AN EMPIRICAL COMPARISON OF THE ACADEMIC PERFORMANCE OF STUDENTS IN THE DISTANCE LEARNING AND TRADITIONAL CLASSROOM ENVIRONMENT

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ABSTRACT

The importance of distance learning programmes in tertiary institutions around the globe, cannot be over-emphasized, as it provides an alternative mode of obtaining a university degree, through the use of information technology. Currently, the world is operating in a technology and social media dominated era where millions of citizens can access limitless information. This study investigates the academic performance of graduates from traditional, and distance learning, modes of education in accounting and business administration courses, with the goal of determining the existence of differences in academic performance. The measure of academic performance considered in this study is the graduating Cumulative Grade Point Average (CGPA) of students. The results suggest that although marginal differences exist between the categories of students in performance, these differences are not significant enough to suggest difference in a performance due to the study mode, thus, this study concludes that performance of students in the selected courses is similar irrespective of the mode of education.

Keywords: Academic performance, Test of Means, Test of Median, Hotelling T-square, Cumulative Point Average, Distance learning

1. INTRODUCTION

Currently, the world is operating in a technology and social media dominated era where millions of citizens can access limitless information. Educational opportunities are enhanced by unlimited availability and accessibility of information by students, instructors, curricula designers, and universities. Technology alters how knowledge is obtained, classified, utilized, and represented; such changes reshape content and delivery of education (Gumport & Chun, 1999; Phipps and Merisotis, 1999; Ponzurick *et al*., 2000; Sherry, 1996; Wernet *et al*., 2000; Setaro, 2000; Hall, 2002). Distance learning connects teachers and students across geographical barriers, providing education and training to remote and off-campus sites, with the aid of audio, video or computer technologies (Ahern and Repman, 1994). Students can now learn from the comfort of their homes or offices with no need to commute to campuses. Virtual learning environments and libraries are providing more opportunities in addition to

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the traditional campus facilities. Consequently, rather than requiring students to travel to a specific physical classroom or library, the virtual environment has made possible the delivery of unlimited learning resources to students. Distance education has existed for over a century, with its origin traced to England and continental Europe, when colleges used postal services for providing education by means of correspondence (Phipps and Merisotis, 1999; Ponzurick, Russo, and Logar, 2000; Sherry, 1996; Wernet, Olliges, and Delicath, 2000). It involves provision of education where the instructor is physically and geographically separated from the student to an extent that requires communication through media such as print or some other form of technology (Gallagher and McCormick, 1999; Moore and Thompson, 1997; Spooner, Jordan, Algozzine, and Spooner, 1999; Perraton, 1988; Keegan, 1986; Garrison and Shale, 1987, as cited in Sherry, 1996).

Global increases in the quest for knowledge, has called for the need to opt for distance learning, as it provides an alternative choice in the mode of study, particularly regarding university degrees. Many students would prefer studying via a distance learning arrangement, due to a number of reasons: one of which includes combining work with study; another reason may be to upgrade a particular certificate they are holding. Within Nigeria, an inability to meet the requirements set by the University Tertiary Matriculation Examination (UTME), (which enables students to join a face-to-face full time programme) may also call for embarking on a distance learning programme. Needless to say, students on a regular study mode have the opportunity to be resident on the University campus and interact with their instructors. Surveys carried out by (Beard *et al*., 2004; Ponzurick *et al*., 2000; and Tomei 2006) reveal that most students prefer traditional face-to-face classroom study to online study. Following an economic downturn in Nigeria and in the third world generally, a number of self-sponsored students would opt for distance learning as it would avail them the opportunity to earn a living even while studying, (Kleinman, 2002; Adewara *et al*., 2010) identified that a good number of students in higher learning institutions consider the distance learning alternative as being a cost-effective instructional methodology.

In order to identify if there is a significant difference between students who attend a traditional classroom and those who study through distance learning, the academic performance of graduating students from the two study modes was examined. Students for the study, were selected from accounting and business administration courses for two consecutive academic sessions. The measure of academic performance considered in this study is the graduating Cumulative Grade Point Average (CGPA) of students. The remainder of this article highlights the findings of related work, outlines the methodology of the study, presents the results and their interpretation, and finally, in section 5, a conclusion is drawn from the study.

2. RELATED STUDIES

There is substantial literature comparing learning from the two modes of study, with the bulk of these studies suggesting similar outcomes for conventional classroom instruction and the distance learning mode (Dellana, Collins, and West, 2000; DeSantis, 2002; Phipps and Merisotis, 1999; Russell, 2002). Some studies concluded that distant learning is more effective than face to face studies while conversely, some stated otherwise. In their study, Adewara *et. al.,* (2010) determined that the two modes of study do not differ from one another, by using descriptive statistics based on the CGPA of graduating students.

Vamosi *et al.,* (2004) carried out a study using two populations, taking measurements on a 7-point Likert-type scale; the first population was classroom based, while the second population had a strictly distance learning delivery mode. The major areas

considered in the study were (i) course content (ii) convenient access to the course materials (iii) effective assimilation of the course materials given. The author found out that the traditional classroom study approach is more satisfactory than the distance learning mode. Ponzurick *et al.* (2000) also based their measurements on a 7-point Likert-type scale, to conduct a statistical comparison between each question raised. Their analysis included both student attendance and test scores throughout the duration of the course. Test scores were analysed and statistically compared for students taking the distance education course versus students taking the same course in a traditional classroom setting. Scores were also analysed for those students that began the semester in one course delivery mode and later switched to the other course delivery mode to see if there was a statistical difference between the two modes. The results showed that the traditional approach was better; in addition, only 7.25 % of the students said that they preferred distance learning.

Tomei (2006), statistically compared teacher hours devoted to advising students, comparing students on traditional and distance learning modes of study. The study showed that students prefer the traditional classroom study over distance education; though there was no statistically significant difference in the grades between the two delivery styles. Dellana *et al.* (2000) evaluated students' academic performance by comparing the GPA of students in the two populations, on a 7-point Likert-type scale. The study also revealed that students prefer the classroom study mode. Beard *et al.* (2004) carried out a survey with ten questions using five category scale, as well as open-ended questions, to measure students' perceptions. The study revealed that students prefer the classroom study mode.

