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Correlation Analysis of Gender Performance in Computer Science Department, Adamawa State Polytechnic Yola, Nigeria

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Abstract
This study examined the correlation analysis of gender performance in Computer Science Department of Adamawa State Polytechnic, Yola. The study used one research question, one research objective and one research hypothesis. The study applied ex post facto and quantitative designed. Secondary data were obtained from Computer Science Department of Adamawa State Polytechnic, Yola. The data were 2021/2022 Cumulative Great Point Average (CGPA) of National Diploma II of the institution. At 0.05 level of significance, data diagnostic tests were done and confirmed the data to be normally distributed with Kolmogorov-Smirnov and Shapiro-Wilk significant p-values of 0.020 and 0.009 respectively. Linearity test was also performed and confirmed the data to be positively linear with a slop of 1.698 and gradient of 0.298. The study used correlation analysis techniques to determine the correlation between the gender performances in the study area. The results revealed that the correlation coefficient r = 0.301 with P-value = 0.028, which indicate a positively weak but statistically significant relationship. The null hypothesis $H_{0:}$ was rejected at 0.05 level of significance and it can therefore be concluded that there is a significant correlation between student's gender on academic performances in Computer Science Department of Adamawa State Polytechnic, Yola. The results from this study will serve as a spring board for policy formulation and implementation of Adamawa State Polytechnic, Yola and Adamawa State Ministry of higher education.

Keywords: Correlation analysis, Gender, Performance, Computer Science, Diagnostic Tests and Statistical significant.

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Introduction

Education remains a fundamental pillar for national development through acquisition of various skills in schools' subjects. There are numerous subjects and courses introduced into the educational system in Nigeria and computer science is these subjects that is being introduced. Computer Science is a science subject that deals with theory, design, development, and application of computers and computational systems to solve specific problems. The specific areas of Computer Science include networks, artificial intelligence, security, vision and graphics, database systems, programming languages, theory of computing, numerical analysis, software engineering, biometric and bioinformatics. The Computer Science students can develop capacities towards identifying and solving problems. The trend of technological development across the globe is fundamentally rooted in Computer Science. Among the benefits of Computer Science studies are high level of job opportunities, problem-solving capabilities,

and acquisition of technological skills (Maloney, 2005; Salako, 2020).

The problem of students' performance in schools in Nigeria has been a much-discussed educational issue. In solving any problem however, it is important to understand the causes of such problems. Many causes have been studied as the etiological starting point for investigating the phenomena of students' performance. These causes are investigated from different perspectives which includes; the role of the government, school environment, society, family, teachers, students, etc. Some of the work done amongst these are; the effects of students' study habits (Ayodele and Adebiyi, 2013; Obasoro and Ayodele, 2012), the effects of students' school environment (Adesoji and Olatunbosun, 2008; Okoro, 2004), the effects of teachers' competencies (Akiri and Ugborugbo, 2009), the effects of parents' economic status (Osonwa *et al*. 2013), and the effects of educational funding (Ugwulashi, 2012). However, there seems to be a strong agreement amongst most authors to explain failure from a multi causal perspective where the phenomenon is analysed with multiple variables.

Gender is one of such factors that repeatedly mentioned in literature to have considerable effects on students' academic performances especially in science subjects. The significance of examining performance in relation to gender is based primarily on the socio-cultural differences between girls and boys. Some vocations and professions have been regarded as masculine such as engineering, agriculture, arts and crafts, while others as feminine such as catering, typing, nursing etc. In a nutshell, what are regarded as complex and difficult tasks are allocated to boys whereas girls are expected to handle the relatively easy and less demanding tasks. As a result of this way of thinking the larger society has tended to see girls as a weaker gender (Joseph *et al.*, 2015). In view of the belief that students' gender may have impact on the students' academic performance, this study will examine the degree of the relationship (correlation) if any. Gender differences in achievement have been examined for some time resulting in a substantial body of literature (Dania, 2014; Agbaje and Alake, 2014; Atovigba *et al*., 2012). Some researchers pointed out that there is no significant gender difference in students' academic achievement and retention in various subjects while others found significant difference with either the boys or the girls performing better.

