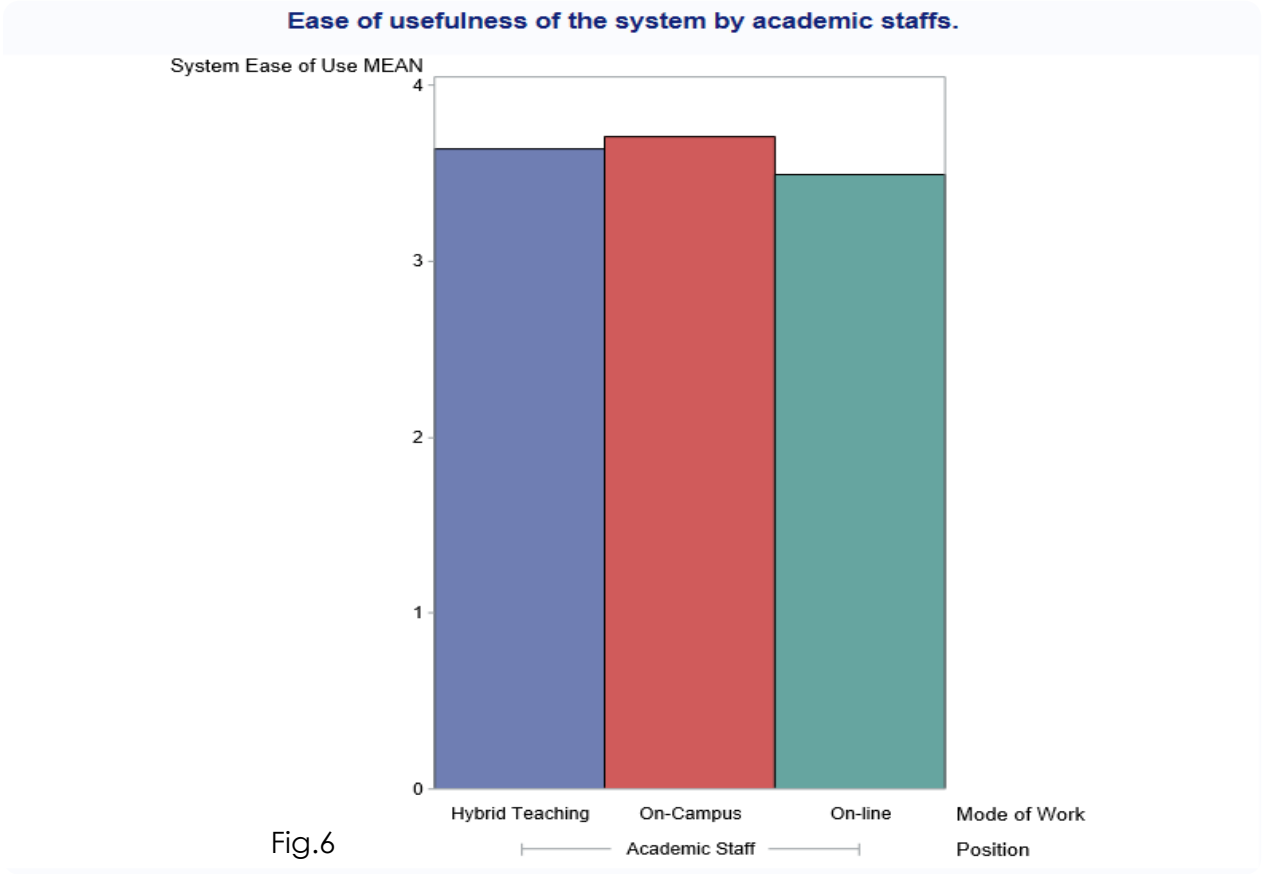


Fig.6

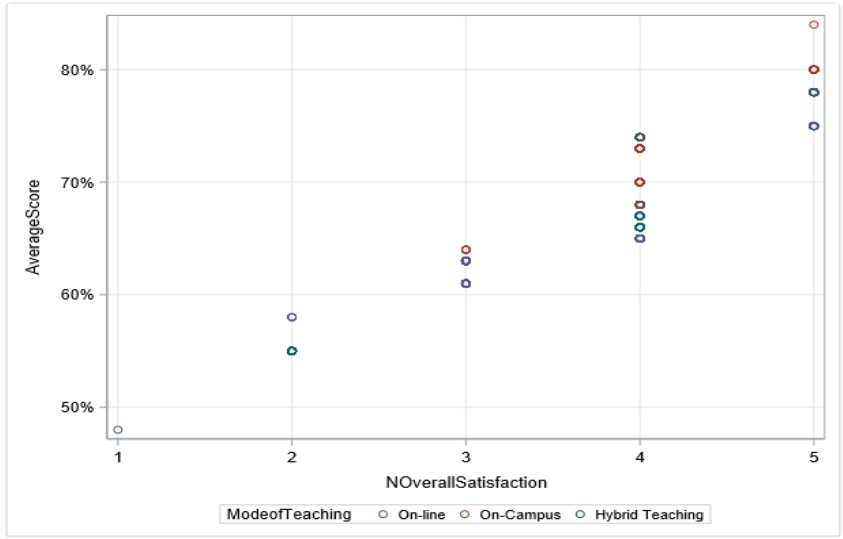


Fig. 7

- In fig 6, this bar chart shows that staff who worked on campus found it easiest to use online system. Staff who taught online struggled a bit, which could be as a result of system glitches or inadequate training.

- In fig 7, we looked at the scatter plot which shows the distribution of student overall satisfaction against their average score.
  - From this plot, online student recorded the least satisfaction which resulted into low average score.

