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**SCHOOL OF PHYSICAL SCIENCES
1ST BIENNIAL INTERNATIONAL CONFERENCE**

PROCEEDINGS

Theme:

**Science Technology and Innovation (STI):
The Vision for Poverty Reduction and Sustainable
Development**

**FEDERAL UNIVERSITY OF TECHNOLOGY
MINNA, NIGER STATE, NIGERIA**

PREFACE

This is the first international Conference organized by the school of Physical Sciences of the Federal University of Technology, Minna Nigeria the school is relatively new and consisting of the Departments of Physics, Chemistry, Mathematics, Statistics, Geology and Geography. It was exercised from the former school of Natural and Applied Sciences on the 6th of November 2014.

The school of Physical Sciences 1st Biennial International Conference is an interdisciplinary forum for the presentation of new ideas, recent developments and research findings in the field of Science and Technology. The Conference provides a platform to scholars, researchers in the academics and other establishments to meet, share and discuss how science and technology can help reduce poverty and bring about sustainable development. Submissions were received both nationally and internationally and severally reviewed by our international program committee. All contributions are neither published elsewhere nor submitted for publication as asserted by contributor.

We wish to express our gratitude to the school for challenging us to organize the first international conference. Special thanks to the Dean of the School Prof. A. S. Abubakar. Special thanks to all members of the organizing committee and sub-committee for their dedication, determination and sacrifice towards achieving a fruitful and successful conference.

The Local Organizing Committee Chairman
Kasim Uthman Isah (PhD).

Thematic

Science Technology and Innovation (STI): The Vision for Poverty Reduction and Sustainable Development

Sub-Themes

- Scientific Research, Innovation and Entrepreneurship for Sustainable Development
- Scientific Research and Technological Development as tool for Poverty Reduction
- Scientific Research for Renewable Energy in Sustainable Energy Development
- Material Science, Nanoscience and Emerging Technologies in Sustainable Development
- Gender Issues in Quality Scientific Research Innovation and Sustainable Development

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ANALYSIS OF EFFECTS OF UNDESIRE COURSE OF STUDY ON STUDENTS' ACADEMIC ACHIEVEMENT IN NIGERIA, USING BINARY LOGISTIC REGRESSION APPROACH

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Abstract

The obvious important of knowledge creation to development has long place University at the Centre of the effort of Governments to increase the rate at which their economies grow. Education been the best legacy any nation can give her citizens especially the youth, the development of any nation depend largely on the quality of education of such nation. Therefore, Students' academic achievement plays a significant role in producing the pre-eminent quality graduates who will become great leader and manpower of the country and hence responsible for the country's economic and social development. This research work was conducted to examine the effects of undesired course of study on students' academic performance in tertiary institution in Nigeria. The main method of data collection was through questionnaire which was administered to 400 students in Federal University of Technology, Minna Nigeria. The specific objectives of the study were to determine the effects of undesired course of study on students' academic performance, and to examine if factors such as gender, age, satisfaction with the course of study affect students' academic performance. The student cumulative grade point average (CGPA) was used as a measure of academic performance. The data were analyzed quantitatively using binary logistic regression approach and the results revealed that factors such as satisfaction with course of study and undesired course of study affected students academic performance. However factors like age and gender difference did not significantly affect students' academic performance.

Keywords: academic, performance, undesired, questionnaire, binary logistic regression, cumulative grade point average (CGPA)

1. Introduction

All centres of learning such as schools, colleges and universities are worthless without students; this is because students are the most indispensable asset of any institution. 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.

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.

According to Ali and et.al (2009) students' academic achievement plays a significant role in producing the pre-eminent quality graduates who will become great leader and manpower of the country and hence responsible for the country's economic and social development: Ali and et.al (2009).

According to Cambridge University Reporter (2013) success has a great influence on a student's self-confidence, enthusiasm, and perseverance in higher education. High rate of academic failure may have results due to lack of satisfaction with the course of study, levels of attrition, and increased cost of education. And this might reduce admission opportunities for students seeking higher degrees or further study.

Academic achievement of students has being an interested topic for educators and researchers. They have been fascinated in identifying and understanding the factors that contribute to students' academic excellence as well as that of its failure. Student academic performance measurement has considerably received attention in previous studies. Various researchers have researched on issues including gender and age difference, lecturers'

or teachers' level of education and their teaching styles, class environment, social economic factors, and educational back-ground of the parents etc. and their discoveries from this studies varies from region to region and their results differs in cities and rural areas.

However, students enrolled 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 given such students their desired course of study?

