EFFECTS OF UNDESIRED COURSE OF STUDY ON STUDENTS' ACADEMIC ACHIEVEMENT IN NIGERIA USING BINARY LOGISTIC REGRESSION

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Abstract

This study was conducted to examine the effects of undesired course of study on students' academic performance in tertiary institutions in Nigeria. The questionnaire method was used with stratified sampling scheme. The questionnaire was administered to 400 students in Federal University of Technology, Minna Nigeria. Factors such as gender, age, satisfaction and the course of study were examined whether these factors were having effect on students' academic performance. The student cumulative grade point average (CGPA) was used as a measure of academic performance. The data were analyzed using binary logistic regression and the results revealed that satisfaction with course of study and undesired course of study affected students' academic performance. However, age and gender difference did not affect students' academic performance.

Keywords: Education, undesired, academic performance, cumulative grade point average (CGPA), questionnaire, satisfaction.

Introduction

The social and economic growth of any nation is directly allied with students' academic performance, because education is a strategic factor for achieving a long-term economic development. Nasirudeen et'al, (2014) was of the opinion that the Nigerian educational system has extremely improved in the last-decades. However, this progress keeps Nigeria at other country's tail end due to its high rates of students' failure and drop out, Ali et.al, (2013). Students' academic achievement plays a significant role in producing the pre-eminent quality graduates who will become great leaders and manpower of the country and hence responsible for the country's economic and social development

Ali et al, (2009) made it known that academic achievement of students has been a focus point for educators and researchers. He lateridentified class size, methods of teaching as factors that contribute to students' academic excellence as well as that of their failure. Fielding (2000) also conducted a researched on aspects of students' academic performance whichincluding gender and age difference, lecturers' or teachers' level of education and their teaching styles, class environment, social-economic factor, and educational back-ground of the parents to identify factor(s) that affect students' academic performances and his discoveries from this studies varies from region to region and his results differs in cities and rural areas. However, students studied in various tertiary institutions in Nigeria may have come from different educational backgrounds, but still, they are provided with the same educational services and equipment in their respective institutions; and some of them still perform significantly better than others academically. Could this be as a result of giving such student their desired course of study?

The purpose of this study was to ascertain the effect of undesired course of study on students' academic performance and ways of addressing them so that educational performance of students can be enhanced. Student academic performance was measured through their cumulative grade point average (CGPA). Students' CGPA being an important variable to measure students' academic achievement and it appear that students tend to be struggling to maintain a CGPA of 3.00. Consequently, there must be copious debatable factors that can

possibly contribute to the deterioration of student's academic performance and one major responsible factor could be undesired course of study.

We decided to conduct this research to investigate the hidden relation between undesired course of study and students' performance using Federal University of Technology, Minna (FUTMINNA) as case study. Bearing evidence to prove that, students who are given a desired course of study will achieve a higher CGPA of 3.00 – above, and a higher level of concentration.

Research Hypothesis

In order to establish a proof about the influence of undesired course of study on students' academic performance (CGPA) and some other factors hindering academic success, the following hypotheses were considered using binary logistic regression analysis.

Null Hypothesis (Ho)

The explanatory variables: undesired course, satisfaction, age and gender differences have no effect on the dependent variable (academic performance: CGPA).

Alternative Hypothesis (Ha)

The explanatory variables: Undesired courses, satisfaction, age and gender differences have effect on the dependent variable (academic performance: CGPA).

Decision rule: The null hypothesis will be rejected if the significant value is greater than the p-value at 5% level of significance.

Literature Review

On gender, Hedges and Navel (1999) unveiled that male students achieve a better performance than female students in science subjects, while in reading and writing, female students did extremely better than male. However, educational statistics have shown that female students were performing better than their male counterparts in various levels of the education system and achieving higher qualifications, Ali et'al, (2013). After analyzing more than a million graduating students, Woodfield and Earl-novell(2006) concluded that female students did much better than their male counterpart. The two researchers collectively attributed this partly to female students being more academically responsible and thus less likely to be absent from lecture. Concerning nationality and academic performance, several studies have shown that academic achievement differs across nationality.

Rienties et'al, (2012) discovered that learning styles play a minor role on students' academic performance, though, however small it influenced the learning outcomes; it is academically believed that the learning styles can help students enrich their own learning and thus encourage self-directed learning.Fielding (2000) showed that it is essential for educational institutions and students to understand learning styles. Students habitually have preferences for the ways by which they understand or learn a subject and therefore it is recommended for undergraduates to tailor these styles to suit their individual learning need. Cuthbert (2005) stated that, understanding the learning style of any student significantly allowed amendment in educators' instructional methods.

However, Yousef (2011) established that involvement in extracurricular activities improve students' academic performance. Many extracurricular activities have proven to be advantageous in enhancing the academic achievement of student, even if the activities are not related to any academic subjects. Students partaking in extracurricular activities perform better academically than students who did not partake in any of the activities.

