

**A STUDY ON FACTORS THAT INFLUENCE STUDENTS ACADEMIC PERFORMANCE IN KOGI STATE UNIVERSITY ANYIGBA: A BINARY LOGISTIC REGRESSION APPROACH**

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**ABSTRACT:** *Students' academic performance of the target institution is discussed under certain vital statistical parameters. The study, aimed at determining strategic remedy to poor academic performance of students, identified possible negative impact factors within the institution. The study considered the following factors: Jamb Score (prior academic performance), Number of friends on Social Networking Sites (SNS), Concept of knowledge acquired in class and how it relates to real world experience (students' motivation). Others are: How often they attend lectures, Rate of study in hours per week; How often they discuss ideas from lectures (students' academic habit) and Time spent taking extra job alongside academic program (additional job). With these factors technically analysed, we employed Binary Logistic Regression Model to investigate the influence of these factors on students' performance, whereas data analysis shows that these factors negatively affected students' academically. From our findings, we recommended that intervention strategies that supports improvement among the Academically Imbalance Students (AIS), should be focused on: how to enhance immediate academic performance at the early stage of their academic career, guided usage of social networking sites. Furthermore, ensuring sufficient motivation as well as improved students' academic habit must be encouraged. In addition, a proper choice of mode of study when additional job is unavoidable should be considered.*

**KEYWORDS:** academic habit, academically balance students, academically imbalance students, academic performance, binary logistic regression.

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## **INTRODUCTION**

Universities are higher education institutions responsible for the training of students in all disciplines of Social, Management, Pure and Applied Sciences, Arts and Humanity, Education, Engineering etc.; unlike other tertiary institutions that are responsible for training students in specific areas. The Polytechnic for example, was established with the primary purpose of training students in sciences and technical subjects [1], while Colleges of Education are responsible for training students only in Education disciplines. This translates to the fact that only the university is responsible for producing graduates in all disciplines of life and to this end, the quality of graduates produced by universities have a great influence on any society economically, morally, and otherwise.

Academic performance is the main feature of an educational system [2]. Academic performance is the measure of how well a student performs in the academic environment, where the academic environment in this case is the University. Many students whose graduating Cumulative Grade Point Average (CGPA) falls below 3.00 have recently been deprived of securing admissions for various Postgraduate Programs, owing to a benchmark requirement for Kogi State University and many other Nigerian Universities.

More so, most enterprises, industries and organizations in Nigeria employ only graduates with a minimum of second class upper (a minimum CGPA of 3.50 on a scale of 5.00), where such academic performance is dependent on students diligence during their university academic studies.

Many graduates are also deprived employment opportunities, given the rate at which they performed poorly academically, whereas this leads to a higher unemployment rate in a county. As an implication of this, the country will witness increasing spate of criminal activities and fraudulent social vices as it is in Nigeria today. There is a need to investigate and determine factors that influence academic performance among students, as this will help the government and instructors know where to focus their instruction of intervention, aimed towards addressing the challenge of academically imbalanced students (AIS) bedeviling the country.

This study will focus on investigating the factors that influence academic performance in Kogi State University Anyigba, a prestigious tertiary institution in Nigeria. An essential step in this study is to develop an effective model, which predicts student academic performance. This will assist instructor(s) or lecturers to bear in mind the specific areas to lay emphasis on as regards intervention strategy, as this will help the AIS to improve in their academic perform. Many education researchers and instructors have made extensive efforts in constructing effective models to predict student academic performance in a class ([3], [4], [5], [6]). The results of these predictive models can help an instructor determine whether or not a pedagogical and instruction intervention is needed. For example, the instructor can determine how well, or how poorly, students may perform in the class. Then, appropriate pedagogical and instructional interventions (for example, designing an innovative and effective learning plan) can be developed and implemented to help the AIS. Following these developments, the interest of this study is therefore to investigate factors that significantly influences students' academic performance in Kogi State University.