REGRESSION ANALYSIS

Relationship between Average Score and Overall Satisfation

The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: AverageScore

Number of Observations Read	1104
Number of Observations Used	1104

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	3.50185	3.50185	4387.94	<.0001
Error	1102	0.87946	0.00079806		
Corrected Total	1103	4.38131			

Root MSE	0.02825	R-Square	0.7993
Dependent Mean	0.69195	Adj R-Sq	0.7991
Coeff Var	4.08268		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	0.39456	0.00457	86.35	<.0001
NOverallSatisfaction	1	0.07567	0.00114	66.24	<.0001

Relationship between Average Score and Overall Satisfation

The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: AverageScore

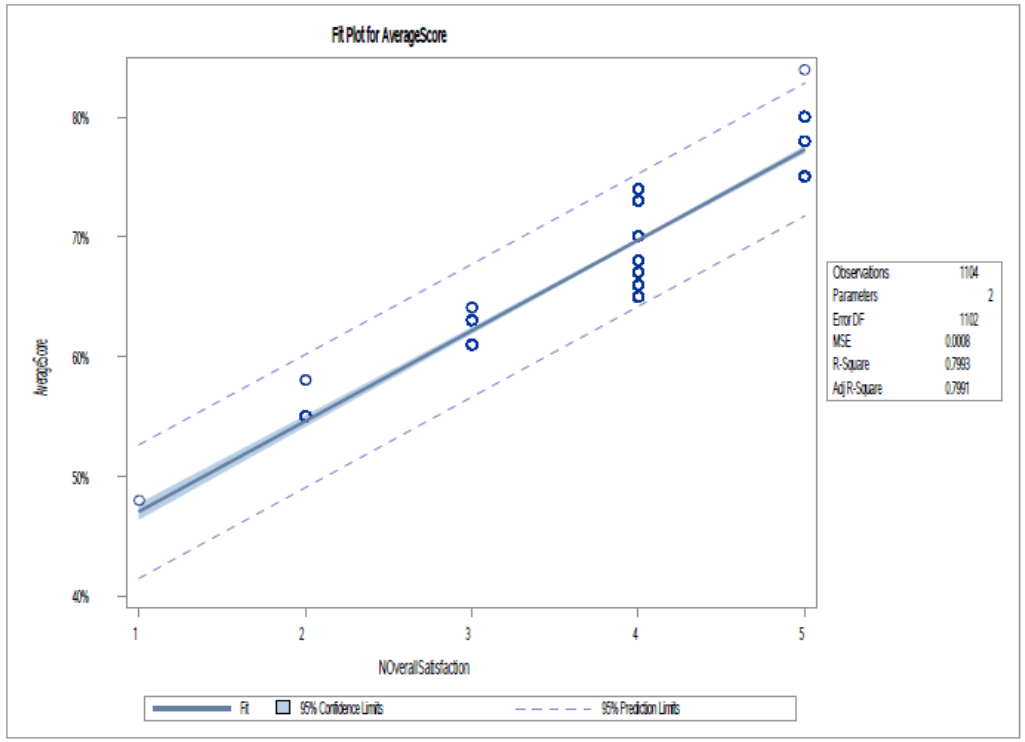


Fig.8

The diagram above depicts the p value is < 0.05 and correlation coefficient (r) is 0.7993, hence we accept our hypothesis, and the regression line shows that there is a positive relationship between the average score of students and overall satisfaction.

