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STATISTICAL ANALYSIS OF THE EFFECT OF GENDER AND OTHER VARIABLES ON ACADEMIC PERFORMANCE OF SOME UNDERGRADUATE UNIVERSITY STUDENTS IN NIGERIA

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ABSTRACT

Enhancing the capabilities and potential of a person is done through education. It is a process designed to provide him with knowledge, skills, and attitudes that will help him handle life. The academic performance based on the evaluation criteria of his institution might be used to measure how much the method has affected these people. This study, therefore, is carried out to examine how gender and other variable factors affect students' academic performance in the University. In order to acquire the data required for the study, concise survey questionnaires were administered at random to some students in the Department of Statistics of the University. The independent sample t-test was used to compare academic performance differences between gender classes, while the regression procedure was used to assess the dependency of academic performance on gender. The results of the study as presented in tables clearly show that student's performance differs by gender classes and that the difference is statistically significant. Additionally, it was discovered that gender significantly affected students' academic performance which emphasizes the significance of gender discrepancies in students' academic performance.

Keywords: Gender, academic performance, independent sample t-test, regression procedure

Introduction

One of the most talked-about educational issues in Nigerian schools is the topic of students' poor academic performance (Adigun *et al*., 2015). But before attempting to solve any issue, it is important to understand its root causes. Numerous factors have been researched as the etiological starting point for examining the phenomenon of academic success or failure. To ensure that a person is successful in society, education is the process of enhancing his or her abilities and potential. Academic performance is simply the assessment of a student's accomplishments in all academic areas (Johanson, 2020). Academic performance is a term used to express how far one has come and how much they have improved (Mwihia, 2020). Academic achievement may need a high degree of innate intelligence, mental prowess, and academic excellence, but it may also require a high degree of diligence and dedication (Godpower-Echie and Ihenko,

2017). The academic growth of the teachers is often based on some predetermined criteria. Academic productivity usually referred simply as teacher productivity is the most well-known of these ideas. Academic publication and scientific research are seen as essential components of academic advancement (Ayse *et al*., 2003). It is believed that academic production in higher education is challenging to define (Adigun *et al*., 2015). The number of scientific research papers is shown as evidence of academic productivity (Jieyi and Chau, 2021). In academic circles, the most critical indicator of research productivity is regarded as publishing (Chatillon *et al*., 2018).

Chatillon *et al*. (2018) discovered that there was no gender difference in students' success in mathematics, numeration statistics, and algebraic procedures. Similarly to this, Ani *et al*. (2021) discovered no connection between gender, age, mathematics anxiety, and college students' algebra performance. Another study by Ani *et al*.(2020) found that when compared to male students, female students exhibited a greater understanding of science process abilities. They stated that the idea that boys are superior to girls in the study of science should be examined and treated with extreme care. The success of children in any academic assignment has always attracted the interest of the government, educators, parents, and society at large, according to Mankumari and Ajay (2017) and Goni *et al*. (2015). Students' academic performance records are frequently used to evaluate schools (Chatillon *et al*., 2018). Teachers are unavoidably linked to the educational outcomes of the institutions in which they work. The dynamics of gender interaction between the student and the instructor, especially the gender mix of students and teachers, is one of the fascinating theories for differences in gender on the academic success of students. Even though females perform better academically, their potential is undervalued, which lowers morale and limits how they behave to traditional female norms. This is probably going to encourage gender-biased perception, which will lead to unfair treatment and low self-esteem in females. There is a noticeable gender disparity in academic achievement among students studying at different levels across the world. Male and female students should be treated equally throughout teaching and learning, according to Banda (2018), and all students should have the same opportunity, encouragement, and degree of participation. Traditionally, girls in our society have been encouraged to conform, whereas boys are expected to be active and dominant risk-takers (Ani *et al*., 2021). One of the elements that influence students' success in Basic Science, according to research, is gender sensitivity. Tsaousis and Alghamdi (2022) in their study examined the dimensionality of the construct of General Academic Ability (GAA) at the subscale level providing additional insights over and above on the conceptualization of the construct. They also explore different degrees of measurement invariance of the General Academic Ability (GAA) across gender using more recent advancements in the examination of measurement invariance. This study is therefore aimed at investigating statistically the effect of gender and other variable factors on the academic performance of students of the Department of Statistics at the Federal University of Technology, Akure, Nigeria.