Ordinal logistic regression was employed to study students' performance, using data obtained from faculty of science at the University of Ilorin. From this approach, it was observed that only sex of students is not a determinant factor of the final grade that students may attain at graduation. The study also found out that there is an equal chance for both male and female students to graduate from a university with First Class, where younger students are more likely to excel academically compared to aged students. The study recommended that governments' policy on education should be focused on both genders instead of special attention usually given to female students [7].

Furthermore, [8] attempted to assess and identify the major factors or independent variables that influence student academic performance at the College of Natural and Computation Science of Wolaita Sodo University in Ethiopia using binary logistic regression. The study revealed that peer influence, securing the first choice of department, arranging study time outside class, amount of money received from family and father's education level were significant variables that influenced academic performance of students in the school.

Examination of students' family socio-economic status as well as availability of academic facilities as it affects students' academic performance in the department of statistics, Ahmadu Bello University, Zaria was conducted in [9] on a sample of 100 students from the department. Data for the research was obtained through a structured questionnaire with a response value of 90 students. Regression Analysis and Analysis of Variance of the determined model indicated a strong positive relationship between CGPA and the predictors. The result of the analysis indicated that availability of reading materials, interest in course of study and reading habits contributed to students' academic performance determined by CGPA.

Reports presented in [10] indicated that, despite effective communication skills, subject mastery and proper class room management on the side of lecturers, students' academic performance was deterred by poor water and electricity supply, inadequate social interaction avenue, poor staff offices as well as hostels. Furthermore, Chi-Square analysis revealed relationship between other factors like socio-economic status, family background and availability of academic facilities, which contributed to the performance of students at various Colleges of Education. It was recommended that parental support to students and funding of Colleges of education is pertinent to students' performance at such tertiary institutions.

A descriptive method was adopted in [11] where stratified data, which ensures gender balance, was collected. Analysis using percentages, means, t-test and multiple regression analysis with the aid of Statistical Package for Social Science (SPSS) was employed to determine academic performance of students in Nigeria Universities from a sample size of 400. Findings indicated that the major factors affecting students' academic performance in Nigerian universities are student, lecturer and institutional related factors. The study also revealed a significant joint contribution of student, lecturer, institutional and home-related factors on poor academic performance of students in Nigerian universities. Conclusion and recommendations were provided in the light of the empirical findings.

Again, [12] studied the socio-economic factors influencing student academic performance in Yaba College of Technology, Yaba, Lagos, on a sample size of six hundred (600) students across different departments and classes using a 28 items structured questionnaire, administered by quota sampling method. Various statistical tools and binary logistic regression were employed in analyzing obtained data, based on academic performance categorized as "poor" (GPA/CGPA between 0.00 and 2.49) and "good" (GPA/CGPA between 2.50 and 4.00). Result indicated that four factors;

mothers' education level, living togetherness of parents, student class and weekly income/allowance; were found to influence students' academic performance, thus, recommendations were made at the end of research.

A close look at the trend of studies suggests that not much have been done to explore students' related factors affecting their academic performance, in line with the current level of students' exposure to the use of social media as well as students' classroom attentiveness. Our study seeks to explore this gap as identified in the literature. This study thus focuses on identifying such factors among the students of Kogi State University, Anyigba, with the aim of providing the basis for improvement on academic performance through certain intervention strategy.

### LOGISTIC REGRESSION MODEL

Several studies aimed at identifying factors that inhibit students' performance on courses taken at the undergraduate level had been determined using Logistic Regression Model. Using this model, it was observed that previous high school grades was a factor that determines students' performance(s) on courses taken at undergraduate level as presented in [13] as well as [14]. In contrast, students' belief and attitude determined their performance according to findings in [15] and [16] using same model. However, student's motivation and socioeconomic factors were separate primary factors, which determines their performance on courses taken at ungraduated level based on finding adapted from Logistic Regression Model as reported in [17] and [18] respectively. Logistic regression analysis extends the techniques of multiple regression to research situations in which the outcome variables are categorical.

Its salient feature is that there is a binary response of interest and the predictor variables are used to model the probability of that response. Here the binary response variable,  $Y$ , is:

- Students with a cumulative grade point average (CGPA) between 0 and 2.99 was coded as 0 and they are regarded as academically imbalance students (AIS) and;
- Students with a cumulative grade point average (CGPA) between 3.00 and 5.00 was coded as 1 and they are regarded as academically balance students (ABS)

The predictor variables are the factors being investigated, for possible influence on the response variable.