REGRESSION ANALYSIS

Relationship between Average Score and Quality of Teaching

The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: AverageScore

Number of Observations Read	1104
Number of Observations Used	1104

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	3.80362	3.80362	7255.80	<.0001
Error	1102	0.57769	0.00052422		
Corrected Total	1103	4.38131			

Root MSE	0.02290	R-Square	0.8681
Dependent Mean	0.69195	Adj R-Sq	0.8680
Coeff Var	3.30889		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	0.39175	0.00359	109.09	<.0001
NQualityOfTeaching	1	0.08690	0.00102	85.18	<.0001

Relationship between Average Score and Quality of Teaching

The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: AverageScore

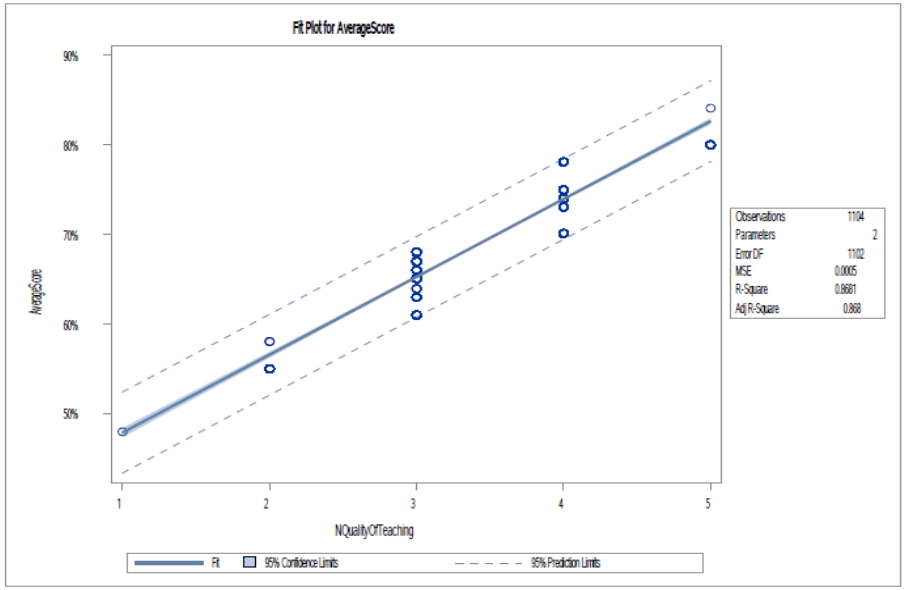
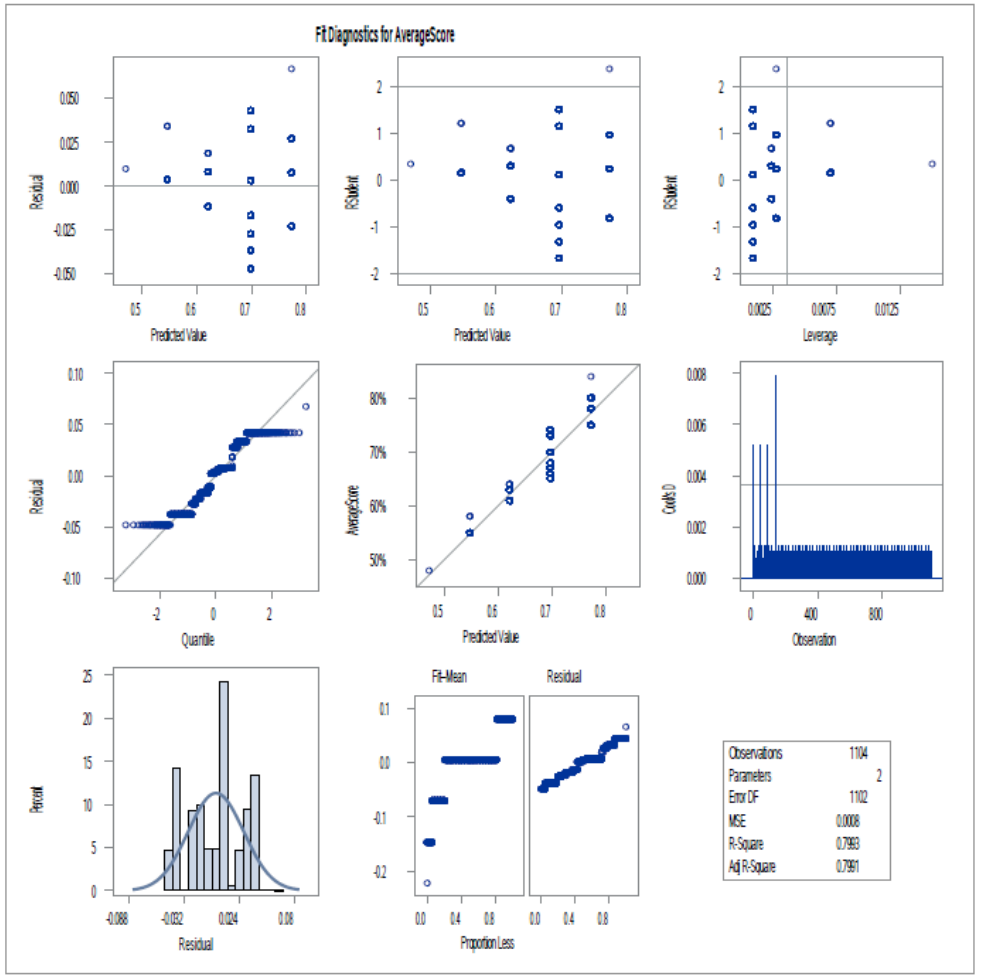