This research is to ascertain the effect or non-effect of undesired course of study on students' academic performance and make recommendations to the policy maker on 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) and students CGPA being an important contributing factor in the future of any student's career. 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. Making assumption that, students who are given a desired course of study will achieve a CGPA of 3.00 and above, and have a higher level of concentration.

This research work aim to contribute to the prevalent knowledge by statistically documenting the effect of undesired course of study on students' academic success or failure in tertiary institution in Nigeria, using FUT Minna as a case studied.

Null Hypothesis (H₀)

There is no significant relationship between the explanatory variables (undesired course, level of satisfaction, age and gender differences) and the dependent variable (academic performance).

Alternative Hypothesis (H_a)

There is a significant relationship between the explanatory variables (undesired course, level of satisfaction, age and gender differences) and the dependent variable (academic performance).

Decision rule:

The null hypothesis will be rejected if the sig-value is less than Alpha (α) at 5% level of significance.

2. Literature Review

Educational achievements of youths require urgent attentions to achieve their goals. Various researches have been made to determine factors that contribute to the educational success of students. Customarily, in any research a researcher always takes the advantages of the information and knowledge that had been accumulated in the past as a result of constant investigation endeavour by mankind.

Previous researches studies have identified several factors that affect students' academic performance in various educational centres. Some of these factors include gender, class attendance, class size, age, entry qualifications, learning style or preferences, family educational background and income etc.

Researchers such as Borde (1998), Hedges and Newell (1999) and Woolfield and et al (2006); considered the rate of gender to academic performance. Borde (1998) in his own work stated that gender play a significant role in students' performance. However, he noted that gender difference of student varies from one setting to another. There are setting where female student outperformed their male counter-part and some other setting where the male performed better than the female. This suggests the need for every research considering gender be performed uniquely to the desired settings. Hedges and Navel (1999) further unveiled the settings where male is expected to perform better than female and vis-visa. Hedge and Navel (1999) concluded that male performed better than female in science subjects and while female performed better in reading and writing just as Aggrawal (1993) has discovered years earlier.

Several studies have shown that academic achievement differs across nationality. Yousef (2011) makes an investigation on academic performance of foreign students. The result of this study revealed that foreign students performed better than local students in business studies.

Gareth and et al (2013) statistically predicted the causes of poor academic performance of school students in a research he conducted on a sample of 200 high school students' of Zimbabwe. Data were gathered through interview he carries out with students. The outcomes of the study revealed that there is dissimilarity in

academic achievement of female and male students with male students performing better while educational background of parents had a significant effect on academic achievement of students.

Bahago (2011) conducted a research on the influence of educational motivation and demographic characteristics on academic performance of nomadic Fulani girls in Adamawa state, Nigeria. The data for the research was collected from a sample of 300 girls randomly selected from polytechnics by administering active-motivation rating scale and nomadic girls' achievement test. The outcome of the research showed that educational levels of parents significantly influence students' academic performance.

3. Methodology

This section described precisely the methodology that was used to reveal some statistical evidence about the effects of undesired course of study on students' academic performance.

3.1 Data Collection

The data for this research work was collected randomly using questionnaire from students of Federal University of Technology Minna, Nigeria. Total samples of 400 questionnaires were distributed and 347 were analysed due to some non-respondents.

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

The data obtained from respondents were analysed using binary logistic regression analysis. Students' academic performance was measured using their Cumulative Grade Point Average (CGPA) and were identified as the dependent variable and were categorised into 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 variable to predict the performance of students. All the data collected from this survey was processed using SPSS software (Statistical Package for the Social Sciences).

After the completion of each questionnaire by the respondents, we (researcher) reviewed them so as to ensure that there are no missing items. The resulting data was entered into a database for processing using SPSS. Descriptive statistics were used to make a description of the responded population.

3.2 Method of Statistical Analysis

The method of analysis used in this research work is binary logistic regression analysis. Binary logistic regression is more appropriate since the dependent variables are either categorical or continuous variables. 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 as opposed to the variable itself. In logistic regression, log odds ratio provides a basic 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. However, the assumption of logistic regression model is quite different from ordinary linear regression model in that the logistic regression takes on a linear relationship between the logit of the outcome variables and the predictor variables. However, it does not assume a linear relationship between the actual outcome and the predictor variable. Secondly, the sample is 'large'-reliability of estimate declines when there are only a few cases, noting that the predictor variables are not linear functions of each other and the usual normal distribution is not necessary or assumed for the outcome variable. Lastly, each and every levels of the independent variable are not necessarily homoscedasticity, as the explanatory variables need not to be interval level.

3.3 The Logistic Regression Model

The aim of a logistic regression is to find the most suitable fitting model to describe the relationship between the dichotomous characteristics of interest (dependent variable or outcome variable) and a set of independent (predictor or explanatory) variables.