The model equation in Logit form is given by

$$\text{Log} \left[ \frac{p(x)}{1-p(x)} \right] = \alpha + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_k x_k \quad (3.1)$$

where  $X_i$ ,  $i = 1, \dots, k$  are the factors being investigated, for a vector  $X = (x_1, x_2, \dots, x_k)$  and

$$\begin{aligned}
 p(x) &= P(Y = 1 | X = x) \\
 &= \frac{1}{1 + e^{\sum_{i=1}^k \beta_i X_i}}
 \end{aligned} \tag{3.2}$$

Hence the odds ratio is

$$\Pi(x) = \frac{p(x)}{1 - p(x)} \tag{3.3}$$

### Parameter Estimation

The method used to find the parameter estimates,  $\alpha, \beta_1, \beta_2, \dots, \beta_k$  is the method of maximum likelihood, which entails finding the  $\hat{\beta}$  that maximizes the likelihood function.

$$f(y / \beta) = \prod_{i=1}^N \frac{n_i!}{Y_i!(n_i - y_i)} p_i^{y_i} (1 - p_i)^{n_i - y_i} \tag{3.4}$$

The maximum likelihood equation is given by

$$L(y / \beta) = \prod_{i=1}^N \frac{n_i!}{Y_i!(n_i - y_i)} p_i^{y_i} (1 - p_i)^{n_i - y_i} \tag{3.5}$$

where

$$P_i = \frac{e^{\sum X_{ik} \beta_k}}{1 + e^{\sum X_{ik} \beta_k}} \tag{3.6}$$

Hence

$$\begin{aligned}
 L(y / \beta) &= \prod_{i=1}^N \left( e^{\sum X_{ik} \beta_k} \left( 1 - \frac{e^{\sum X_{ik} \beta_k}}{1 + e^{\sum X_{ik} \beta_k}} \right)^{n_i} \right) \\
 &= \prod_{i=1}^N e^{\sum X_{ik} \beta_k} \left( 1 + e^{\sum X_{ik} \beta_k} \right)^{-n_i}
 \end{aligned}$$

Therefore,

$$\log L(\beta / Y) = \sum Y_i \sum X_{ik} \beta_k - n_i \log(1 + e^{\sum X_{ik} \beta_k}) \tag{3.7}$$

To obtain the critical points of the log likelihood function, we set the first derivative with respect to each  $\beta$  equal to zero, and solve for  $\beta$

$$\frac{\partial}{\partial \beta_k} \log(\beta / y) = \sum y_i X_{ik} - n_i \frac{1}{1 + e^{\sum X_{ik} \beta_k}} X_{ik} e^{\sum X_{ik} \beta_k} \quad (3.8)$$

$$\begin{aligned} &= \sum y_i X_{ik} - n_i \frac{e^{\sum X_{ik} \beta_k}}{1 + e^{\sum X_{ik} \beta_k}} X_{ik} \\ &= \sum y_i X_{ik} - n_i P_i X_{ik} \end{aligned} \quad (3.9)$$

The maximum likelihood estimates for  $\beta$  can be found by setting each of the  $k + 1$  equations in (2.9) equal to zero and solving for each  $\beta_k$ . This can be done by iterative procedure using SPSS statistical package.

### Research Design

The research instrument used is the questionnaire method, which was distributed to students of Kogi State University, Anyigba. The questionnaire consisted of 31 questions making up the response variables, predictor variables, and descriptive variables, which collectively investigates performance indicators. The questionnaire was conveniently grouped into nine (9) subsections and was tested for content validity and test-re-test reliability before administering it to students.