Fig.9

According to the results shown in the preceding graphic, the p value is less than 0.05 and the correlation coefficient (r) is 0.8681 which shows that there is a strong positive relationship between quality of teaching and average score.

Relationship between Average Score and Overall Satisfation

The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: AverageScore



Relationship between Average Score and Quality of Teaching

The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: AverageScore

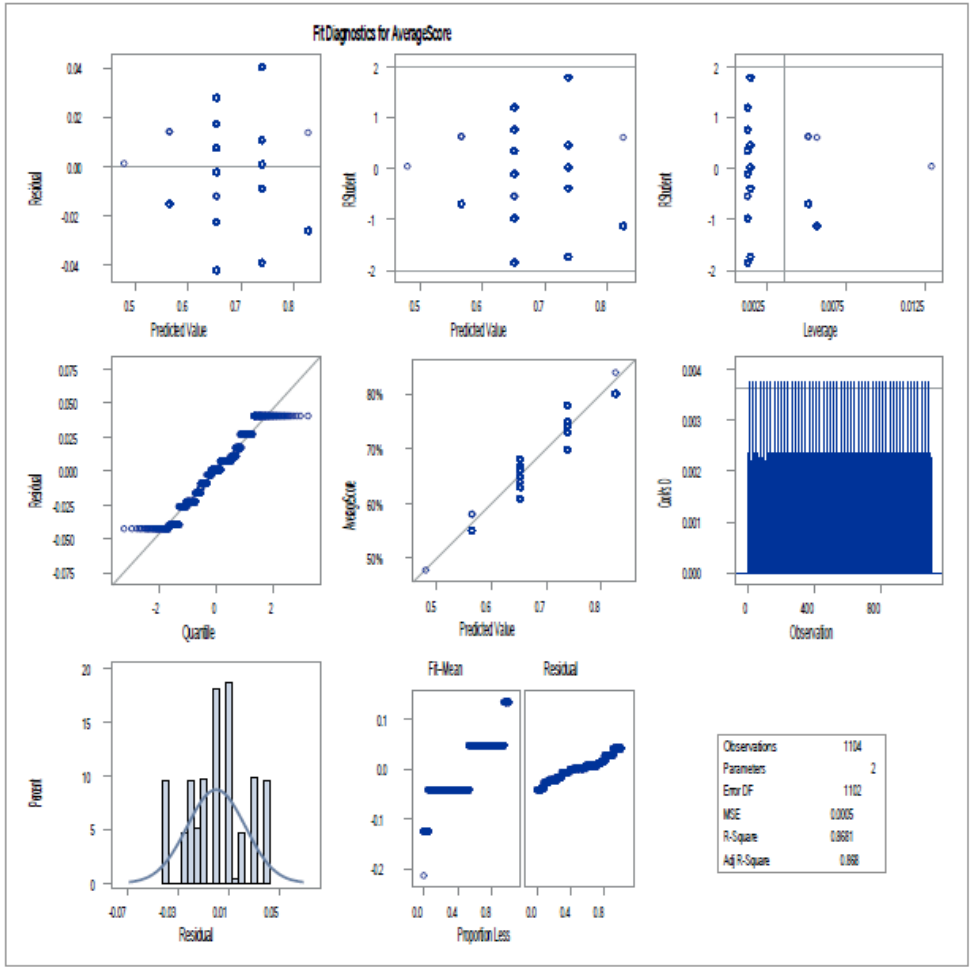
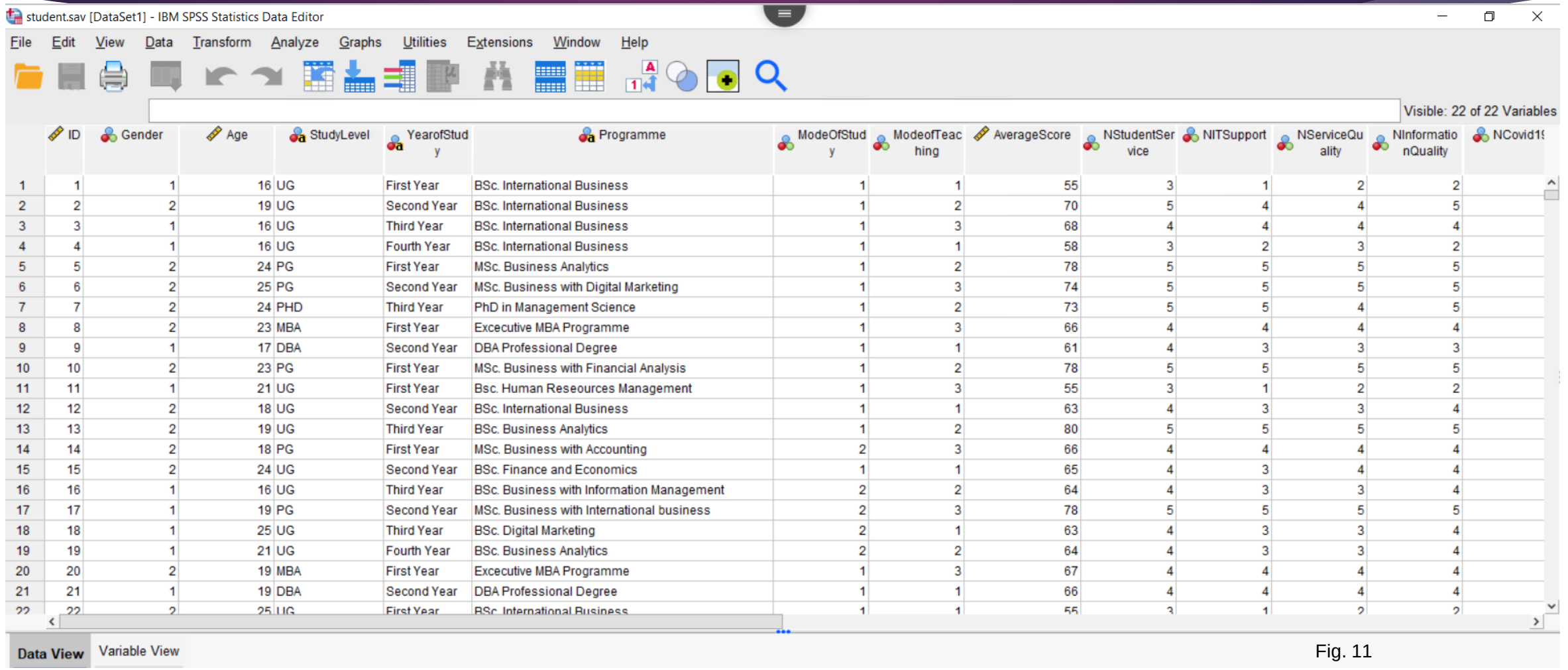