Materials and Methods

This section described precisely the methodology that was used to reveal some statistical evidence about the study. The target population is stratified into four strata which comprises of 200level, 300level, 400level and 500level, a sample of 100 students of Federal University of Technology Minna was taken from each stratum and questionnaire was used to collect information on each student.

In the questionnaire, students were asked to indicate their gender, level, Cumulative Grade Point Average (CGPA). They were asked to specify whether they were given their desired course of interest at the time of admission and their level of satisfaction base on the given course of study. Additionally, they were asked to indicate their level, school (faculty), and department.

A total sample of 400 students was used and binary logistic regression model was fit to the data obtained with students' CGPA as the dependent variable. The dependent variable was categorised in to dichotomous values (0, 1). CGPA of 3.00 and above was represented as 1, while CGPA of 2.99 and below was represented as 0. Other variables (undesired course, age, sex, and level of satisfaction) were used as the explanatory variables to predict the performance of student through their CGPA. All the data collected from this survey was processed using Statistical Package for the Social Sciences (SPSS) software.

Satisfaction is an ordinal scale with five levels which are: highly dissatisfied, dissatisfied, moderate satisfied, satisfied and highly satisfied which served as a reference point. Sex and GUCarenominal categorical data which is categorised into male and female, yes and no respectively.Age is a ratio scale and is not categorical.

After the completion of each questionnaire by the respondents the resulting data was entered into a database for processing using SPSS. Descriptive statistics were used to make a description of the responded population.

Method of Statistical Analysis

Binary logistic regression is more appropriate when the dependent variables are either categorical or continuous variables, but when dependent variable is not dichotomous that is it comprised of more than two cases, we employed multinomial logistic regression.Logistic regression analysis is a statistical analysis that determines the influence of various factors on a dichotomous outcome by calculating the changes in the log odds of the dependent variable as opposed to the variable itself.

Suppose a binary variable y follows a Bernoulli distribution, that is, y takes either the value 1 or the value 0 with probabilities $\pi(x)$ or $1-\pi(x)$ respectively, where $x = (x_1, x_2 \ldots . x_p) \in R$ a vectorof p explanatory variables. In fact, π(x) represents the conditional probability $P(y/x) of y = 1$ given x based on the binary outcome variable, we use the logistic distribution. The specific form of logistic regression model with unknown parameters β_0, β_1,..., βp is given as,

$$\Pi(x) = \frac{\exp(\beta_0 x_0 + \beta_1 x_1 \ldots + \beta_p x_p)}{1+\exp(\beta_0 x_0 + \beta_1 x_1 \ldots + \beta_p x_p)} \quad (1)$$

At times, it is convenient to change the notation slightly writing $x_0 = 1$, thus the above model becomes, exp ($x^T\beta$),

$$\pi(x) = \frac{e^{x^T\beta}}{1 + e^{x^T\beta}} \quad (2)$$

Where $X = (x_0, x_1, \ldots, x_p)^T$ and

$$\beta = (\beta_0, \beta_1, \ldots, \beta_p)^T$$

A transformation of $\pi(x)$ is called the logit transformation and is given by

$$\text{Logit}\,\pi(x) = ln\frac{\pi(x)}{1-\pi(x)} \quad (3)$$

Under the above transformation, we can write the regression model as,

$$\text{Logit}\,\pi(x) = x^T\beta \quad (4)$$

This implies that $Logit(P) = b_0 + b_1X_1 + b_2X_2 + \cdots + b_kX_k$ (5)

Where P, is the probability of presence of the characteristic of interest and the logit transformation is defined as the logged odds.

$$\text{Odds} = \frac{p}{1-p} = \frac{\text{probability of presence of characteristic}}{\text{probability of absence of characteristic}}$$

$$\text{And} \quad \text{logit (P)} = Ln\left(\frac{p}{1-p}\right) \quad (6)$$

In logistic regression, log odds ratio provides a simplistic description of the probabilistic relationship of the variables and the outcome in comparison to a linear regression by which more information about the linear relationship can be drawn. Logistic regression is a special case of the generalized linear model and is comparable in certain respect to linear regression.

This implies that the relationship between the odds ratio and the independent dichotomous variable for the logistic regression coefficient is Odds ratio = $e^{\beta_i}; i = 1, 2, \ldots, p$

Results, Interpretation and Discussion

Table 1: Processing Summary Table

Case Processing Summary

		N	Percent
Unweighted Cases[a]			
Selected Cases	Included in Analysis	290	83.6
	Missing Cases	57	16.4
	Total	347	100.0
Unselected Cases		0	.0
Total		347	100.0

a. If weight is in effect, see classification table for the total number of cases.