Research Method

This study carries out statistical analysis of the effect of gender and other variable factors on the academic performance of some undergraduate students of the Department of Statistics, Federal University of Technology, Akure, Nigeria. The data for the study were gathered through the conventional research survey questionnaire. Students in the Department of Statistics of the Federal University of Technology, Akure, were randomly selected to fill out concise questionnaire. To facilitate participation and data management during the study, these questionnaires were sent using Google forms platforms. Variable factors such as age, gender, academic level, cumulative grade point average (CGPA), average reading and resting times, thought to have significant impact on academic success are among the information gathered. The independent sample t-test was used to compare academic performance differences between gender classes. Independent samples *t*-test is used to compare two groups whose means are not dependent on one another. The two samples are independent if the sample values selected from one population are not related with the sample values selected from the other population. An independent sample t-test tells the researcher whether there is a statistically significant difference in the mean scores for the two groups or not. In statistical terms, it means that the researcher is testing the probability that the two sets of data came from the same population. In other words, an independent sample is a sample in which the participants in each group are independent of each other. A common example of independent groups might be comparisons between students taught using Collaboration Learning Approach and the other group taught using Conventional Learning Approach. The regression procedure was used to assess the dependency of academic performance on gender. Regression analysis is a collection of statistical techniques that serve as a basis for drawing inferences about relationships among interrelated variables. Since these techniques are applicable in almost every field of study including the social, physical and biological sciences, business and engineering, regression analysis is now perhaps the most used of all data analysis methods.

Data Analysis, Results and Discussion

In this section, the summary exploratory data analysis of the collected data using the survey questionnaire is first presented here followed by the results and discussion of findings. Exploratory analysis is a vital component of research analysis since it allows for a fast understanding of the material acquired.

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Table 1: Frequency distribution of data gathered.

		Age	Gender	Academic Level	CGPA	Reading	Resting
N	Valid	62	62	62	62	62	62
	Missing	0	0	0	0	0	0
Mean		23.68	1.48	2.92	3.58	5.92	6.00
Median		24.00	1.00	3.00	3.69	6.00	6.00
Mode		26	1	1	2.13	5	6
Std. Deviation		2.952	0.504	1.529	0.77093	1.441	1.449

According to Table 1, the median age of the respondents is 24, and their average age is 23.68. This indicates that the age group with the highest representation in the data is 26. The male is treated as 1, while the female is treated as 2, in the numerical representation of the age variable. The proper measure of central tendency for the gender variable, the modal gender, is shown in Table 1 to be male. Male respondents outnumber female respondents in this survey. Since there are five classes in the ordinal categorical variable of academic level, the mode is the proper indicator of central tendency. Given that the CGPA is a continuous variable, the mean and variance are strong indicators of its central tendency. Since the median is seen as a reliable indicator of central tendency, it is reported that the average CGPA for students in the Department of Statistics is 3.69. According to our answers, students spend an average of 6 hours every day reading and resting.