The development of any nation is a measure of her development in the area of Technology. Technological growth of a nation leads to its social and economic development. In the world today, science and technology has become a dominant power development indicator. America, Russia, Japan and China are typical examples of nations which are now referred to as Developed countries, as a result of their development in the area of Science and technology. The brain behind science and technology is information technology (Joseph *et al.*, 2015).

Pearson's correlation analysis techniques are statistical measures that indicates the extent to which two or more variables fluctuates together. It examines the direction and strength of a linear relationship between two continuous or scale variables. A positive correlation indicates the extent to which those variables increase or decrease in parallel; a negative correlation indicates the extent to which one variable increase as the other decreases. Pearson's degree of measurement values is denoted by r and $-1 \leq r \geq 1$. The closer the value is to -1 or 1, the stronger the relationship and when the value is zero, it means no relationship between the variables (DBI and NCC, 2022).

However, this study aims at investigating the degree of relationship (correlation) between student's gender on academic performance in Computer Science Department of Adamawa State Polytechnic, Yola.

Research Question

What is the correlation coefficient between genders on academic performance in Computer Science Department of Adamawa State Polytechnic, Yola?

Objective of the Study

The objective of this study is to investigate the correlation between genders on academic performance in Computer Science Department of Adamawa State Polytechnic, Yola.

Hypothesis

H_o: There is no significant correlation between student genders on academic performance in Computer Science Department of Adamawa State Polytechnic, Yola

H_1: There is a significant correlation between student genders on academic performance in Computer Science Department of Adamawa State Polytechnic, Yola

Literature Review

Computer Science has been regarded as a traditionally male preserve field. This phenomenon is deeply ingrained in most societies because of the low number of female students. For instance, female participation in the Computer Science exams on programming languages such as Pascal, C++, and Java have decreased to a large extent (Iroju *et al.*, 2018). Sex and gender are not similar, for example, Iman and Mama (1997), sex refers to the physiological denotation like biology, hormones and chromosomes, while gender is referred to as the social and historical construction of feminine and masculine roles, attributes and ideologies. Gay & Lesbian Alliance Against Defamation (2011), refers to sex as the classification of people as male or female at birth, based on bodily characteristics such as chromosomes, hormones, internal reproductive organs, and genitalia while gender is one's internal, personal sense of being a man or woman.

Gender has been erroneously identified to influence the performance of students (Adesoji and Olatunbosun, 2008; Iji *et al*., 2015; Olaoye and Adu, 2015). Researchers have shown that a particular sex seems to have interest in some areas of study than the other (Dania, 2014; Kyei *et al*., 2011; Musa and Hartley, 2015). For instance, Aikman *et al*. (2007) reported that females showed lower interest in Mathematics related courses, less confidence as Mathematics related courses learners, and less motivation to use Mathematics related courses in the future. Thus, the male child performed better than the female child in Mathematics (Keys *et al.,* 2011; Musa *et al*., 2016). Amelink (2009), in a related study revealed that, males and female showed no measurable difference in their average science performance. Researchers explained that males showed more interest in Computer Science, Physical Science, and Engineering than their female counterparts while female showed more interest in biological sciences such as Nursing and Psychology. Females showed more interest than male in arts and humanities courses. Hence the female child outperformed the male child in these courses (Iroju *et al*., 2018).

Role model is also a factor that is responsible for gender differences in Computer Science (Obasoro and Ayodele 2012; Ayodele and Adebiyi, 2013; Solanki and Xu, 2018; Osonwa *et al.,* 2013). Research has also shown that there is a relationship between the sex of a computer teacher role model chosen by female students and perceptions of competence. For example, the gender of a computer teacher affected female student's attendance. In the case of male computer teacher, the percentage of girls was lower compared with a female computer teacher (Gilbert *et al*., 1983).