Parnell and Carraher (2003) gave a comprehensive report on the development of the Management Education by Internet Readiness (MEBIR) scale. MEBIR is designed to help both the learners and management of an education provider, to determine the effectiveness of the online study option as compared to face-to face learning. In the study, the author recognized the fact that both young and old students find internet based learning more rewarding, as instructors lead them to where material can be sought on the internet. Studies carried out by Cox (2000), Egerton (2001), and Schwarzer, Mueller, & Greenglass (1999) all showed that future students will likely possess greater comfort with technology than do current ones, thereby making distance learning more sought after.

Sonner (1999) carried out a study of undergraduate students, following various business courses through either traditional or distance learning modes of study. The study analysed the GPA at completion of 85 students, showing that students who studied through the distance learning mode had significantly higher grades than students who took traditional classes. There was also a positive and significant correlation between the numbers of distance learning courses taken by the students and their CGPAs. Braun (2008) conducted a comparative study of students following a distance learning mode of study, to traditional classes, with a sample size of 90; data was collected using a 7 point Likert-type scale; data on quizzes, assignments, and exams was also collected and subjected to statistical analysis. The study revealed that the students enjoyed the flexibility associated with the distance learning mode, as it allows students to combine and balance their studies with family and work commitments. Therefore the study recommends the distance learning mode.

Warren *et al.* (2005) carried out an analysis and evaluation of the quality of learning in distance education and traditional classroom populations. The study included pre and post learning analysis and showed that there was no significant difference between the distance learning and traditional face-to-face study mode. The outcomes of the course evaluations carried out, also

showed no significant difference in students' satisfaction between the two modes of study. Swan *et al.* (2000) sampled 623 secondary education students comparing the mean GPA of the samples. The study showed that delivery of distance education does not differ significantly from that of the traditional face-to-face study mode. Results from a study carried out by Spooner *et al.* (1999) also showed no significant difference between the two study modes, just as reported by (Swan *et al.* (2000) and Warren *et al.* (2005).

Some of the studies reviewed had small sample sizes, Tomei (2006) had a total of 22 samples, Beard *et al.* (2004) had 25 responses, Spooner *et al.* sampled 8 men and 42 women. Sonner (1999) and Swan *et al.* (2000) had larger sample sizes. In this study much larger samples are considered, the advantage of a large sample size, is to reduce the effect of outliers on the population in either tail of the distribution. Ponzurick *et al.* (2000), Beard *et al.* (2004), Vamosi *et al.* (2004), and Warren *et al.* (2005) adopted dual delivery methodology to carry out a comparison of the performance of students between the two modes of study. None of the literature reviewed considers a robust parametric test approach to compare the two modes of study, while this study takes advantage of Hotelling T-square statistics. The test is robust for analysing data that have unequal sample sizes. Hotelling T-square statistics were further used to validate results obtained from a test of equality of the mean and median in comparing the distance learning and traditional face-to-face learning modes.

3. MATERIAL AND METHODS

Method

A combination of exploratory, causal-comparative research designs and parametric tests has been adopted for the study. Causal-comparative designs do not allow for explicit finding of causation (Fraenkel & Wallen, 2006), but can strongly suggest whether the mode of instruction had a direct impact on student retention and without any manipulation or intervention; it allows for the exploration of naturally occurring relationships between groups. Archived student records including the final year grade point average and cumulative point average of accounting and business administration students were used in the study. These averages were used to compare both course completion and student academic performance between groups of students in open or distance learning and traditional programmes. Accounting and business administration course were chosen for the study, based on the fact that these courses are offered through traditional or face to face modes, as well as via distance learning. The graduating performance of students in the 'Regular' and 'Distance learning institute' (DLI) of the University of Lagos were examined for two consecutive academic sessions, denoted Y_{n-1} and Y_n respectively, for example where Y_{n-1} is used to denote the academic session of 2009/10, Y_n denotes the academic session of 2010/11. The Hotelling T-square is used as an extension of the study carried out by Adewara *et al.*, (2010), where the authors used only descriptive causal-comparative research designs for their study.

3.1 Hotelling's T-statistics

Hotelling's T-squared distribution is a multivariate generalization of the student-t test, and is proportional to the F-distribution as expressed in equation (13) below. Both F and T distributions are used to assess the difference between variables.
The specific representation of T-squared is an algebraic approach similar to the one used by Polymenis (2008), in order to derive the distribution of T^2, under the null hypothesis. For the sake of simplicity, first, X_i vectors are centred, so that the null hypothesis becomes $\mu = \mu_0 = 0$. Furthermore, the covariance matrix of $\sqrt{r}\bar{X}$ is chosen to be l, the Identity matrix, since this simplification will not affect the distribution of T^2

Polymenis (2008). The covariance matrix of X_i can, consequently, be chosen to be l, since it is equal to the covariance matrix of $\sqrt{r}\bar{X}$. We then proceed by considering an orthogonal $(p \times p)$ matrix $Q = (q_{ij})$ such that:

$$q_{ij} = \frac{\bar{X}_i}{\sqrt{\bar{X}' \bar{X}}} \ for \ i = 1, ..., p \qquad (1)$$

We now give the main result concerning the new representation of T^2

Hotelling's $T^2 = r \bar{X}' M_r^{-1}\bar{X}$ can be written as:

$$T^2 = \frac{r \bar{X}' \bar{X}}{\frac{1}{r-1}\sum_{i=1}^{r-p+1}(V_i^{(1)})^2} \qquad (2)$$

where $V_i^{(1)}$ is the first element of the column vector.

Let us set:

$U = \sqrt{r}Q\bar{X}$ and $B = (r-1)QM_rQ'$

Where:

$$M_r = \frac{1}{(r-1)}\sum_{i=1}^{r}\left(X_i - \bar{X}\right)(X_i - \bar{X})' \qquad (3)$$