Table 1 above provides us with the summary of the analysis. Thus there were 347 (100%) total cases for the analysis for which 290 (83.6%) cases are included in the analysis. However, 57 (16.4%) of the cases were missing due to the fact that some of the students did not indicate their CGPA and they were removed from the analysis.

Table 2: Classification Table

Classification Table[a]

			Predicted CGPA		
	Observed		Achieved CGPA of (2.99 - Below)	Achieved CGPA Of (3.00 - Above)	Percentage Correct
Step 1	CGPA	Achieved CGPA Of (2.99 - Below)	67	52	56.3
		Achieved CGPA Of (3.00 - Above)	17	154	90.1
	Overall Percentage				76.2

a. The cut value is .500

Table 2 above is the classification table; CGPA was classified into two classes which were CGPA of 2.99 and bellow as well as CGPA of 3.00 and above. It shows the overall predictions that were correctly classified by the model. There were 221 correctly classified predictions out of 290 times, for an overall success rate of 76.2% as can be seen in tale 2 above. It also allowed us to compute the values for sensitivity, specificity, false positive rate, and false negative rate for the full model and the subscript below the table states "the cut value is 0.500", this mean that if the estimated probability of an event occurring is greater than or equal to 0.500, Statistical Package for Social Sciences (SPSS) classified the event as occurring (achieved CGPA of 3.00 or above) otherwise it is classified as not occurring (achieved CGPA of 2.99 or below). The table gives an indication of how well the model is able to predict the correct category. Adding across the rows represents the number of cases in each category in the actual data and adding down the columns represents the number of cases in each category as classified by the full model. The model correctly classified 76.2% of overallsometimes referred to as the Percentage Accuracy in Classification (PAC). Hence, there is an improvement over 59.0% in the null model.

The sensitivitywhich measures the proportion of correctly classified event that is, the probability of making a correct prediction of an event given that, the event did occurs. Thus, the percentage of occurrences correctly predicted is 56.3%.

The specificity which measures the proportion of correctly classified nonevent that is the probability of making a correct prediction of a nonevent given that the event did not occur, i.e. the P (correct | event did not occur), the percentage of nonoccurrence correctly predicted is 90.1%.

The false positive which measures the proportion of observations misclassified as events over all of those classified as events. That is when an event is predicted to occur whereas it did not. The percentage of false positive is 20.99%.

The false negative that measures the proportion of observations misclassified as nonevents over all of those classified as nonevents. That ispredicting that an event did not occur when it did occur. The percentage of false negative is 25.24%.

Table 3: Categorical Variables Coding

Categorical Variables Codings						
			Parameter coding			
		Frequency	(1)	(2)	(3)	(4)
Satisfaction	Highly Satisfied	39	.000	.000	.000	.000
	Satisfied	97	1.000	.000	.000	.000
	Moderate	107	.000	1.000	.000	.000
	Dissatisfied	42	.000	.000	1.000	.000
	Highly Dissatisfied	5	.000	.000	.000	1.000
Sex	Female	120	.000			
	Male	170	1.000			
GUC	No	150	.000			
	Yes	140	1.000			

Categorical Variables Coding of Table 3 is a reference table that shows exactly how dummy variables were created by the SPSS.

Table 4: Variables in the Equation

Variables in the Equation							
		B	S.E.	Wald	Df	Sig.	Exp(B)
Step 1[a]	Highly Satisfied			39.321	4	.000	
	Satisfied	-.156	.497	.099	1	.753	.855
	Moderate Satisfied	-1.298	.473	7.532	1	.006	.273
	Dissatisfied	-3.249	.652	24.831	1	.000	.039
	Highly Dissatisfied	-1.645	1.014	2.629	1	.105	.193
	GUC(1)	-.578	.287	4.058	1	.044	.561
	SEX(1)	.533	.287	3.448	1	.063	1.704
	AGE	-.030	.053	.321	1	.571	.970
	Constant	2.079	1.296	2.574	1	.109	7.996

a. Variable(s) entered on step 1: SATISFACTION, GUC, SEX, AGE.

Table 3 provides detail information about the contributions and significance of each of the explanatory variables. It shows the logistic coefficient (B), Wald test and odds ratio for each predictor variable. The logistic coefficient is the expected amount of change in the logit for each one unit change in the predictor variable. The logit is what is being predicted, it is the odds of membership in the category of the outcome variable with the numerically higher value (here 1 rather than 0) the closer a logistic coefficient is to zero, the less influence it has in the predicting the logit. The variables that contribute significantly to the predictive ability of the model are Giving Undesired Course (GUC) and SATISFACTION.