Fig.10

SPSS ANALYSIS

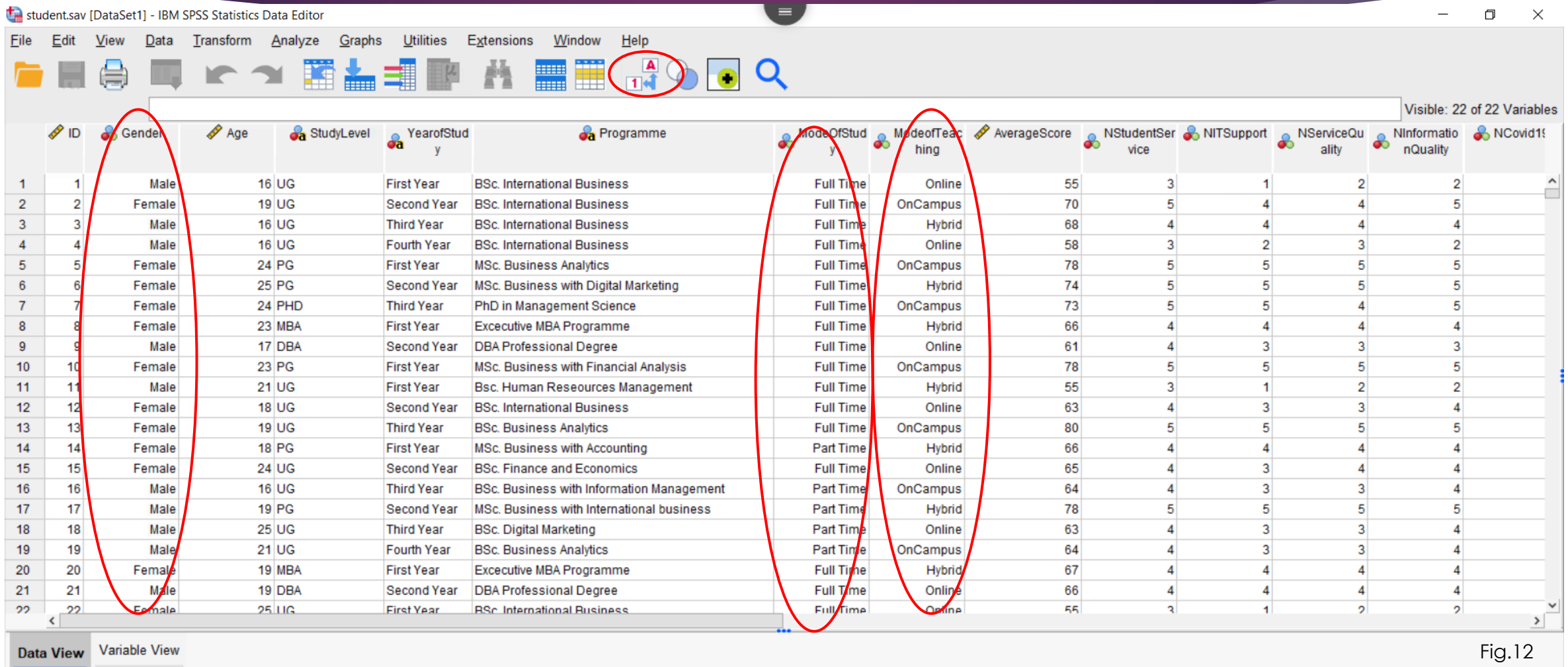
SPSS DATA VIEW



	ID	Gender	Age	StudyLevel	YearofStudy	Programme	ModeOfStudy	ModeofTeaching	AverageScore	NStudentService	NITSupport	NServiceQuality	NInformationQuality	NCovid19
1	1	1	16	UG	First Year	BSc. International Business	1	1	55	3	1	2	2	
2	2	2	19	UG	Second Year	BSc. International Business	1	2	70	5	4	4	5	
3	3	1	16	UG	Third Year	BSc. International Business	1	3	68	4	4	4	4	
4	4	1	16	UG	Fourth Year	BSc. International Business	1	1	58	3	2	3	2	
5	5	2	24	PG	First Year	MSc. Business Analytics	1	2	78	5	5	5	5	
6	6	2	25	PG	Second Year	MSc. Business with Digital Marketing	1	3	74	5	5	5	5	
7	7	2	24	PHD	Third Year	PhD in Management Science	1	2	73	5	5	4	5	
8	8	2	23	MBA	First Year	Excecutive MBA Programme	1	3	66	4	4	4	4	
9	9	1	17	DBA	Second Year	DBA Professional Degree	1	1	61	4	3	3	3	
10	10	2	23	PG	First Year	MSc. Business with Financial Analysis	1	2	78	5	5	5	5	
11	11	1	21	UG	First Year	Bsc. Human Reseources Management	1	3	55	3	1	2	2	
12	12	2	18	UG	Second Year	BSc. International Business	1	1	63	4	3	3	4	
13	13	2	19	UG	Third Year	BSc. Business Analytics	1	2	80	5	5	5	5	
14	14	2	18	PG	First Year	MSc. Business with Accounting	2	3	66	4	4	4	4	
15	15	2	24	UG	Second Year	BSc. Finance and Economics	1	1	65	4	3	4	4	
16	16	1	16	UG	Third Year	BSc. Business with Information Management	2	2	64	4	3	3	4	
17	17	1	19	PG	Second Year	MSc. Business with International business	2	3	78	5	5	5	5	
18	18	1	25	UG	Third Year	BSc. Digital Marketing	2	1	63	4	3	3	4	
19	19	1	21	UG	Fourth Year	BSc. Business Analytics	2	2	64	4	3	3	4	
20	20	2	19	MBA	First Year	Excecutive MBA Programme	1	3	67	4	4	4	4	
21	21	1	19	DBA	Second Year	DBA Professional Degree	1	1	66	4	4	4	4	
22	22	2	25	UG	First Year	BSc. International Business	1	1	55	3	1	2	2	

