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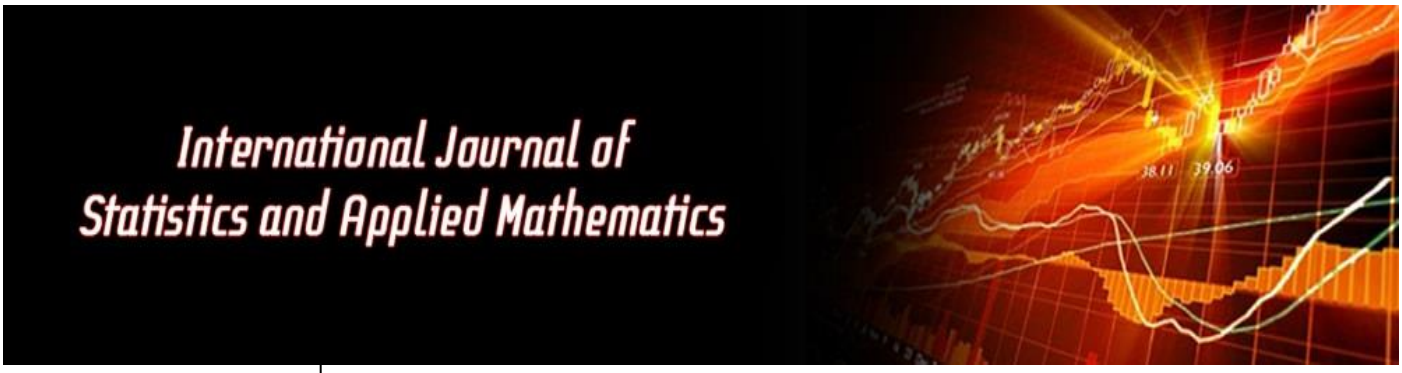

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Muhammed M Muhammed
Department of Statistics,
Faculty of Physical Sciences,
Ahmadu Bello University, Zaria,
Nigeria

Jibril Y Kajuru
Department of Statistics,
Faculty of Physical Sciences,
Ahmadu Bello University, Zaria,
Nigeria

Correspondence
Muhammed M Muhammed
Department of Statistics,
Faculty of Physical Sciences,
Ahmadu Bello University, Zaria,
Nigeria

Statistical analysis of the factors affecting students' academic performance in tertiary institutions: A case study of the department of statistics, Ahmadu Bello University, Zaria

Muhammed M Muhammed and Jibril Y Kajuru

Abstract
This research examined factors affecting students' academic performance in tertiary institutions taking the department of statistics, ABU, Zaria as a case study. Five factors namely: family income, adequacy of lecture halls, availability of reading materials, interest in course of study and reading habits; were considered. A sample of 100 students from the department of statistics was selected purposively and data was obtained through a structured questionnaire with a response value of 90 students. Multiple regression analysis revealed a model which proved to be significant at 0.05 level of significance by Analysis of variance and a multiple correlation value of 0.551 which indicates a strong positive relationship between CGPA and the predictors. The coefficient of determination posited that 30.4% of the variation in academic performance was explained by the predictor variables. The result of the analysis indicated that availability of reading materials, interest in course of study and reading habits contribute to students' academic performance (CGPA).

Keywords: Academic performance, multiple regression, CGPA, factors, tertiary institutions, students

1. Introduction
Students' academic gain and learning performance is affected by numerous factors including age, teaching facilities, students' schooling, parent/guardian socio economic status, residential area of students, medium of instructions in schools, tuition trend, daily study hour and accommodation as hostels (Shoukat *et al*. 2013) [9].

1.2 Academic Performance CGPA
Academic performance refers to the level of performance in school, accomplishment or success in school. However, academic performance is the core of educational growth (Aremu and Oluwole, 2001) [3].

1.3 Statement of the Problem
The most prevalent argument is that the socioeconomic status of learners affects the quality of their academic performance. Student academic performance measurement has been a challenging issue in social, educational, psychological, environmental and personal factors. The utility of these studies lies in the need to undertake corrective measures that improve the academic performance of graduate students. Among all factors, socioeconomic status is one of the most researched and debated factor among educational professionals that contribute towards the academic performance of students. These factors strongly influence students' academic pursuit though they vary from person to person. This study, therefore aims to identify and analyse some determinant factors of academic performance in tertiary institutions. This research will therefore consider family socio-economic status, adequacy of lecture halls, availability of reading materials, interest in course of study and reading habits as factors that determine the academic performance of students.

1.4 Relationship between Reading Habits, Family Income and CGPA

Okewole (2012) [7] pointed out that students reading habit and mothers' educational qualification have significant relationship with students' academic performance and concluded that regular tests and assignments and proper monitoring of students' reading habits will be enough to have positive influence on their academic performance. Considine and Zappala (2002) [4] also noticed that parent's income or social status positively affects the student test score in examination.

1.5 Relationship between Interest in Course of study and CGPA

Akey (2006) [2] cited that students' beliefs about their competence and their expectations for success in school have been directly linked to their levels of engagement, as well as to emotional states that promote or interfere with their ability to be academically successful.