Kalo and Taiwo, (2013) in a related study to investigate the correlation between student's gender performance in College of Education Kwara Sate Nigeria, revealed that the Pearson's correlation coefficient (r) is 0.221, which means that the degree of relationship (correlation) between student's gender performance is positively weak. Steven, (2013) also in a related study to investigate the Correlation between Students' Gender Performance in Computer Science Department, Federal Polytechnic Mubi, revealed that the Pearson's correlation coefficient is 0.344 with P-value > 0.05, which implies that the degree of relationship between the student's gender performance is positively weak. However, Steven (2013) in the same study also revealed that; the data he

used to investigate the Correlation between Students' Gender Performance is a linear data with a slope of 1.101 and gradient of 0.327.

Materials and Methods

This study applied ex-post factor and quantitative designed. Secondary data were obtained from the Computer Science Department of Adamawa State Polytechnic, Yola. The data were 2021/2022 Cumulative Great Point Average (CGPA) of National Diploma II of the institution. Slovene's formula:

$n = \frac{N}{1+N(e^2)}$, and a linear systematic sampling technique:

$r, r+k, r+2k, r+3k \cdots r+(n-1)k$,

$K = \frac{population\ size\ (N)}{sample\ size\ (n)}$, where k is used to sampled the required sample size of fifty-three (53) male and fifty-three (53) female students.

However, after successful selection of the required sample size as shown in table, diagnostic tests of the data were done before the analysis with SPSS version 25:

Table 1: Students Cumulative Great Point Average (CGPA) of National Diploma II, 2021/2022

S/N	Male CGPA	S/N	Male CGPA	S/N	Male CGPA	S/N	Female CGPA	S/N	Female CGPA	S/N	Female CGPA
1	2.85	19	2.43	37	2.52	1	3.38	19	2.15	37	2.15
2	2.24	20	2.57	38	2.71	2	2.98	20	2.21	38	3.09
3	2.03	21	2.04	39	2.20	3	2.00	21	2.75	39	2.00
4	3.23	22	3.24	40	1.41	4	2.74	22	2.85	40	2.38
5	2.15	23	2.85	41	3.57	5	2.63	23	3.03	41	2.67
6	2.64	24	2.51	42	2.41	6	2.51	24	2.40	42	2.01
7	2.82	25	2.36	43	2.26	7	2.10	25	2.17	43	1.26
8	2.61	26	2.74	44	2.03	8	2.26	26	1.44	44	2.50
9	2.30	27	2.45	45	2.43	9	2.03	27	2.41	45	2.74
10	2.86	28	2.20	46	2.33	10	2.68	28	2.22	46	2.00
11	2.07	29	2.65	47	2.00	11	2.16	29	2.00	47	3.08
12	2.91	30	2.06	48	2.51	12	2.58	30	2.70	48	2.00
13	2.34	31	2.71	49	2.97	13	2.68	31	2.31	49	2.53
14	2.98	32	2.49	50	1.54	14	3.15	32	2.26	50	2.18
15	2.29	33	3.30	51	1.30	15	2.32	33	2.62	51	1.73
16	2.42	34	2.06	52	2.26	16	2.22	34	2.03	52	2.00
17	3.21	35	2.44	53	2.01	17	3.08	35	2.76	53	2.80
18	2.10	36	2.38			18	3.36	36	2.47		

Source: *Computer Science Department of Adamawa State Polytechnic, Yola*

Diagnostics test

Digital Bridge Institute & Nigerian Communication Commission (2022) explain that, diagnostic test/assumptions have to be done/check before using Pearson Correlation analysis technique. The diagnostic tests/assumptions are: the two variables of interest must be continuous, there must be a linearity between the variables of interest, and the two variables must be normally distributed.