Fig. 11

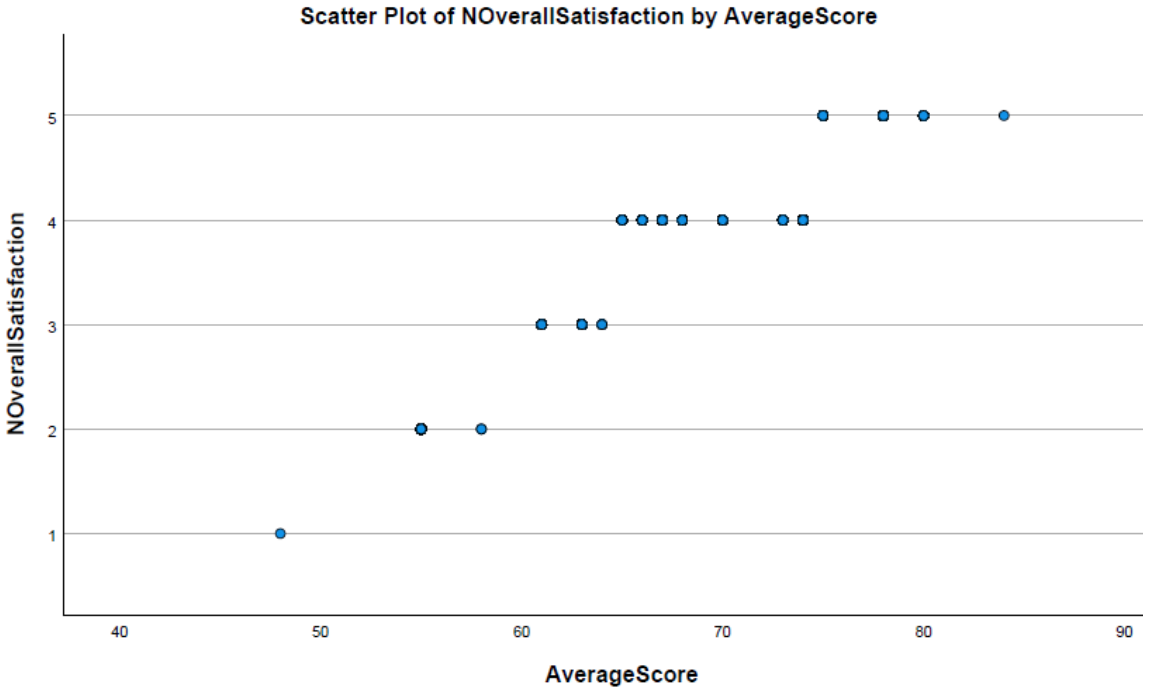
SPSS DATA VIEW



	ID	Gender	Age	StudyLevel	YearofStudy	Programme	ModeOfStudy	ModeofTeaching	AverageScore	NStudentService	NITSupport	NServiceQuality	NInformationQuality	NCovid19
1	1	Male	16	UG	First Year	BSc. International Business	Full Time	Online	55	3	1	2	2	
2	2	Female	19	UG	Second Year	BSc. International Business	Full Time	OnCampus	70	5	4	4	5	
3	3	Male	16	UG	Third Year	BSc. International Business	Full Time	Hybrid	68	4	4	4	4	
4	4	Male	16	UG	Fourth Year	BSc. International Business	Full Time	Online	58	3	2	3	2	
5	5	Female	24	PG	First Year	MSc. Business Analytics	Full Time	OnCampus	78	5	5	5	5	
6	6	Female	25	PG	Second Year	MSc. Business with Digital Marketing	Full Time	Hybrid	74	5	5	5	5	
7	7	Female	24	PHD	Third Year	PhD in Management Science	Full Time	OnCampus	73	5	5	4	5	
8	8	Female	23	MBA	First Year	Excecutive MBA Programme	Full Time	Hybrid	66	4	4	4	4	
9	9	Male	17	DBA	Second Year	DBA Professional Degree	Full Time	Online	61	4	3	3	3	
10	10	Female	23	PG	First Year	MSc. Business with Financial Analysis	Full Time	OnCampus	78	5	5	5	5	
11	11	Male	21	UG	First Year	Bsc. Human Reseources Management	Full Time	Hybrid	55	3	1	2	2	
12	12	Female	18	UG	Second Year	BSc. International Business	Full Time	Online	63	4	3	3	4	
13	13	Female	19	UG	Third Year	BSc. Business Analytics	Full Time	OnCampus	80	5	5	5	5	
14	14	Female	18	PG	First Year	MSc. Business with Accounting	Part Time	Hybrid	66	4	4	4	4	
15	15	Female	24	UG	Second Year	BSc. Finance and Economics	Full Time	Online	65	4	3	4	4	
16	16	Male	16	UG	Third Year	BSc. Business with Information Management	Part Time	OnCampus	64	4	3	3	4	
17	17	Male	19	PG	Second Year	MSc. Business with International business	Part Time	Hybrid	78	5	5	5	5	
18	18	Male	25	UG	Third Year	BSc. Digital Marketing	Part Time	Online	63	4	3	3	4	
19	19	Male	21	UG	Fourth Year	BSc. Business Analytics	Part Time	OnCampus	64	4	3	3	4	
20	20	Female	19	MBA	First Year	Excecutive MBA Programme	Full Time	Hybrid	67	4	4	4	4	
21	21	Male	19	DBA	Second Year	DBA Professional Degree	Full Time	Online	66	4	4	4	4	
22	22	Female	25	UG	First Year	BSc. International Business	Full Time	Online	55	3	1	2	2	

Fig.12

QUALITY OF TEACHING AND SYSTEM USEFULNESS



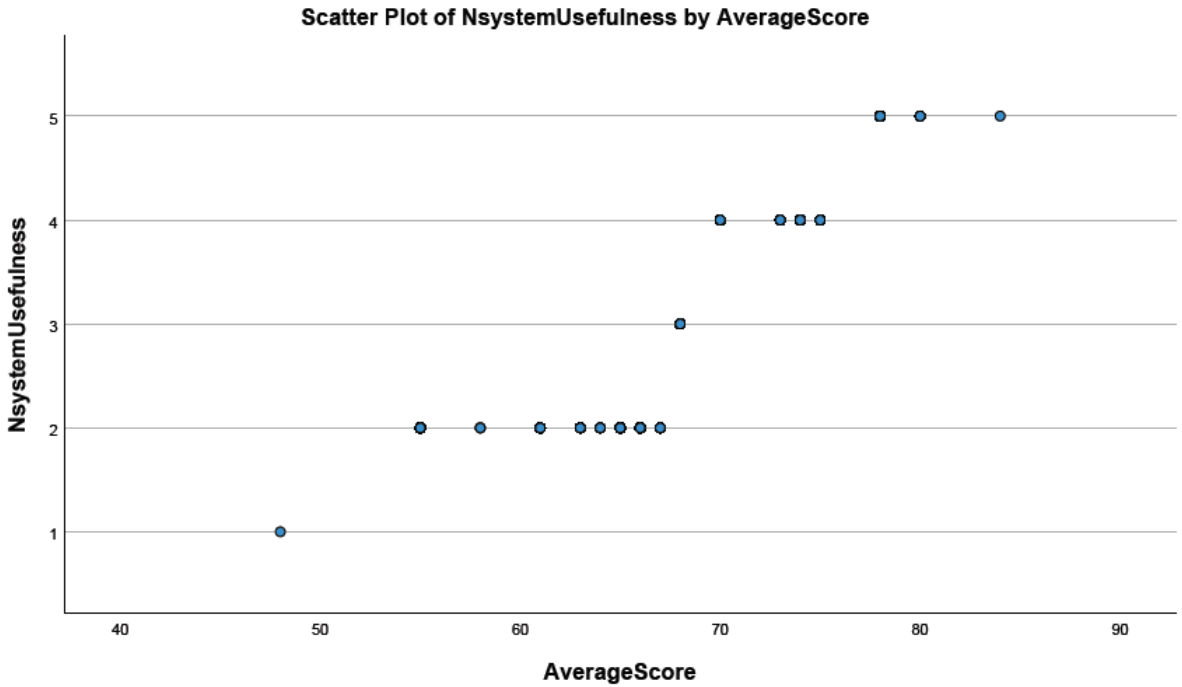


Fig.13

Mann-Whitney U Test

We performed a non-parametric test because all the assumptions of a parametric test of independent variables (2 groups) are not met.

From the group statistic, it can be observed that the categorical variable groups is not evenly distributed.

The P value is < 0.05

Hence, we accept our hypothesis which states that there is a strong positive relationship between mode of study and average scores.