From a total population of 17000 students of Kogi State University, the target population consists of 200 – 500 level students of the University. A random sample of 376 from the target population was administered the questionnaire for the pilot and main survey respectively. The method described in [21] was used for determining the sample size of known population, to ensure the accuracy of the sample size of the population. Thus, the sample size formula by [21] is defined as:

$$S = \frac{\chi^2 NP(1-P)}{d^2(N-1) + \chi^2 P(1-P)}$$

where,

S = required sample size

$\chi^2$  = the table value of chi square for 1 degree of freedom at  $\alpha = 0.05$  is (3.841)

N = Population Size (17000)

P = the population proportion (assumed to be 0.5)

D = the degree of accuracy expressed as a proportion (0.05)

Upon substituting these values in the defined formula, we have:

$$S = \frac{(3.841 \times 17000 \times 0.5(1-0.5))}{(0.05^2(17000-1)) + (3.841 \times 0.5(1-0.5))} = \frac{16324.25}{42.5 + 0.96025} = \frac{16324.25}{43.46025} \approx 376$$

The response rate was 100% because concerted efforts were made to retrieve the questionnaire from students.

### Data Description

The data used were derived from the questionnaire administered to students using appropriate numerical codes. The current GPA/CGPA of the students used as the binary dependent variable, is coded as mentioned earlier. The questionnaire covered largely the thirty-one descriptive, dependent and independent variables that were investigated.

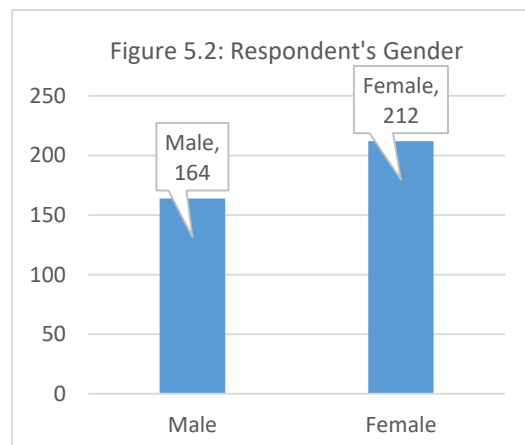
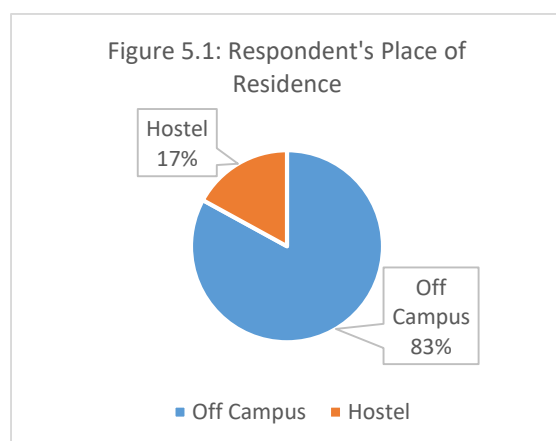
The choice of response to a question could be categorical, multiple-choice, or alternative choice answers provided on a Likert scale. The coding for the Likert scale is done as follows:

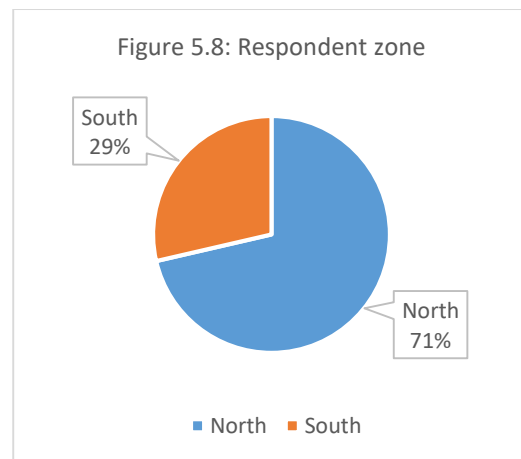
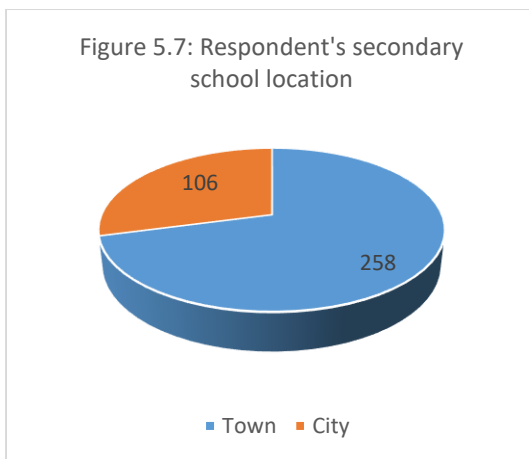
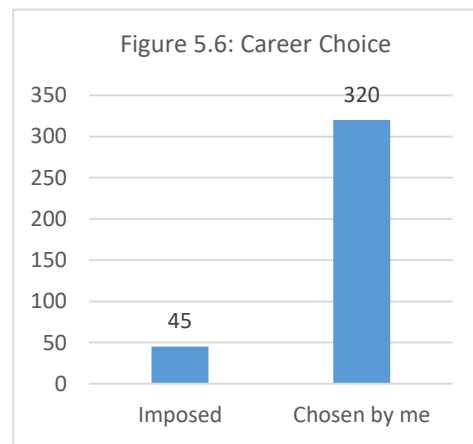
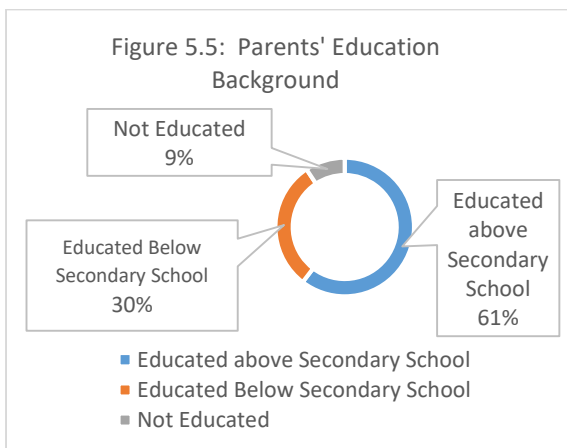
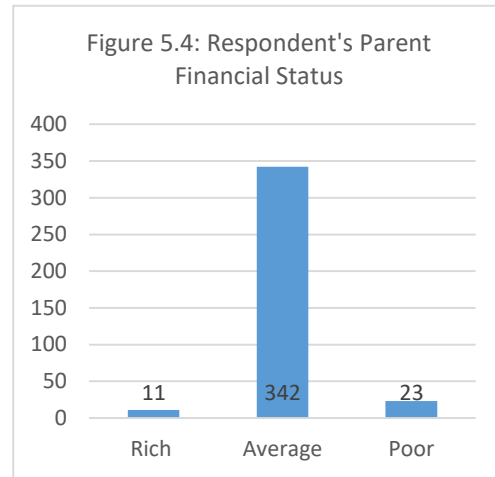
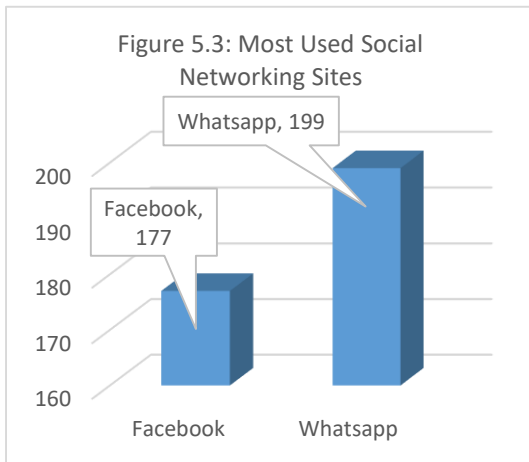
Very Great Extent (V.G.E) is 4, Great Extent (G.E) is 3, Little Extent (L.E) is 2, and No Extent (N.E) is 1.

All other types of choice of response were coded in a serial sequence. The coded form of the response to the questionnaire by the 376 students in the study constitutes the data for analysis.

### Demographic features of the data

A bar, pie and doughnut chart was used to display some of the demographic variables, which are Gender, Place of Residence, Most Used Social Networking Site, Parent's Educational level, Parent's Financial Status, Career Choice, Secondary School location and zone.. These are shown in figures 5.1 to 5.8 respectively. All the charts were obtained using Microsoft Excel.