However, students CGPA are well-known as data that are scaled continuous variables. Using SPSS Version 25 software, a normality test was done to test how fit are the collected data for analysis. Kolmogorov-Smirnov and Shapiro-Wilk test were applied to confirm the normality of the data as shown in Table 2.

Table 2: Output of Normality Test

	Female Student	Kolmogorov-Smirnov[d]			Shapiro-Wilk		
		Statistic	Df	Sig.	Statistic	Df	Sig.
Male Student	2.00	.167	6	.020*	.981	6	.009
	2.03	.260	2	.			
	2.15	.260	2	.			
	2.22	.260	2	.			
	2.26	.260	2	.			
	2.68	.260	2	.			
	2.74	.260	2	.			
	3.08	.260	2	.			

Source: *SPSS results, 2022*

The above table shows that, the Kolmogorov-Smirnov and Shapiro-Wilk p-values are 0.020 and 0.009 respectively which are both less than 0.05 level of significant. Hence both Kolmogorov-Smirnov and Shapiro-Wilk p-values are significant, it can therefore be concluded that the data are all normally distributed.

The below figure 1 shows that; the data are scattered on a straight line which indicate a positively weak linear relationship between the data of gender performances in the study area. It can therefore be concluded that the data are fit for Pearson Correlation technique analysis.

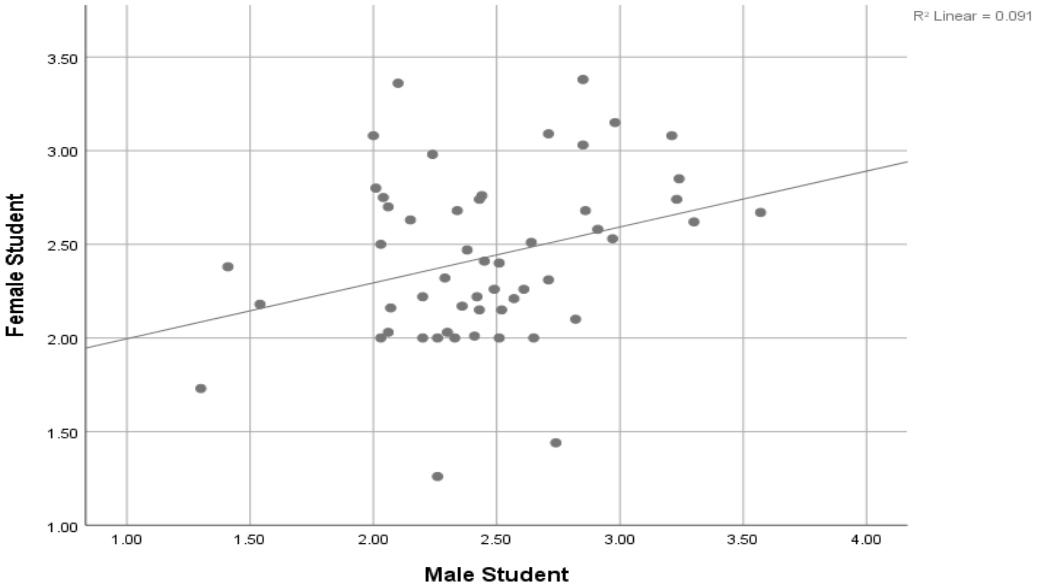

Figure 1: Output of Linearity Test

Table 3: Output of Linearity Test

Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.698	.330		5.149	.000
	Male Student	.298	.132	.301	2.257	.028

a. Dependent Variable: Female Student

Source: *SPSS Results, 2022*

The above table shows that, the positive intercept $\alpha = 1.698$ and gradient of $\beta = 0.298$ with *p*-value of 0.028 means there is a positive linear relationship between gender performances in the study area. Hence, it can therefore be concluded that the data are fit for Pearson Correlation technique analysis.