1.6 Relationship between Adequacy of lecture halls, Availability of Reading Materials and CGPA

The availability, provision and the use of teaching and learning materials go a long way to improve quality of teaching which enhances academic performance. Earthman (2002) [5] and Adeogun (1999) [1] in their separate researched explained how adequacy of school facilities affect the morale of students. Opare (1999) [8] also asserted that the provision of the needed human and material resources goes a long way to enhance academic performance.

2. Methodology

2.1 Source and Data Collection Procedure

Data were sourced primarily through structured questionnaire. A sample of 100 students was considered using purposive sampling and a response value of 90 respondents was obtained. Students of the department of Statistics, Ahmadu Bello University were considered to be the sampling space.

2.2 Model Specification

The model used in this study is multiple linear regression model. Regression analysis is the study of the nature and extent of relationship between two or more variables with a view of predicting the value of one variable from the other. It is used when the focus is on the relationship between a dependent variable and one or more independent variables. More specifically, regression analysis helps us to understand how the typical value of the dependent variable changes when one of the independent variables varies, while the other independent variables are held fixed (Montgomery, 2005) [6]. In this case, it attempted to look at the effects or the relationship between a dependent (responsible) variable and number independent (explanatory) variables. With regard to this study, the dependent variable is Cumulative Grade Point Average (CGPA) and the independent or explanatory variables are family income (FI), adequacy of lecture halls (ALH), availability of reading materials (ARM), interest in course of study (ICS), and reading habits (RH). The model is therefore specified as:

$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 +$ eij. Letting CGPA = Y, X_1 = family income (FI), X_2 = adequacy of lecture halls (ALH), X_3 = availability of reading materials (ARM), X_4 = interest in course of study (ICS), X_5 = reading habits (RH). The model is re-specified as:

$CGPA = \beta_0 + \beta_1 (FI) + \beta_2 (ALH) + \beta_3 (ARM) + \beta_4 (ICS) + \beta_5 (RH) =$ eij, where β_0, β_1, β_2, β_3, β_4 and β_5 are the regression coefficients which are estimated from the sample data. The eij is the random error term.

2.3 Method of Data Analysis

All data collected were sorted out, edited and collated using simple tables in order to ease developing of classical insights on the data. Tables enable quicker interpretations and drawing help in meaningful conclusions. Statistical Package for Social Scientists (SPSS) software was used to conduct the inferential statistical analysis.

2.4 Model Adequacy Checking

This is done first by testing for individual regression coefficients. The dependence of Y and Xj can be assessed by testing the significance of βj. The hypothesis is H_0: βj = 0 and H_1: βj ≠ 0

If the hypothesis is true, none of the independent variables X_1, X_2, …, X_k. is linearly related to Y otherwise they are linearly related.

3. Results and Discussions

3.1 Model Formulation

The linear regression model is developed as follows using the output results (coefficients) below:

Table 1: Analysis of the predictors on academic performance

Regression Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.730	.482		3.587	.001
	Family Income (x_1)	-.169	.129	-.156	-1.308	.195
	Adequacy of Lecture Halls (x_2)	-.210	.177	-.129	-1.182	.240
	Availability of Reading Materials (x_3)	.185	.146	.176	1.269	.208
	Interest in Course of Study (x_4)	.371	.161	.308	2.306	.024
	Reading Habits (x_5)	.256	.123	.258	2.075	.041
Dependent Variable: CPGA						

From Table 1 above, the exact regression model is specified as: Y = 1.730 - 0.169 (FI) – 0.210 (ALH) + 0.185 (ARM) + 0.371 (ICS) + 0.256 (RH) where FI, ALH, ARM, ICS and RH denote their usual meanings. The constant value (1.730) is the intercept which represent total output of academic performance in terms of Cumulative Grade Point Average (CGPA) given that all the predictors are zero, all other factors held constant. On the other hand the coefficients of x_1 (family income) and x2 (adequacy of lecture halls) of -0.169 and -2.10 implies the magnitude by which CGPA would decrease per unit change in both x_1 and x_2. Likewise, the coefficients of X_3 (availability of reading materials), X_4 (interest in course of study) and X_5 (reading habits) of 0.185, 0.371 and 0.256 respectively indicate how much the CGPA would increase per unit change in x_1, x_2 and x_3.

3.2 Model Summary of Other Regression Coefficients

Table 2: Multiple correlation and Coefficient of Determination

Model Summary				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.551[a]	.304	.262	.63500
a. Predictors: (Constant), Reading Habits, family income, adequacy of lecture halls, interest in course of study, availability of Reading materials				

The R value of 0.551 shows that there exist a strong positive relationship between Academic Performance (CGPA) as dependent variable and family income, adequacy of lecture halls, availability of reading materials, interest in course of study and reading habits as independent variable. This implies that the behavioural patterns of the predictors did affect the CGPA. While the R^2 value of 0.304 indicates that 30.4% of the variations in academic performance of the students is explained by the predictor variables (family income, adequacy of lecture halls, availability of reading materials, interest in course of study and reading habits).