**METHOD OF DATA ANALYSIS**

The data were analysed using statistical package for social sciences (SPSS). A step wise Logistic Regression method was performed. The parameters were obtained by maximum likelihood method. The Nagelkerke  $R^2$ , Hosmer-Lemeshow test and Percentage Accuracy in Classification (P.A.C) were used to assess the model fit. The Wald statistic, likelihood ratio test and odds ratio with 95% Confidence Interval (C.I) were used to assess the significance of the individual coefficient.

Observed results are presented in Tables 6.1 to 6.4 below.

**Table 6.1: Nagelkerke  $R^2$  Test**

Step	-2 Log likelihood	Nagelkerke R Square
	268.161 <sup>a</sup>	.653

**Table 6.2: Hosmer and Lemeshow Test**

Step	Chi-square	Df	Sig.
	2.409	6	.300

**Table 6.3: Classification Table with a cut value of 0.500**

Observed		Predicted		
		Students CGPA		Percentage Correct
		0.00 – 2.99	3.00 – 5.00	
Students CGPA	0.00 – 2.99	159	26	85.9
	3.00 – 5.00	24	167	87.4
Overall Percentage				86.7

**Table 6.4: Variables in the Equation**

	B	S.E	Wald	Df	Sig	Exp(B)	95% C.I. for Exp(B)	
							Lower	Upper
Jamb Score	.742	.168	19.436	1	.000	2.100	1.510	2.921
How Many Friends on SNS?	.782	.102	21.807	1	.000	2.186	1.574	3.032
Concept in Class	.517	.219	5.550	1	.018	1.676	1.091	2.576
How Often do you Come to Lecture?	.985	.202	23.778	1	.000	2.678	1.802	3.979
How Many HPW do you attend Lecture?	1.360	.116	38.265	1	.001	2.526	2.459	4.980
Discuss Ideas From lectures	1.440	.208	48.016	1	.000	4.220	2.808	6.341
Additional Job outside school	1.360	.116	13.165	1	.000	3.898	3.107	4.890
Constant	-3.750	.381	96.988	1	.000	0.240		

Legend: **SNS**:-Social Networking Sites, **HPW**:-Hours Per Week.

## DISCUSSION OF RESULTS

From the demographic features of the data in figures 5.1 to 5.8 above, the proportion of female respondents is a bit higher than that of males. Most of the students reside off campus, majority of the respondents chose their career choice, the parents of the respondents are mostly educated above secondary school. The respondents mostly use Whatsapp.

The value of  $R^2$  in **Table 6.1** indicate that 65.3% of the variability in the log odd ratio is explained by the independent variables. The result of the Hosmer – Lemeshow goodness – of – fit test in **Table 6.2** indicate that the logistic model is a good fit to the data. In **Table 6.3**, the model correctly classifies 86.7% of all the cases. This again confirms that the model is a good fit.

The results in **Table 6.4** shows that seven (7) variables were identified to have significant regression coefficient  $\beta$ . They are Jamb Score, Number of friends on Social Networking Sites, Concept in class relate to the real world how often the students attend lectures, How many hours per week do the students study, discuss ideas from lectures with students outside class and additional job. Hence, they are they seven (7) variables that contributed significantly to the predictive ability of the model. Column seven of **Table 6.4** gives the values of the corresponding estimated odds ratios, that is,  $e^\beta$ . The estimated odd ratio of 2.1 indicates that students with a higher jamb score are 2.1 times more likely to perform better, compared to students with lower Jamb Scores, controlling for other variables in the model. In the same fashion, an odd ratio of 2.186 means that students with lesser friends on social networking sites are 2.186 times more likely to perform better than students that have many friends on social networking sites controlling for other variables in the model. Similarly, an estimated odd ratio of 1.676 indicates that students who believe that the concept in class relate to real world experience are 1.676 times more likely to perform better than students who believe that the concept in class don't relate to real world experience controlling for other variables in the model. Furthermore, an estimated odd ratio of 2.678 indicates that students who don't miss lectures are 2.687 times more likely to perform better than students that usually miss class controlling for other variables in the model. From the above table, an estimated odd ratio of 2.526 indicates that students who spend more time reading are 2.526 times more likely to perform better than students who spend less time reading controlling for other variables in the model. An estimated odd ratio of 4.220 indicates that students who discuss ideas of what was thought in class with people outside of the class are 4.220 times more likely to perform better than students that do not discuss ideas of what was thought in class with people outside classroom, controlling for other variables in the model. Finally, an estimated odd ratio of 3.898 indicates that students that don't have any other job aside being students are 3.898 more likely to perform better than students who have additional occupation when schooling controlling for other variables in the model. The variables, "how concept of courses relates to real world experience", "How often they attend lectures", "How many hours per week they study",