Data analysis

Using SPSS version 25, the male students Cumulative Great Point Average was correlated with female students Cumulative Great Point Average to determine the correlation (degree of relationship) between the students' gender performance in computer science department of Adamawa State Polytechnic, Yola. The SPSS Version 25 Output of analysis is presented as shown in table 4 below:

Table 4: Output for Correlations Analysis

		Male Student	Female Student
Male Student	Pearson Correlation	1	.301*
	Sig. (2-tailed)		.028
	N	53	53
Female Student	Pearson Correlation	.301*	1
	Sig. (2-tailed)	.028	
	N	53	53

Source: *SPSS Results, 2022*

Hypothesis: There is no significant correlation between student genders on academic performance in Computer Science Department in Adamawa State Polytechnic, Yola.

From the table above, the Pearson correlation coefficient *r* is 0.301, which indicate that there is positively weak degree of the relationship between male and female student's performance in computer science department, Adamawa State Polytechnic, Yola.

However, the above table also revealed that the Pearson correlation coefficient $r = 0.301$ has a smaller *p*-value of 0.028. Hence, H_0 is rejected and it can be concluded there is significant correlation between gender performances in Computer Science Department of Adamawa State Polytechnic, Yola at 0.05 level of significance.

Discussion of Results

Based on the finding, the correlation coefficient between gender performances in Computer Science Department of Adamawa State Polytechnic, Yola is 0.301 with *p*-value < 0.05. This indicate a positively weak correlation but statistically significant relationship between the gender performances, while Steven, (2013) in related study to investigate the correlation of Students' Gender Performance revealed that the correlation coefficient between the students' gender performance is 0.344 with *p*-value > 0.05, which also indicate a positively weak correction but statistically insignificant relationship between the gender performances. Hence, these two studies agree in terms of "positively weak correlation" between the gender performances.

On diagnostic test of linearity of the data before performing Pearson's correlation technique, this result revealed a positive linearity between data of gender performances with $\alpha = 1.698$ and $\beta = 0.298$, while Steven, (2013) revealed a constant of $\alpha = 1.101$ and a gradient of $\beta = 0.327$. Hence, these two studies are also in agreement in terms of "data linearity" between the gender performances.

Kalo and Taiwo, (2013) in a related study to investigate the correlation between student's gender performance in College of Education Kwara Sate Nigeria, revealed that the Pearson's correlation coefficient is 0.221. This implies that the degree of relationship (correlation) between the gender performances is positively weak. While this study shows that the correlation coefficient between gender performances in Computer

Science Department of Adamawa State Polytechnic, Yola is 0.301. This also indicate a positively weak degree of relationship (correlation) between the gender performances. Based on the above statements, the two studies agree.

Conclusion

From table 2, the result of normality test shows that, Kolmogorov-Smirnov and Shapiro-Wilk p-values are 0.020 and 0.009 respectively which are both less than 0.05 level of significant. The graph of data of the students CGPA are scattered on a straight line with an intercept of 1.698 and gradient of 0.298 as shown on figure 1 and table 3. The result also shows a Pearson's correlation coefficient of 0.301 with a *p*-value of 0.028.

In conclusion, the data of students CGPA is normally distributed with a positive linear relationship. The study also revealed that the Pearson Correlation coefficient is positively weak with statistically significant *p*-value. The null hypothesis $H_{0:}$ was rejected and it was concluded there is a significant correlation between student's gender on academic performances in Computer Science Department of Adamawa State Polytechnic, Yola.

Recommendations

Based on the conclusions, the study recommends the following measures for implementation.

i. Department should encourage the students to do group reading irrespective of gender bias in order to strengthen their performance in examination.
ii. Department should encourage the students to do social activities irrespective of gender bias in order to strengthen their relationship.
iii. School management should make a provision for physical infrastructures and update learning facilities such as e-library, and laboratories.
iv. Government should improve on regular and prompt payment of scholarships to boost their day to day academic activities of students
v. Government should also as a matter of emergence adequately do a general revitalization of higher education for student's effective performance

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