Then we have:

$$u_1 = \sqrt{r}\sum_{i=1}^{p} q_{11}\bar{X}_1$$

$$= \sqrt{r}\left(\frac{\bar{X}_1'}{\sqrt{\bar{X}^T\bar{X}}}\bar{X}_1 + \frac{\bar{X}_2'}{\sqrt{\bar{X}^T\bar{X}}}\bar{X}_2 + \cdots + \frac{\bar{X}_p'}{\sqrt{\bar{X}' \bar{X}}}\bar{X}_p\right)$$

$$= \frac{\sqrt{r}\,\bar{X}' X}{\sqrt{\bar{X}' \bar{X}}} = \sqrt{\bar{X}' \bar{X}}$$

and, for $j \neq 1$, we have:

$$u_j = \sqrt{r}\sum_{i=1}^{p} q_{ji}\bar{X}_1 = \sqrt{r}\sum_{i=1}^{p} q_{ji}q_{ii}\sqrt{\bar{X}^T\bar{X}}$$

$$= \sqrt{r\bar{X}^T\bar{X}}\sum_{i=1}^{p} q_{ji}q_{ii} = 0 \qquad (4)$$

Since q is orthogonal:

$$T^2 = r \bar{X}' M_r^{-1}\bar{X} \qquad (5)$$

and

$$U^T B^{-1}U = \frac{r}{r-1} \bar{X}' M_r^{-1}\bar{X}$$

$$= \frac{T^2}{r-1} \qquad (6)$$

Where, $U = (u_1, 0, ..., 0)^T$ and:

$$B^{-1} = \begin{pmatrix} b_{11} & b_{12} & \cdots & b_{1p} \\ b_{21} & b_{22} & \cdots & b_{2p} \\ \vdots & \vdots & \ddots & \vdots \\ b_{p1} & b_{p2} & \cdots & b_{pp} \end{pmatrix}$$

Thus:

$$\frac{T^2}{r-1} = u_1^2 b_{11} \qquad (7)$$

To set B to be the inverse matrix of B^{-1}, write $B = (b_{ij})$ and partition B as:

$$B = \begin{pmatrix} b_{11} & (b_{(1)})' \\ b_{(1)} & B_{22} \end{pmatrix}$$

3.2 The Univariate t-test

Recall that for the univariate test:

To test the hypothesis $H_o: \mu_x = \mu_y$ against the alternative hypothesis $H_a: \mu_x \neq \mu_y$, the Student t statistic

$$t = \frac{\bar{X}-\bar{Y}}{s_p\sqrt{(n_x+n_y)/n_x n_y}} \sim t\left(n_x+n_y-2\right) \qquad (8)$$

Under H_o, where:

$$s_p^2 = \frac{(n_x-1)s_x^2+(n_y-1)s_y^2}{n_x+n_y-2} = \frac{\sum_{i=1}^{n_x} (X_i-\bar{X})^2+\sum_{i=1}^{n_y} (Y_i-\bar{Y})^2}{n_x+n_y-2} \qquad (9)$$

Assuming that the quantity, S_p^2, under the radical is the pooled estimate of the assumed common, within population variance, we call this value S_p^2, and reduce to the following by squaring both sides:

$$t^2 = \frac{(\overline{X}\text{-}\overline{Y})^2}{S_p^2\left(\frac{1}{n_x}+\frac{1}{n_y}\right)} \qquad (10)$$

The above further reduces to:

$$t^2 = \frac{n_x n_y}{n_x + n_y}(\overline{X}\text{-}\overline{Y})(S_p^2)^{-1}(\overline{X}\text{-}\overline{Y}) \qquad (11)$$

Replacing each variable with a vector of means in each group, gives the Hotteling T^2 for equality variance as follows:

$$T^2 = \frac{n_x n_y}{n_x + n_y}(\overline{X}\text{-}\overline{Y})(S)^{-1}(\overline{X}\text{-}\overline{Y}) \qquad (12)$$

The statistical formula for the testing of the above hypotheses is the Hotelling T^2 test.

Following the equations and expressions in the previous section, a transformation of T^2 yields an exact F distribution such that:

$$F = \frac{n_x + n_y + p\text{-}1}{(n_x + n_y\text{-}2)p} \qquad (13)$$

This can be evaluated for p and $(N - p - 1)$ degrees of freedom, F, where p is the number of dependent variables and $N = n_x + n_y$. Therefore, the F can be evaluated in terms of statistical significance by computing the p-value.

3.3. Estimating the Hoteling T-square in a Multivariate Case

Consider testing the null hypothesis that the two populations have identical population mean vectors. This is represented below, along with the general alternative that the mean vectors are not equal.

$$H_0 : \mu_1 = \mu_2 \text{ against } H_a : \mu_1 \neq \mu_2$$

That is:

$$H_0 : \begin{pmatrix} \mu_{11} \\ \mu_{12} \\ : \\ \mu_{1p} \end{pmatrix} = \begin{pmatrix} \mu_{21} \\ \mu_{22} \\ : \\ \mu_{2p} \end{pmatrix} \text{ against } H_a : \begin{pmatrix} \mu_{11} \\ \mu_{12} \\ : \\ \mu_{1p} \end{pmatrix} \neq \begin{pmatrix} \mu_{21} \\ \mu_{22} \\ : \\ \mu_{2p} \end{pmatrix}$$

$$(14)$$

In other words:

$H_0 : \mu_{11} = \mu_{21}$ and $\mu_{12} = \mu_{22}$ and ………

$\mu_{1p} = \mu_{2p}$

Where p represents the total number of dependent variables. For the null hypothesis, that is fine only if the population means are identical for all of the variables. The alternative is that at least one pair of these means is different. This is expressed below:

$H_a : \mu_{1k} \neq \mu_{2k}$ for at least one $k \in \{1, 2, ...p\}$

This could be different for only one or it could be all of them using data only from the ith population, we will define the sample variance-covariance matrices:

$$S_i = \frac{1}{n_i - 1}\sum_{j=1}^{n_i}(X_{ij} - \overline{X}_i)(X_{ij} - \overline{X}_i)' \qquad (15)$$

Under our assumption of homogeneous variance-covariance matrices, both S_1 and S_2 are estimators for the common variance-covariance matrix Sigma. A better estimate can be obtained by pooling the two estimates using the expression below:

$$S_p = \frac{(n_1 - 1)S_1 + (n_2 - 1)S_2}{n_1 - n_2 - 2} \qquad (16)$$

The CGPAs for the two groups (Regular and DLI) is considered. Hotelling's T^2 test statistic for the difference between two multivariate means is computed for this case.

Data

The data used in this study consisted of the results of all graduating students of the department of Accounting and Business Administration under the two modes of

learning, Distance Learning Students (DLI) and the mainstream traditional face-to-face students. The Cumulative Grade Point Average (CGPA) for two consecutive academic sessions was used for the analysis, with maximum obtainable GPA is 5.00 and lowest being 0.00. A total of 354 traditional classroom students and a total of 1247 Distance learning students were collected, summing up to 1601. For the 2009/2010 session the results of 189 regular students and 387 DLI students were used, 292 of which were from Accounting students, with 284 results collected from Business administration students. In the 2010/2011 academic session, a total of 458 accounting and a total of 567 business administration students' CGPA were collected. It should be noted that the data represents the entire population of graduating students from these programmes, and not samples. The two sets of students were taught by the same lecturer of the university using the same course contents. A normality test was carried out on the data set, and it was found to be normally distributed; this is one of the underlying conditions for using the Hotelling T-square, the results are shown in table 7.