“how well they discuss ideas from lectures” come under the sub grouping of the variables with titles, student’s motivation and student’s academic habit which conforms with the result in the study of [8] and [17].

## RECOMMENDATIONS

Based on the results, the following recommendation are proposed.

1. The Academically Imbalance Students (AIS) with lower Jamb Scores can be identified reliably, so that they are guided towards becoming successful in their academic journey through the university.
2. Such students should be counseled against numerous friends on social network; rather, social academic groups could help them become more successful academically.
3. At the early period of their academic career, AIS should be well informed on the importance of sufficiently attending classes (enforcing a minimal class attendance rate of 80% during every academic semester), bearing in mind that concepts taught in class relates to the real world experience. Furthermore, peer discussion of classroom activities and lesson should be encouraged among students, with the aid of extracurricular instructional aids and materials.
4. Taking jobs while schooling should be discouraged for such students, they could be advised to go for part time programs rather than full time programs so as to enable them manage their jobs and schooling together, if need be.
5. Identification of potentially low performing students both in the classroom and at the administrative level should be practiced. Classroom techniques to identify low performing students includes; using clear grading strategies, issuance of formal continuous assessment reports, the use of formative assessment, and the implementation of proactive counseling by peers, instructors, and/or administrators. These techniques enlightens students on the potential implications of their grade status, and to offer them advice and assistance on improving their grades.
6. The university should set programs to strengthen self-concept or motivation to make them confident of their potential. Also, plan academic trips for students, with the aim of instilling required practical knowledge of classroom theories and to bridge the gap of social-academic disconnection.
7. Further study with additional predictor variables have to be made, to address the issues raise in this study.

## CONCLUSION

A logistic model was fitted to data on some variables provided by questionnaire administered on 376 of Kogi State University, Anyigba. From the Neglerke  $R^2$ , 65.3% variation in the log odd ratio was explained by fitting the independent variables. The unexplained variation is 34.7% and this shows that the model is a good fit. The Hosmer Lemeshow test further shows that the model is a good fit. The model also correctly classifies 86.7% of the overall cases; this is also an indication that the model is a good

fit. Seven (7) variables made significant contribution to the predictive ability of the model. The significant variables are: Jamb Score, How many friends on SNS, Concept of the course relate to the real world experience, How often they attend lectures, How many hours per week the students study, How often they discuss ideas from lectures and Additional Job.

These seven (7) variables affects the status of Academically Imbalance Students (AIS) in Kogi State University Anyigba. The variable, “Jamb Score” is under the prior academic performance while the variable, “Number of Friends on SNS” is categorized as effect of social networking sites. The variables, “how concept of course relates to real world experience”, “How often they attend lectures”, “How many hours per week they study”, “how well they discuss ideas from lectures” come under the sub grouping of the variables with titles, student’s motivation and student’s academic habit respectively. Finally, the variable “additional job outside school” falls under additional job. Consequently, this clearly indicates that any intervention strategy that could lead to the improvement of performance of the AIS towards being academically successful could be focused on student’s prior academic performance, usage of social networking sites, motivation, student’s academic performance and additional job.

#### **ADDITIONAL RESOURCE(S)**

Details of administered questionnaire is available upon request from [bash0140@gmail.com](mailto:bash0140@gmail.com)

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