Group Statistics

	ModeOfStudy	N	Mean	Std. Deviation	Std. Error Mean
AverageScore	Full Time	841	68.72	6.377	.220
	Part Time	260	70.80	5.743	.356

Test Statistics[a]

	AverageScore
Mann-Whitney U	72605.000
Wilcoxon W	428351.000
Z	-8.350
Asymp. Sig. (2-tailed)	<.001

a. Grouping Variable: ModeOfStudy

Fig.14

Test of Normality

ModeofTeaching

Case Processing Summary

		Cases				
		Valid		Missing		Total
	ModeofTeaching	N	Percent	N	Percent	N
AverageScore	Online	368	100.0%	0	0.0%	368
	OnCampus	368	100.0%	0	0.0%	368
	Hybrid	368	100.0%	0	0.0%	368

Case Processing Summary

		Cases
		Total
	ModeofTeaching	Percent
AverageScore	Online	100.0%
	OnCampus	100.0%
	Hybrid	100.0%

Fig.15

- skewness z-value and Kurtosis z-value-1.96 to +1.96

Descriptives

	ModeofTeaching			Statistic	Std. Error
AverageScore	Online	Mean		66.85	.319
		95% Confidence Interval for Mean	Lower Bound	66.22	
			Upper Bound	67.47	
		5% Trimmed Mean		66.67	
		Median		65.00	
		Variance		37.505	
		Std. Deviation		6.124	
		Minimum		48	
		Maximum		78	
		Range		30	
		Interquartile Range		12	
		Skewness		.736	.127
		Kurtosis		-.587	.254
	OnCampus	Mean		73.05	.197
		95% Confidence Interval for Mean	Lower Bound	72.66	
			Upper Bound	73.43	
		5% Trimmed Mean		73.00	
		Median		73.00	
		Variance		14.240	
		Std. Deviation		3.774	
		Minimum		64	
		Maximum		84	
		Range		20	
		Interquartile Range		4	

Descriptives

ModeofTeaching			Statistic	Std. Error
	Skewness		.343	.127
	Kurtosis		-.028	.254
Hybrid	Mean		67.69	.350
	95% Confidence Interval for Mean	Lower Bound	67.01	
		Upper Bound	68.38	
	5% Trimmed Mean		67.83	
	Median		67.00	
	Variance		44.965	
	Std. Deviation		6.706	
	Minimum		55	
	Maximum		78	
	Range		23	
	Interquartile Range		8	
	Skewness		-.351	.127
	Kurtosis		-.220	.254

Fig.16

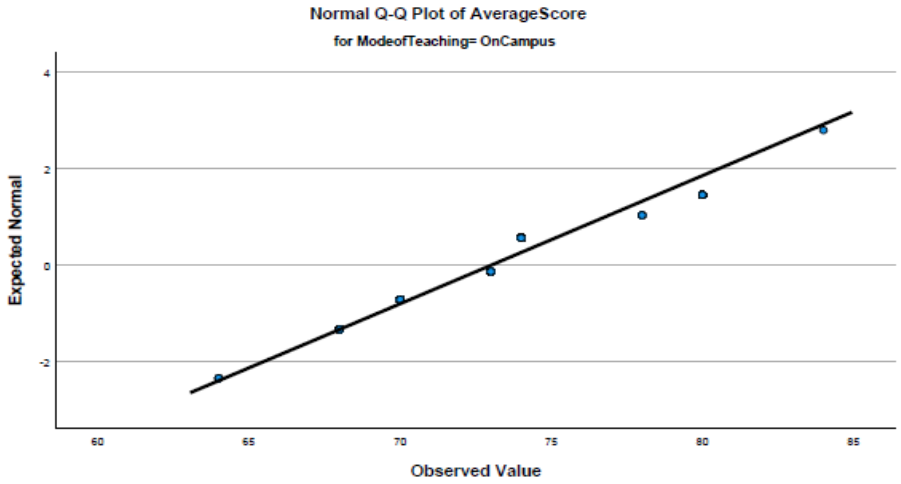
Tests of Normality

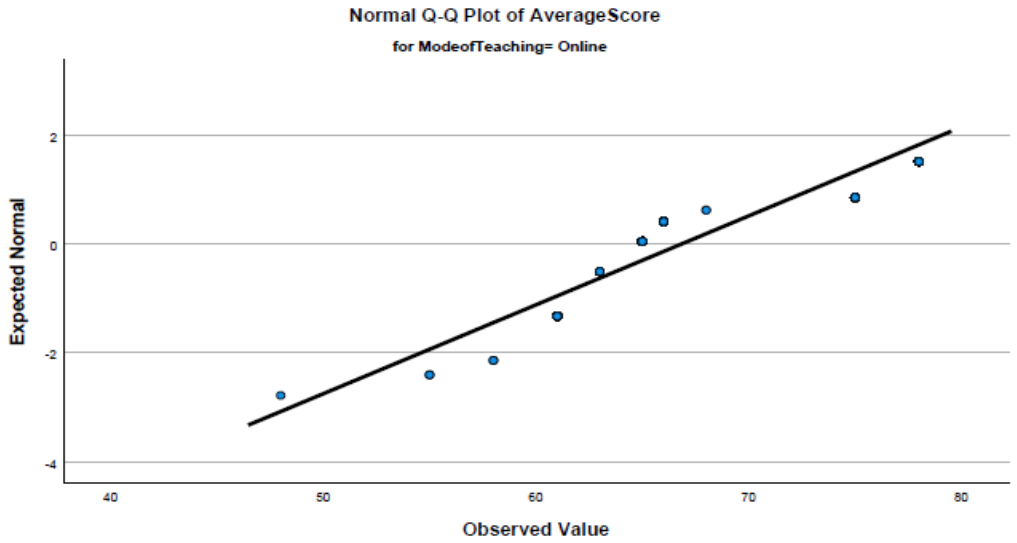
		Kolmogorov-Smirnov[a]			Shapiro-Wilk	
	ModeofTeaching	Statistic	df	Sig.	Statistic	df
AverageScore	Online	.286	368	<.001	.818	368
	OnCampus	.240	368	<.001	.894	368
	Hybrid	.256	368	<.001	.861	368