Statistical Analyses

To provide a preliminary understanding of the results, descriptive statistics were used. Descriptive procedures are useful for obtaining summary comparisons of variables that can be easily understood. In addition to measures of central tendency, like the mean, median and mode, statistics, such as skewness and kurtosis were also utilized. A normality test was conducted in preparation for the Hotelling T-square test statistics that were later computed. Further tests for equality of the means and medians were also done; the results output is presented in the tables and figures below.

Analysis for the Hotelling-T square was carried out using SPSS 20.0, Kotz & Johnson (1983), established that to get the value for Hotelling's T^2, the Hotelling's Trace obtained in a Multivariate Analysis of Variance (MANOVA) is multiplied by ($N - L$), where N is the sample size across all groups and L is the number of groups; this gives a generalized version of Hotelling's T-Square. When $L = 2$, the product is Hotelling's two-sample T^2.

4. RESULTS

The results of the descriptive statistics are presented in Table 1. The normality test's results are presented in Table 2, while Tables 3-7 present results of various tests of the means and medians as well as the Hotelling tests.

Table 1: Statistical Analysis of Graduating Cumulative Grade Point Average (CGPA)

	ACCOUNTING				BUSINESS-ADMINISTRATION			
	Regular Vs DLI		Regular Vs DLI		Regular Vs DLI		Regular Vs DLI	
	Y_{n-1}	Y_{n-1}	Y_n	Y_n	Y_{n-1}	Y_{n-1}	Y_n	Y_n
Count	110	205	71	473	79	182	94	387
mean	3.521	2.912	2.848	2.765	3.122	3.095	2.80	2.891
S.D	0.720	0.699	0.894	0.655	0.644	0.878	0.721	0.884
Min	1.660	1.28	1.36	1.120	1.760	1.190	1.150	1.140
Max	4.780	4.46	4.60	4.540	4.630	4.920	4.330	4.770
Skewness	-2.224	-1.257	0.581	0.665	0.488	-1.776	-0.141	-0.207
Kurtosis	-0.878	-1.822	-1.526	-1.963	-0.853	-2.279	-0.721	-4.055

Table 2: Normality Test, H_0 : data is normally distributed

	Doornik-Hansen	Shapiro-Wilk W	Lilliefors	Jarque-Bera
Combined	1.76363	00.95488	0.11086	1.53350
Regular	(0.41403)	(0.01229)	(0.0300)	(0.46450)
Combined	0.13726	0.98745	0.05250	0.24888
DLI	(0.93367)	(0.70419)	(0.9000)	(0.88299)

Table 1 shows the summary statistics of CGPA (maximum attainable CGPA being 5.00) of graduating students who undertook undergraduate courses through the distance learning mode and those who studied through a traditional face-to-face classroom. The table reveals that the number of students studying through the distance learning mode is significantly higher than those who are using a traditional face-to-face mode. Other descriptive statistics like the mean, maximum and minimum shows that based on CGPA, the two study modes do not differ from each other significantly, except for the 2009/10 academic session in accounting, as seen in the various plots presented in the appendix.

The data sets were found to be normally distributed at the 5% significant level following the Doornik-Hansen test, Lilliefors test and Jarque-Bera test for the Regular (face-to face learning mode), while combined for Distance Learning Institute (DLI) is considered normal following the Doornik-Hansen test, Shapiro-Wilk W test, Lilliefors test and Jarque-Bera test.

Figure 1 of the appendix shows graphical representations of the academic performance of accounting students in the 2009/2010 session. The density trace plot shows that the academic performance of students in the two categories of students, peaks almost at equal height. The box-and-whisker plot shows that both sets of data are skewed in the same direction, with that of 'regular' students more highly negatively skewed than DLI students. The Quantile plot shows a slight distance between the performance of students from the two categories.

Figure 2 of the appendix shows graphical representations of the academic performance of accounting students in the 2010/2011 session. The density trace plot shows that the academic performance of students in DLI peaks at a point higher than that of regular students, while the box-and-whisker plot shows that the data of the performance of students who study through the DLI mode is closer to normality than that of students who studied on 'regular' mode, and the Quantile plot shows no difference between the performance of students in the two categories.

Figure 3 in the appendix shows graphical representations of the academic performance of business administration students in the 2009/2010 session. The density trace plot shows that the academic performance of 'regular' students peaks at a point higher than that of DLI students. The box-and-whisker plot shows that the data on the performance of students who study through the 'regular' study mode is closer to normality than that of students who study through 'DLI', while the Quantile plot shows no difference between the academic performance of students in the two categories.

Figure 4 in the appendix shows graphical representations of the academic performance of business administration students in the 2010/2011 session. The density trace plot shows that the academic performance of students studying through the 'regular' study mode has a peak at a point higher than that of DLI. The box-and-whisker plot shows that the data on the performance of students who study via the DLI mode is closer to normality than that of students who study through the 'regular' mode, while the Quantile plot shows a slight distance between the performance of students in the two categories.

Figure 5 in the appendix shows graphical representations of the academic performance of students from both programmes (accounting and business administration combined) in the 2009/2010 session. The density trace plot shows that the academic performance of students studying in the 'regular' mode has a peak at a point higher than that of DLI students. The box-and-whisker plot shows that the performance of students who study through the 'regular' mode is slightly closer to normality than that of students who studied via the distance learning mode, while the Quantile plot shows a slight distance between the performance of students in the two categories.

Figure 6 in the appendix shows graphical representations of the academic performance of students from both programmes (accounting and business administration combined) in the 2010/2011 session. The density trace plot shows that the academic performance of 'regular' students has a peak at a point higher than that of DLI students. The box-and-whisker plot shows that the data on the performance of students who study through the 'regular' mode, and that of students who study via distance learning, is overlapping, indicating that there is no difference between the two modes of study. The Quantile plot also shows overlaps indicating that the overall performance of students is equal.