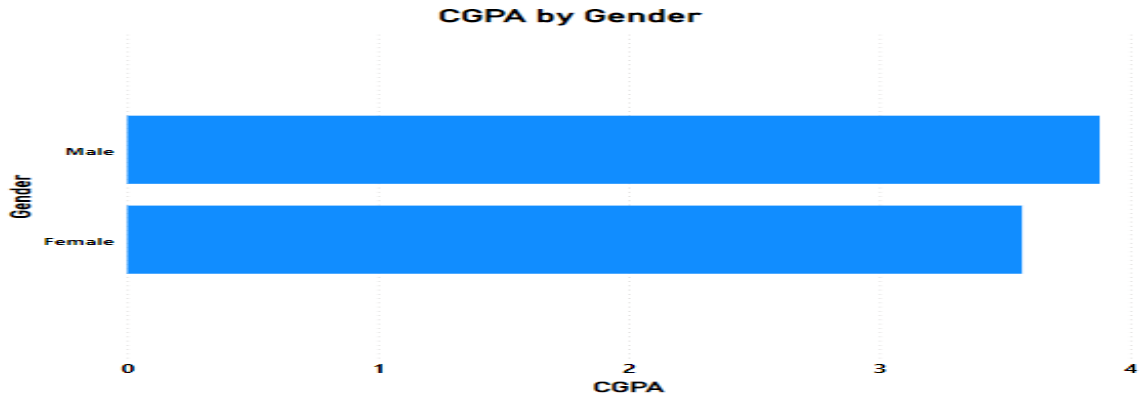


Figure 1: Average CGPA by Gender

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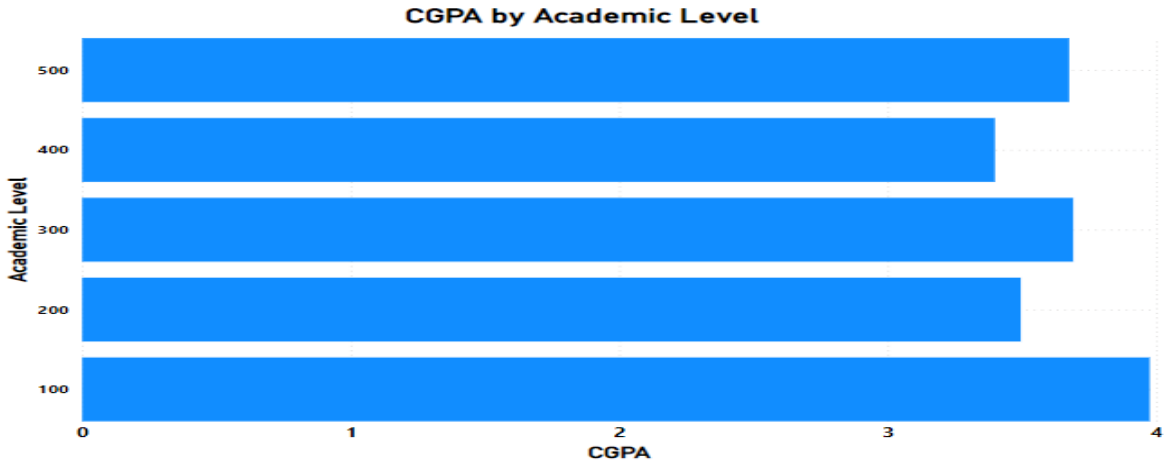