Tests of Normality

		Shapiro-...
	ModeofTeaching	Sig.
AverageScore	Online	<.001
	OnCampus	<.001
	Hybrid	<.001

a. Lilliefors Significance Correction





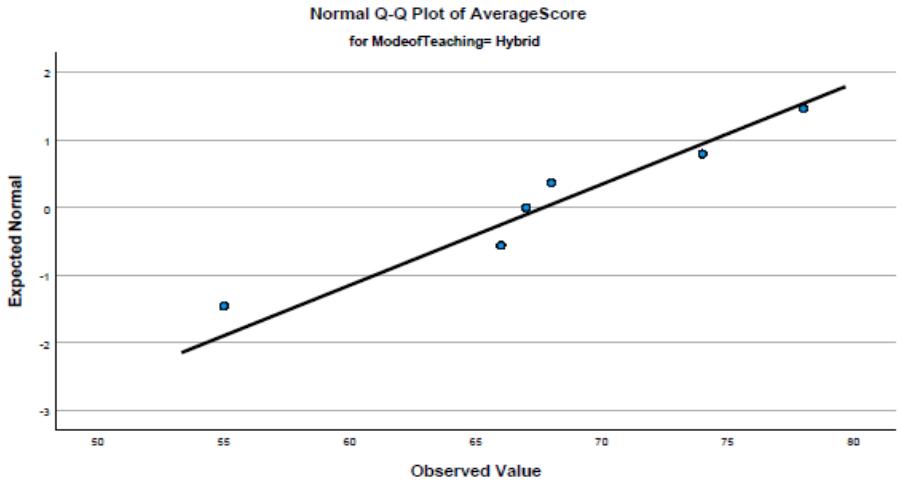


Fig.17

Anova Test

Equal sample > 25, no need for homogeneity and normality checks.

The samples are of equal numbers 368.

P value is < 0.05.

Hence, we accept our hypothesis which states that there is a strong positive relationship between mode of teaching and average scores.

Report

AverageScore

ModeofTeaching	Mean	N	Std. Deviation
Online	66.85	368	6.124
On-Campus	73.05	368	3.774
Hybrid	67.69	368	6.706
Total	69.19	1104	6.303

ANOVA

AverageScore

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	8320.442	2	4160.221	129.052	<.001
Within Groups	35492.688	1101	32.237		
Total	43813.130	1103			

Fig.18

RESEARCH FINDINGS

- By plotting the charts (fig 3 –fig 7) using the SAS programming tool to depict the various relationships that exist between the identified variables
  - The ease of use of the system for academic staff.
  - The quality of teaching.
  - The overall satisfaction.

the results shows that perceived overall effectiveness of online education is lower than that of on-campus mode of study and hybrid study.

- In terms of academic success, students with on-campus mode of study have the greatest average scores of over 75% when compared to students with hybrid (both online and on campus) and just online presence for all the university degrees and mode of study (Part time and Full time) .

RESEARCH FINDINGS

Using the SPSS and SAS to examine the relationships between the dependent and independent variables below are the research findings;

- To determine whether there is a positive relationship between mode of study and student performance (i.e., average scores of student) using the Mann Whitney U test , reveals that a positive relationship exists between the two variables. The p- value in Hypothesis 1 is lesser than the level of significance i.e. (0.001 < 0.05) and as such we will reject the null hypothesis and accept the alternative hypothesis.
- Secondly, to determine if there is a positive relationship between the quality of teaching and the student's performance by conducting a regression analysis, the results shows that the p- value in Hypothesis 2 is lesser than the level of significance i.e. (0.001 < 0.05) and as such we will reject the null hypothesis and accept the alternative hypothesis.
- Thirdly, to determine if there is a positive relationship between the mode of teaching and the student performance by using the Anova statistical tool, the result shows that the p- value in Hypothesis 3 is lesser than the level of significance i.e. (0.001 < 0.05) and as such we will reject the null hypothesis and accept the alternative hypothesis.
- Fourthly, to determine if there is a positive relationship between the overall satisfaction and the student's performance by conducting a regression analysis, the results shows that the p- value in Hypothesis 2 is lesser than the level of significance i.e. (0.001 < 0.05) and as such we will reject the null hypothesis and accept the alternative hypothesis.

HOW THE STATISTICAL METHOD ALIGNS WITH THE STUDY.

- The consistency of these findings in comparison to the analyzed data lends credibility to this study. The p-value derived from the Parametric(regression analysis and Anova) and non-parametric tests(Mann-Whitney U Test) performed in this study is commonly used by scientists to decide whether to accept or reject a hypothesis relationship. Authors use the instrument to quantify theoretical concepts in education and investigate the causality of observed phenomena (Kowalczyk, 2015).

- In a need to compare two groups on a continuous scale, the Mann-Whitney U Test is the statistical method of choice. One of the necessary prerequisites for using the Mann-Whitney U Test is the existence of two independent groups, such as full-time and part-time students, and this is clearly the case here. The Mann-Whitney U Test compares the median of two groups, while the t-test compares the means of the groups. It is recommended to apply the Mann-Whitney U-Test when there are significant disparities in the sample sizes of the two groups being compared, when the data being compared is ranked, or when there are other significant outliers in the data. Milenkovic et al. (2011)

RECOMMENDATION

Recommendation: Based on our analysis, critical evaluation of the study and findings from stated hypotheses, we recommend the following**:**

To address the positive relationship that exist between mode of study and student performance we advise:

I. The university to adopt the hybrid teaching method that combines both online and on campus teaching. E-learning provides more strengths and opportunities for the university and as such should be combined with on campus learning.

II. That online students should be allowed to have few on campus experience for better learning experience. The student can socialize more and have access to more information. On campus learning enables the lecturers to easily read through their student's body language during lectures and as a result improve on the quality of teaching.

RECOMMENDATION

Since the mode of teaching positively impacts on student performance, we recommend;

I. The university put in place adequate study guide for online students to enable them increase their performances

II. Allow student access online recorded lectures during the duration of their courses to reduce issues caused by network instability

III. Enhance engagement and motivation via course materials and group activities online

RECOMMENDATION

To address the positive impact the quality of teaching and overall satisfaction has on student performance we recommend :

I. Adequate training for all academic staff on online teaching techniques. In the words of Crawford-Ferre and Weist (2012), “Most instructors new to online teaching begin with little to no training or preparation specific to this delivery model”

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THANK YOU.