Table 3: Profiling of Regular Students' CGPA into various Classes of Degree

| Grade | Business Administration | | | | Accounting | | | | TOTAL | % |
	Y_{n-1}	%	Y_n	%	Y_{n-1}	%	Y_n	%		
1st Class	1	1.26	0	0	8	7.27	2	2.82	11	3.11
2.1	21	26.58	20	21.28	54	49.09	15	21.13	110	31.07
2.2	41	51.90	46	48.94	38	34.55	29	40.84	154	43.50
3rd Class	16	20.25	25	26.60	10	9.09	23	32.39	74	20.90
Pass	0	0	3	3.18	0	0	2	2.82	5	1.42
Total	79	100	94	100	110	100	71	100	354	100

Table 4: Profiling of DLI Students' CGPA into various Classes of Degree

| Grade | Business Administration | | | | Accounting | | | | TOTAL | % |
	Y_{n-1}	%	Y_n	%	Y_{n-1}	%	Y_n	%		
1st Class	1	0.49	1	0.21	5	2.74	7	1.81	14	1.12
2.1	47	22.93	69	14.59	62	34.07	104	26.87	282	22.61
2.2	98	47.80	239	50.53	64	35.16	134	34.63	535	42.90
3rd Class	56	27.31	152	32.14	43	23.63	119	30.75	370	29.67
Pass	3	1.47	12	2.54	8	4.4	23	5.94	46	3.7
Total	205	100	473	100	182	100	387	100	1247	100

In table 3 and table 4 above, Y_{n-1} indicates the academic session for 2009/10 while Y_n indicates the academic session for 2010/11. Comparing the two modes of study, there is a higher percentage of students in the first class and upper second class grades for the 'regular' students, than for the DLI students, while the percentage of students achieving lower second class (2.2) is similar for both groups, and the percentage of degrees classed as third class or pass is higher for DLI students. This may suggest that students on the 'regular' mode of study perform better. However, more robust techniques are required to validate this claim.

Table 5: Test of means in the form Null hypothesis:
Mean 1= Mean 2 vs Alt hypothesis: Mean 1 $\neq$ Mean 2

Department and session	t-statistics	p	95% C.I	Decision
Accounting 2009/10 DLI Vs Regular	7.28334	0.0000	(0.44105 0.77286)	Reject H_0
Accounting 2010/11 DLI Vs Regular	0.93743	0.3489	(-0.090331 0.2552)	Accept H_0
Bus-Admin 2009/10 DLI Vs Regular	0.24955	0.8031	(-0.188125 0.2436)	Accept H_0
Bus-Admin 2010/11 DLI Vs Regular	-0.88267	0.3778	(-0.279936 0.1063)	Accept H_0
Combined 09/10 DLI Vs Regular	5.21998	0.0000	(0.222083 0.49003)	Reject H_0
Combined 10/11 DLI Vs Regular	0.01634	0.9869	(-0.279936 0.10639)	Accept H_0

Table 5 above shows a test of the equality of the mean, comparing the academic performance of students who study through the regular mode (mean 1) and DLI (mean 2). By not rejecting the null hypothesis, that there is no difference in the means, the results show that Accounting 2010/11 DLI vs. Regular, Bus-Admin 2009/10 DLI vs. Regular, Bus-Admin
.

2010/11 DLI vs. Regular, and Combined 10/11 DLI vs. Regular do not differ from each other in terms of academic performance. While the results for Accounting 2009/10 DLI vs. Regular and Combined 09/10 DLI vs. Regular do indicate a difference in the performance of students in the two categories, based on the mean CGPA

Table 6: Test of medians in the form Null hypothesis:
Median 1 = Median 2 vs Alt hypothesis: Median 1 $\neq$ Median 2

Program & Session	Mann-W	p-value	Decision	Kolmogorov	p-value	Decision
Accounting 2009/10 DLI Vs Regular	6108.5	0.0000	Reject H_0	3.14424	0.0000	Reject H_0
Accounting 2010/11 DLI Vs Regular	16074.5	0.5617	Accept H_0	1.06771	0.20461	Accept H_0
Bus-Admin 2009/10 DLI Vs Regular	7364.0	0.7554	Accept H_0	1.11915	0.163394	Accept H_0
Bus-Admin 2010/11 DLI Vs Regular	19188	0.4087	Accept H_0	1.44249	0.031166	Reject H_0
Combined 09/10 DLI Vs Regular	27555	0.0000	Reject H_0	2.11215	0.0002645	Reject H_0
Combined 10/11 DLI Vs Regular	70902	0.9891	Accept H_0	0.75994	0.610461	Accept H_0

The median test for the equality of samples (table 6) shows that there is no significant difference between the CGPA of graduating students from the DLI and Regular programmes at the University of Lagos, for Accounting in the 2010/11 academic session, Business Administration in the 2009/10 academic session, or for combined data from both courses in the

2010/11 academic session, but also indicates a significant difference between the DLI and Regular students in academic performance for Accounting in the 2009/10 session, and for the combined data from 2009/10 session. Based on Mann-W test, equality of variance, is found to be as per the 'equality of the mean' test at the 5% level of significance.

Table 7: Hotelling T-square statistics for DLI versus Regular Students

	T^2 Value	F	Sig.
Business Administration 2009/10	2740.125	1406.63	0.000
Business Administration 2010/11	2539.89	1298.17	0.000
Accounting 2009/10	4192.72	2135.90	0.000
Accounting 2010/11	1497.09	748.55	0.000

Finally, Hotteling T-square statistics were computed, as given in table 7. The results show that there is no difference between the performance of students who study via distance learning and those who study in the traditional face-to face classroom. Therefore, based on column 4 of table 7 above, and following equation (14), we do not reject the null hypothesis that says the performance of regular classroom students is equal to distance learning students in terms of academic performance, at 5% level of significance.

5. SUMMARY AND CONCLUSION

This study compares academic performance of students from the Distance Learning Institute with full-time students studying through a traditional mode of study, in both Accounting and Business Administration for two academic sessions, 2009/10 (Y_{n-1}) and 2010/11 (Y_n). Detailed exploration of the students' graduating CGPA suggests that the average graduating grade point average is 3.52 for Accounting students from the regular programme as against 3.12 for DLI students for the 2009/2010 academic session. Similar marginal differences are experienced across programmes and session. Although the histograms and box plots depict the marginal differences in the performance of students, the statistical tests of the means, medians and the Hotelling T-square statistics presented in Tables 5 to 7 suggest a non-significant difference in the performance of students from the two modes of learning across the selected courses except for accounting as shown in the test of the equality of the mean and median. The significant difference was observed in the case of accounting students graduating in 2009/10, which may have imparted on the combined results for the same session (2009/10). This suggests that studying Accounting would be more effective in a face-to-face study mode.