Figure 2: Average CGPA by Academic Level

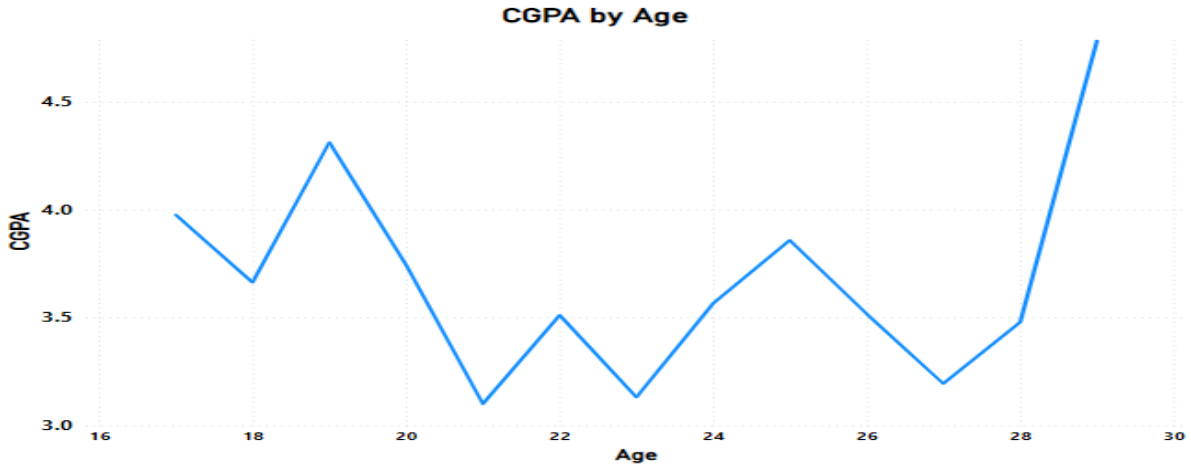


Figure 3: Average CGPA by Age

The visuals presented in figures 1, 2 and 3 shows the CGPA distribution of the respondents relative to gender, academic level, and age respectively.

Difference in Academic Performance by Gender

Comparing student performance according to gender is the primary goal to determine whether or not the difference is statistically different from zero. In order to do this, it is considered necessary to formulate the following hypotheses for the evaluation:

H_0: The difference in students' academic performances between the genders is not significantly different from zero

H_1: The difference in students' academic performances between the genders is significantly different from zero at the level of significance $\alpha = 0.05$

Decision rule: If the p-value is less than α, reject the null hypothesis. Otherwise, do not reject.

Table 2: The independent sample t-test comparison of CGPA based on gender

		Independent Samples Test								
		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
CGPA	Equal variances assumed	0.007	0.935	0.711	60	0.080	0.13986	0.19672	-0.25363	0.53335
	Equal variances not assumed			0.871	59.784	0.040	0.13986	0.19668	-0.25359	0.53331

According to Table 2 above, when equal variance is assumed, the independent sample t-test reveals that the difference in the gender group's means is not statistically different. This implies that the null hypothesis is maintained. After all, the p-value of 0.080 was generated for the t-statistic value of 0.711, which is not less than the level of significance 0.05. However, the t-statistic is 0.871 with a p-value of 0.040 when equal variance is not assumed. The null hypothesis is rejected since this is less than the level of significance 0.05. The study maintains the assumption that there is no equal variance since the samples come from various populations that are classed and distinguished by gender. As a result, it is statistically concluded that the academic achievements of the two groups, as distinguished by gender, significantly differ.

Effect of Gender and other factors on the Academic Performance of Students

The degree of academic performance of students is influenced by several factors. While gender impacts are the main focus of this study, other variable factors that could have substantial impact on students' academic performance were also taken into account. This section makes use of both regression and analysis of variance (ANOVA) respectively.

Table 3: Summary of the regression analysis of CGPA on reading time

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.499[a]	0.050	0.047	0.77350

a. Predictors: (Constant), Reading

Table 3 shows that the regression of the effect of reading time on academic performance is minimal. The model shows that only 5 percent of the variations in CGPA can be explained by the reading time variable. The fit of the model is therefore said to be 5 percent.

Table 4: ANOVA of the regression model of CGPA on reading time

ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	0.356	1	0.356	0.595	0.444[b]
	Residual	35.898	60	0.598		
	Total	36.254	61			

a. Dependent Variable: CGPA
b. Predictors: (Constant), Reading

Table 4 shows the ANOVA analysis of the regression model in Table 3. The model is not statistically significant, and thus the predicted impact is not true according to the statistical technique.

Table 5: Coefficient of the regression analysis of CGPA on reading time

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	T	Sig.
1	(Constant)	3.269	0.419		7.810	0.000
	Reading	0.053	0.069	0.099	0.771	0.444

a. Dependent Variable: CGPA

According to Table 5 above, it can be seen only the constant is statistically significant to the link that the model establishes according to the model's coefficients.

Table 6: Summary of the regression analysis of CGPA on resting time

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.616[a]	0.670	0.586	0.77723
a. Predictors: (Constant), Resting				

From Table 6 above, it is interesting to see the decrease in the impact of resting on academic achievement. According to the model, the resting time variable may account for 67 percent of the changes in CGPA. As a result, 67 percent of the model is reported to suit the data.