3.3 Analysis of Variance (ANOVA)

Table 3: Analysis of Variance Table

Anova[a]						
Model		**Sum of Squares**	**Df**	**Mean Square**	**F**	**Sig.**
1	Regression	14.777	5	2.955	7.330	.000
	Residual	33.871	84	.403		
	Total	48.648	89			
a. Dependent Variable: CGPA						
b. Predictors: (Constant), Reading Habits, family income, adequacy of lecture halls, interest in course of study, availability of Reading materials						

Hypothesis: H_0: $\beta_1 = \beta_2 = \ldots = \beta_k$ (The model is not significant), H_1: $\beta_k \neq 0$, for at least one j (The model is significant)

Level of significance is ($\alpha = 0.05$). The test statistic is F-test and the Decision Criteria is Reject H_0 if p-value < 0.05 level of significance.

Conclusion

Since P-value (0.000) < 0.05 level of significance. We therefore reject H_0 and conclude that the model is significant.

3.4 Results of Correlation Analysis

Table 4: Correlation between academic performance and the factors under study.

Correlations							
			family income	**adequacy of lecture halls**	**availability of Reading materials**	**interest in course of study**	**Reading Habits**
CGPA	Pearson Correlation		.059	.087	.321**	.470**	.476**
	Sig. (2-tailed)		.578	.416	.002	.000	.000
	N		90	90	90	90	90
family income	Pearson Correlation	.059	1	.429**	.623**	.313**	.252*
	Sig. (2-tailed)	.578		.000	.000	.003	.017
	N	90	90	90	90	90	90
adequacy of lecture halls	Pearson Correlation	.087	.429**	1	.469**	.436**	.256*
	Sig. (2-tailed)	.416	.000		.000	.000	.015
	N	90	90	90	90	90	90
availability of Reading materials	Pearson Correlation	.321**	.623**	.469**	1	.560**	.503**
	Sig. (2-tailed)	.002	.000	.000		.000	.000
	N	90	90	90	90	90	90
interest in course of study	Pearson Correlation	.470**	.313**	.436**	.560**	1	.654**
	Sig. (2-tailed)	.000	.003	.000	.000		.000
	N	90	90	90	90	90	90
Reading Habits	Pearson Correlation	.476**	.252*	.256*	.503**	.654**	1
	Sig. (2-tailed)	.000	.017	.015	.000	.000	
	N	90	90	90	90	90	90
**. Correlation is significant at the 0.01 level (2-tailed).							
*. Correlation is significant at the 0.05 level (2-tailed).							

Table 4 above shows that there is a weak positive association between Academic Performance (CGPA) of the students under study with their family income with a correlation value of (0.059) which is not statistically significant with p-value 0.578>0.05 level of significance. Furthermore, the association between adequacy of lecture halls and academic performance (CGPA) is quite very weak, with a correlation of 0.087 which indicates it is statistically not significant with p-value 0.416 at 0.05 level of significance. Likewise the association between Academic Performance with availability of reading materials, Interest in course of study and Reading habits indicates a positive association with correlation values of 0.32, 0.47 and 0.48 respectively. This also shows a statistical significance with p-values 0.02, 0.000 and 0.000 < 0.05 respectively at 5% level of significance.

4. Conclusion

The study revealed that interest in course of study and readings habits have significant effects on students' academic performance since their individual p-values are both less than 0.05. The study also indicated that there exist a positive correlation (relationship) of 0.551 between CGPA, family income, adequacy of lecture halls, availability of reading materials, interest in course of study and reading habits. This therefore implies that the behavioural patterns of family income, adequacy of lecture halls, availability of reading materials, interest in course of study and reading habits had some influence on the CGPA. In addition, the study revealed an R^2 value of 0.34 (30.3%), this implies that approximately 30% of the variations in CGPA are explained by family income, adequacy of lecture halls, availability of reading materials, interest in course of study and reading habits. Therefore, there are about 70% of the changes in CGPA that are not accounted for by family income, adequacy of lecture halls, availability of reading materials, interest in course of study and reading habits. It can also be concluded from the findings that indeed there exist some relationship between CGPA, family income, adequacy of lecture halls, availability of reading materials, interest in course of study and reading habits as already established and this is given by the linear regression model: $Y = 1.730 - 0.169\ (FI) - 0.210\ (ALH) + 0.185\ (ARM) + 0.371\ (ICS) + 0.256\ (RH)$ where FI, ALH, ARM, ICS and RH denote their usual meanings.

5. Recommendations

Since the model revealed that availability of reading materials, interest in course of study and reading habits contribute significantly to the model, the following recommendations are therefore necessary:

1. Teachers should device modern techniques of teaching to arouse students' interest in learning which will improve their academic performance.
2. Students should be motivated and encouraged by their lectures to read different information resources other than their notebooks and handouts so as to be exposed to diverge and broader views to knowledge.
3. Academic institutions should encourage students to have a blueprint of their time schedule for reading.
4. Academic institutions should provide an enabling environment that will encourage students' reading habits and thus enhance academic achievement.

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