The outcome of this study agrees with Dellana *et al*. (2000), Swan *et al*. (2000) and Warren & Holloman (2005) who statistically demonstrated that the academic performance of students who study via distance learning and those who studied via traditional face-to-face classes is not significantly different. The outcome of the study does deviate from other studies (Sonner 1999; Spooner *et al*. 1999; Schwarzer, Mueller, & Greenglass, 1999; Cox, 2000; Egerton, 2001; and Braun 2008) who statistically showed that distance learning education is more effective, following the overall satisfaction of students and academic performance, whereby the authors recommended distance education as a way of enhancing growth in the education sector. Another deviation, in support of the traditional face-to-face study mode, comes from Vamosi *et al.*, (2004) who statistically found the distance learning option to be less efficient and less involving, when compared to traditional classroom learning. Other studies by Beard *et al.* (2004), Ponzurick *et al.* (2000), and Tomei (2006) show traditional classroom learning is better, based on students' preferences in terms of effectiveness and delivery.

From this study, it is recommended that student should choose the study mode which will not conflict with their career, family and other social responsibilities, as both have proven to be equally effective. However, students who are studying practical courses like accounting, sciences and engineering may opt for traditional classroom learning.

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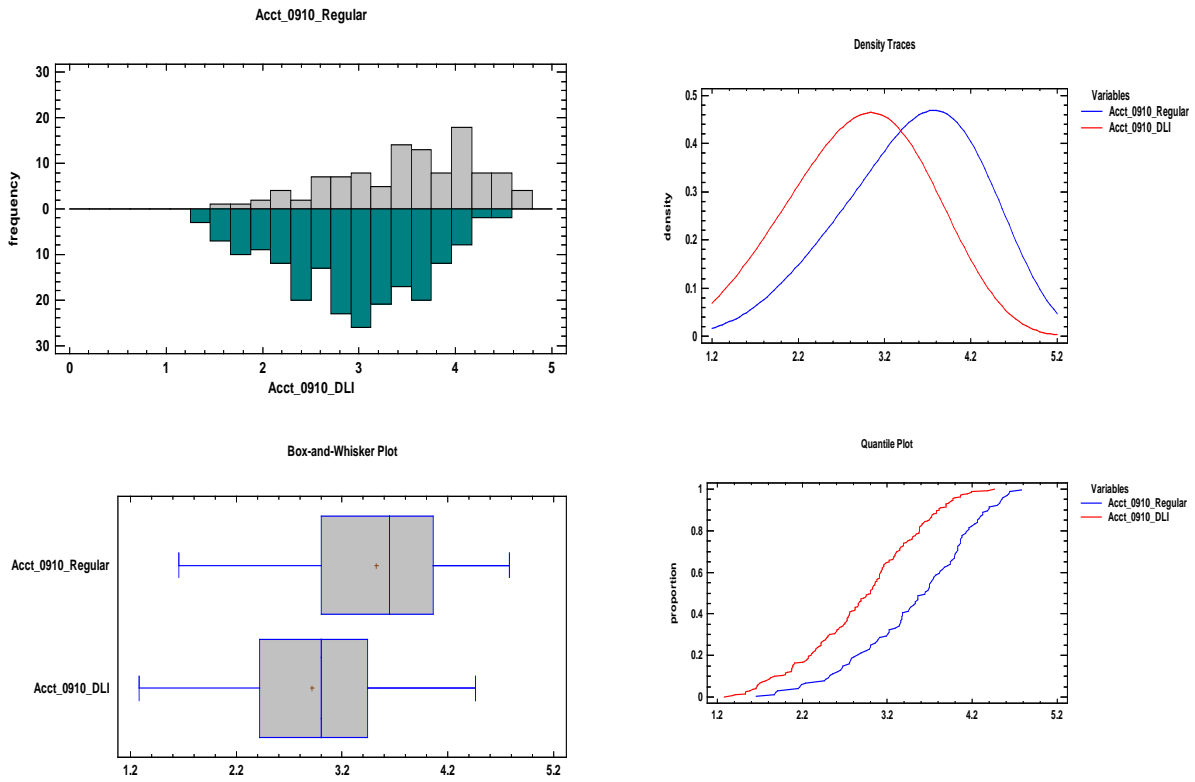
APPENDIX

Fig 1: Histogram, Density trace, Box-and Whisker plot and Quantile plot comparing the CGPA of Accounting 2009/10 graduating students of University of Lagos
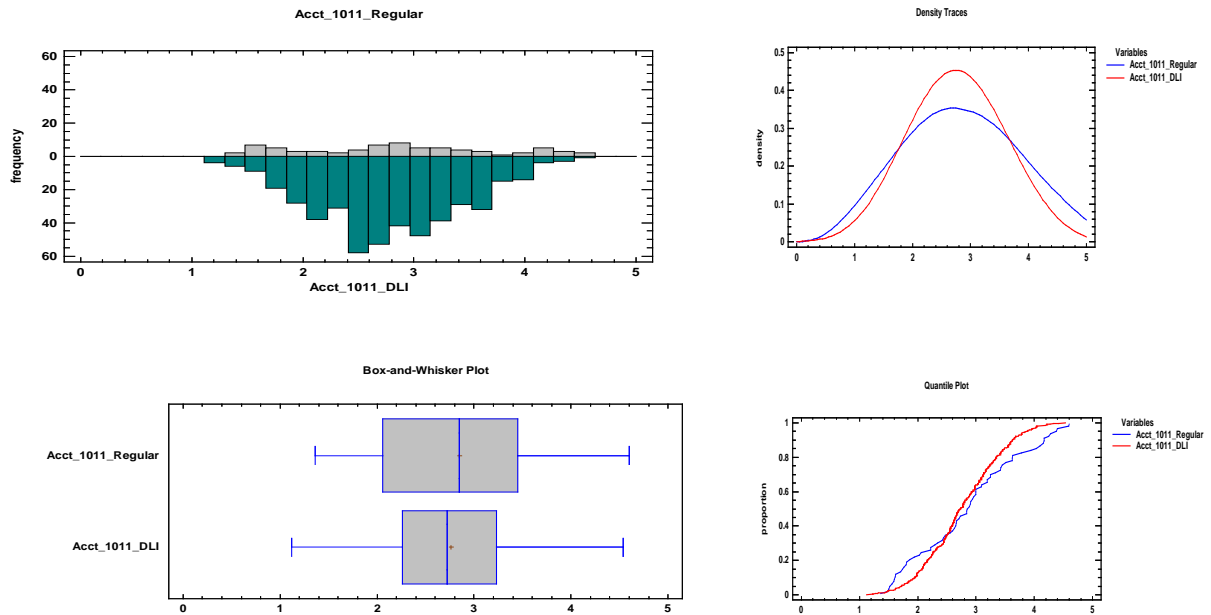