Table 7: ANOVA of the regression model of CGPA on resting time

ANOVA						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	0.009	1	0.009	0.775	0.004[b]
	Residual	36.245	60	0.604		
	Total	36.254	61			
a. Dependent Variable: CGPA						
b. Predictors: (Constant), Resting						

The ANOVA analysis of the regression model in Table 6 is shown in Table 7. The model is statistically significant and the predicted impact is true according to the statistical technique.

Table 8: Coefficient of the regression analysis of CGPA on resting time

Coefficients						
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	3.533	0.424		8.336	0.000
	Resting	0.008	0.069	0.016	5.122	0.004
a. Dependent Variable: CGPA						

According to Table 8 above, the effect of resting on the academic performance of students is considered to be statistically significant. Both the constant and the variable are very significant in the model.

Table 9: Summary of the regression analysis of CGPA on gender

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.491[a]	0.508	0.481	0.77407

a. Predictors: (Constant), Gender

From Table 9 above, it can be seen that the regression of the gender influence on academic performance is statistically significant. The model demonstrates that gender differences can account for 50% of the variances in CGPA. As a result, the model's fit is deemed to be 50%.

Table 10: ANOVA of the regression model of CGPA on gender

ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	0.303	1	0.303	0.915	0.040[b]
	Residual	35.951	60	0.599		
	Total	36.254	61			

a. Dependent Variable: CGPA
b. Predictors: (Constant), Gender

Table 10 displays the results of the regression model's ANOVA analysis. According to the table, the model is statistically significant and the impact that was expected occurred.

Table 11: Coefficient of the regression analysis of CGPA on gender

Coefficients

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	3.791	0.308		12.307	0.000
	Gender	0.140	0.197	-0.091	9.711	0.048

a. Dependent Variable: CGPA

Table 11 shows that gender has significant impact on CGPA of students and thus gender is considered to have a substantial role to play. The above table 11 shows that the coefficients are statistically significant.

Table 12: Summary of the regression analysis of CGPA on gender, reading time, and resting time

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.136[a]	0.618	0.532	0.78328

a. Predictors: (Constant), Resting, Reading, Gender

Table 12 shows the regression of the combined effects of reading, resting time, and gender on the academic performance of students. The model shows that gender differences may explain roughly 62% of the variations in CGPA. The model's fit is thus estimated to be 62%.

Table 13: ANOVA of the regression model of CGPA on gender, reading, and resting time

ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	0.670	3	0.223	0.834	0.019[b]
	Residual	35.585	58	0.614		
	Total	36.254	61			

a. Dependent Variable: CGPA
b. Predictors: (Constant), Resting, Reading, Gender

Table 13 displays the results of the regression model's ANOVA analysis. According to the table, the model is statistically significant and the impact that was expected occurred.

Table 14: Coefficient of the regression analysis of CGPA on gender, reading, and resting time

Coefficients

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	T	Sig.
1	(Constant)	3.439	0.679		5.067	0.000
	Gender	-0.140	0.200	-0.092	-0.703	0.046
	Reading	0.054	0.070	0.100	0.770	0.445
	Resting	0.006	0.069	0.011	0.085	0.033

a. Dependent Variable: CGPA

From Table 14 above, it can be seen that the association produced by the statistical model demonstrates that gender and resting factors have considerable impact on CGPA.

Therefore, it can be statistically concluded that the gender variable is a significant variable that influences the assimilation level which in turn directly influences academic performance.

Conclusion

This study established the relevance of gender variations and their impact on academic performance of some selected students of the Department of Statistics, Federal University of Technology, Akure, Nigeria. The various results in tables above show that academic performances of the students vary by gender classes and the difference is considered statistically significant. Additionally, the impact that gender has on academic performance demonstrates the importance of gender disparities in students' academic performance. Therefore, the study concluded that gender should be taken into account when assessing potential academic performance. Gender disparities are a good predictor of academic performance because they may be brought on by the pressure that society places on students.

Recommendation

Based on how gender and other variable factors contribute significantly to the academic performance of the targeted students of the University, it is strongly recommended that government and other stakeholders in the educational sector formulate policies that will bridge the gap in gender disparities in order to enhance the academic performance of students.

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