The model fit for the data is:

$$CGPA = -0.578GUC - 1.298moderatesatisfied - 3.249dissatisfied \quad (7)$$

$$CGPA = e^{0.561GUC + 0.273moderatesatisfied + 0.039dissatisfied} \quad (8)$$

Equations (7) and (8) are the same. From the analysis, two levels of satisfaction (moderate satisfied and dissatisfied) and GUC were the explanatory variables were significant with significance values 0.044, 0.006 and 0.000;the contributions of these factors to the model are 4.058, 7.532 and 24.831; the standard error of the estimates are 0.287, 0.473 and 0.652

respectively. The intercept, age and sex with significance values 0.109, 0.571 and 0,063 were removed from the equations (7) and (8) because they were not significant.In addition, the probability of achieving a CGPA of 3.00 or above for students that are satisfied with the course of study is lower compare to students that are highly satisfied with the course of study. The odds ratio for satisfied is 0.855 and this implies that, students that are satisfied with the course of study are 15% times less likely to achieve a CGPA of 3.00 or above than those that are highly satisfied with the course of study holding other independent variable fixed.

For the second dummy variable moderate satisfied ,the negative sign in its coefficient mean that the odds of achieving a CGPA of 3.00 or above is going to be lower for students that are moderately satisfied with the course of study compare to those that are highly satisfied with the course of study. This implies that the probability of students to achieve a CGPA of 3.00 or above given that they are moderately satisfied with the course of study is lower compare to those that are highly satisfied.The odds ratio is 0.273 and this shows that, students that are moderately satisfied with the course of study are 73% times less likely to achieve a CGPA of 3.00 or above than those that are highly satisfied with the course of study holding other independent variable fixed.

For the third dummy variable dissatisfiedthe negative sign in its coefficient indicate that the odds of achieving a CGPA of 3.00 or above is going to be lower for students that are dissatisfied with the course of study compare to those that are highly satisfied. This implies that the probability of students to achieve a CGPA of 3.00 or above given that they are dissatisfied with the course of study is lower compare to those that are highly satisfied.

The odds ratio for dissatisfied is 0.039 and this means that the odds of achieving a CGPA of 3.00 or above for students that are dissatisfied with the course of study is 96% times lower than the odds of students that are highly satisfied with the course of study holding other independent variables fixed.

On GUC, This implies that the probability of students to achieve a CGPA of 3.00 or above given that they are given an undesired course of study is lower compare to those that are given a desired course of study.The odds ratio for GUC is 0.561 and this implies that, when holding all other variables constant, students that are given an undesired course of study are 44% times less likely to achieve a CGPA of 3.00 or above than those that are given a desired course of study.

For sex, therefore this predictor variable is not statistically significant. The positive sign in its coefficient implies that the odds of achieving a CGPA of 3.00 or above are higher for male students than female students. In other word, the probability achieving a CGPA of 3.00 or above for male students is higher compare to female students.The odds ratio for SEX is 1.704 and this implies male students are 70% times more likely to achieve a CGPA of 3.00 or above than female students.

On age, thus it is not statistically significant. The negative coefficient means those students that are of young age are more likely to achieve a CGPA of 3.00 or above compare to those that are of old age.The odds ratio for AGE is .970 and this implies when holding all other variables constant, students of young age are 3% times more likely to achieve a CGPA of 3.00 or above than those of old age.

Conclusion

The outcome this study revealed that given student a desired course of his interest improved

their cumulative grade point average (CGPA) significantly whereas students that were given an undesired course to study find it difficult to achieve a cumulative grade point average (CGPA) of 3.00 or above. We also observed this result that students that were satisfied with the course of study are more likely to achieved a CGPA of 3.00 or above, where those that highly dissatisfied are more likely to achieve a cumulative grade point (CGPA) of 2.99 or below. We also have from the result that students that were of young age have a high probability of achieving a CGPA of 3.00 or above in comparison to students that of old age.

However, research statistically revealed that both age, sex are not a good predictor of students' academic performance base on this research work.These results also revealed that students of young age are more likely to achieve a better academic performance than their old students' counterpart.

The factors investigated in this study were not exhaustive; there are numerous additional factors that affect academic achievement of students. However, it can be concluded from this study that given students undesired course of study significantly affect his/her academic achievement. And also, it is of prominence to conclude that lack of satisfaction on the course of study greatly affected the performance of student.

Recommendations

The following recommendations will be useful solutions to the identified factors and other factor as they affect students' academic achievement in Nigeria:

(i) The Nigerian University Commission (NUC), tertiary institutions, and other centre of learning in Nigeria, if not stop should reduce the rate at which students are be given an undesired course to study so that student academic performance can be improved.

(ii) Government and policy makers should ensure that students across Nigeria are given their desired course and provided with appropriate and adequate tools to achieve their aim, so that Nigeria will have a better future leader.

(iii) Parents should exempt from deviating their children from their desires course for their own interest. And various center of learning should ensure that necessary orientation is given to student after admission.

(iv) Tertiary institution should provide those students who are achieving at lower levels with educational support and educational resources in order to bridge the achievement gap.

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