Fig 2: Histogram, Density trace, Box-and Whisker plot, and Quantile plot comparing the CGPA of Accounting 2010/11 graduating students of University of Lagos
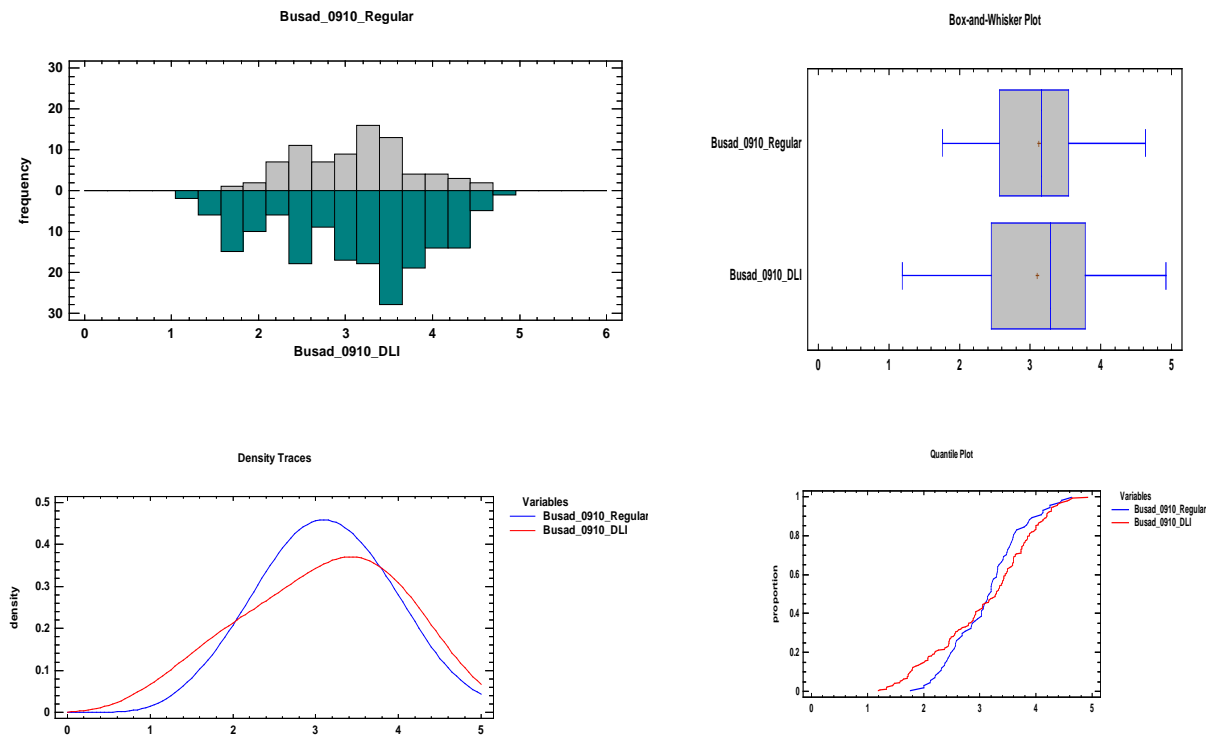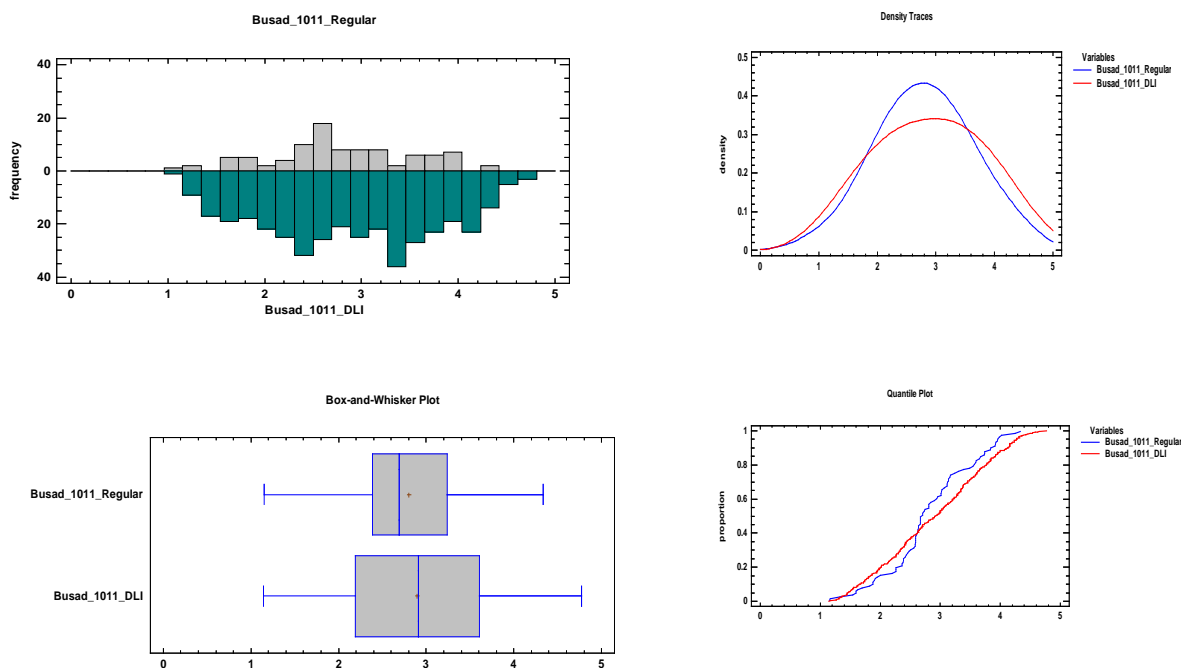
Fig 3: Histogram, Density trace, Box-and Whisker plot, and Quantile plot comparing the CGPA of Bus-Admin 2009/10 graduating students of University of Lagos

Fig 4: Histogram, Density trace, Box-and Whisker plot, and Quantile plot comparing the CGPA of Bus-Admin 2010/11 graduating students of University of Lagos
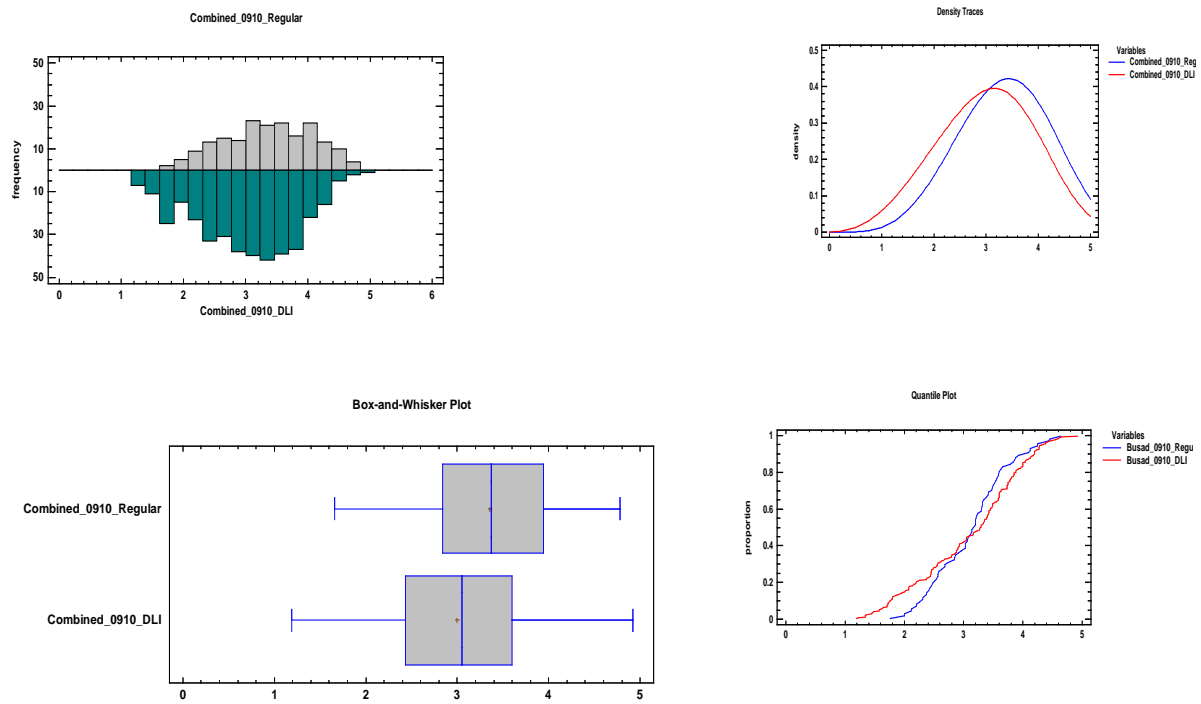
Fig 5: Histogram, Density trace, Box-and Whisker plot and Quantile plot comparing the combined Regular and DLI in the two categories for 2009/10 graduating students of University of Lagos
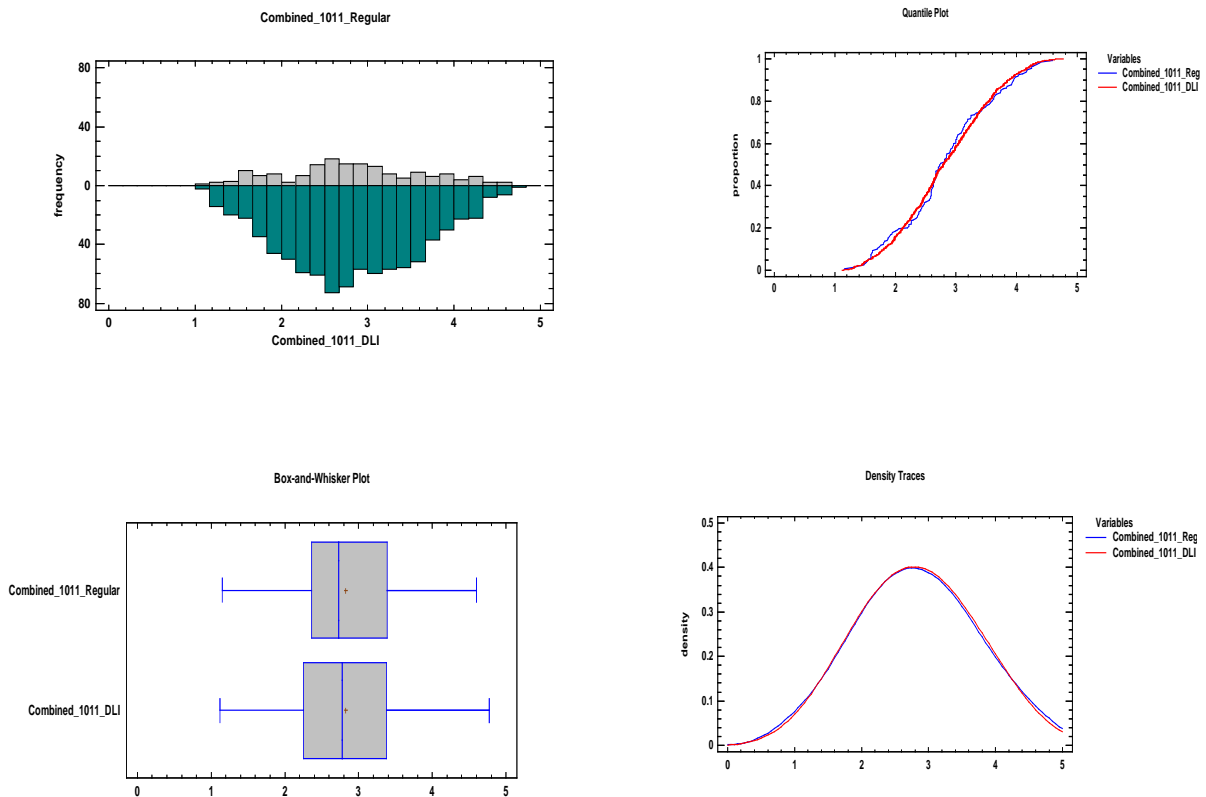

Fig 6: Histogram, Density trace, Box-and Whisker plot and Quantile plot comparing the combined Regular and DLI in the two categories for 2010/11 graduating students of University of Lagos