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 $x = (x_0, x_1, \dots, x_p) \in R$ is a vector of p explanatory variables. This means, $\pi(x)$ represents the conditional probability $p(y/x)$ of $y = 1$ given x . Based on the binary outcome variable, we use the logistic distribution and specific form of logistic regression model with unknown parameters $\beta_0, \beta_1, \dots, \beta_p$ is given as,

$$\pi(x) = \frac{\exp(\beta_0 + \beta_1 x_1 + \dots + \beta_p x_p)}{1 + \exp(\beta_0 + \beta_1 x_1 + \dots + \beta_p x_p)} \quad \text{equation (1)}$$

At times, it is convenient to change the notation slightly writing $x_0 = 1$, thus the above model becomes,

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

Where $(x_0, x_1, \dots, x_p)^T$ and $\beta = (\beta_0, \beta_1, \dots, \beta_p)^T$

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

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

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

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

$$\text{This implies that } \text{Logit } p = b_0 + b_1 x_1 + \dots + b_k x_k \quad \text{equation (5)}$$

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

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

$$\text{And } \text{Logit } (p) = \ln\left(\frac{p}{1-p}\right) \quad \text{equation (6)}$$

3.4 Wald Test

Wald test is a statistic that examines the contributions of each of the predictors in a given model. The Wald statistic is comparable to the T-test in linear regression, which assesses the significance of the coefficients. Wald test is defined as the ratio of the square of the regression coefficient to the square of the standard error of the coefficient and it is asymptotically distributed as a chi-square distribution. It tests the following hypotheses:

H_0 : The regression coefficients are zero

H_1 : The regression coefficients are not zero

The Wald statistic is given as; $W = \frac{\beta}{SE(\beta)}$

3.5 Odds and Odds Ratio

The odds ratio is a measure of relationship which expresses the association between an exposure and outcome from a comparative study. In other words, the odds ratio is one of a range of statistics used to assess the risk of a particular outcome, if a certain factor (or exposure) is present. It is a relative measure of risk, telling us how much likely it is that someone who is exposed to the factor under study will develop the outcome as compared to someone who is not exposed. While, the term "Odds" are method of presenting chances. That is, the odds of an event happening is the probability that the event will happen divided by the probability that the event will not happen.

Odds ratio is used because it does adequately provide an estimate (with confidence interval) for the relationship between the two dichotomous variables also enable us to thoroughly determine the influences of other variables on the relation, using logistic regression and their interpretation is special and convenient. Therefore, it is essential to introduce the term odds and odds ratio to discourse binary data and to interpret the logistic regression coefficients. For a probability π of success, the odds are defined to be;

$$\text{Odds} = \frac{\pi}{1-\pi}$$

The odds are nonnegative and odds > 1.0 when a success is more likely than a failure.

In a 2×2 table, the probability of success is π_1 in row 1 and π_2 in row 2. Within row 1, the odds of success and defined to be,

$$Odds_1 = \frac{\pi_1}{1-\pi_1}$$

And within row 2, the odds of success are defined to be,

$$Odds_2 = \frac{\pi_2}{1-\pi_2}$$

The ratio of the odds from the two rows is called the odds ratio, which is given by, $Odds\ Ratio = \frac{\frac{\pi_1}{1-\pi_1}}{\frac{\pi_2}{1-\pi_2}}$

4. Results and Discussion

Table 4.1: Case processing summary table

Case Processing Summary			
		<u>N</u>	<u>Percent</u>
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 4.1 provides us with the summary of the analysis. Thus there are 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 which result due to the fact that some of the students were not having cumulative grade point average (CGPA)

Table 4.2: Variables in the Equation

		Variables in the Equation					
		<u>B</u>	<u>S.E.</u>	<u>Wald</u>	<u>Df</u>	<u>Sig.</u>	<u>Exp(B)</u>
Step 1 ^a	SATISFACTION			39.321	4	.000	
	SATISFACTION(1)	-.156	.497	.099	1	.753	.855
	SATISFACTION(2)	-1.298	.473	7.532	1	.006	.273
	SATISFACTION(3)	-3.249	.652	24.831	1	.000	.039
	SATISFACTION(4)	-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 4.2 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 GUC and SATISFACTION. The following are the interpretation of the respective predictor variables.

4.1 Satisfaction

Satisfaction is a significant predictor of academic performance with sig (p-value) equal 0.000, which is less than 0.05, looking at individual's contributions of the dummy variable. For the first dummy variable SATISFACTION(1) which stand for satisfaction and the negative sign in its coefficient means that, the odds of achieving a CGPA of 3.00 or above is lower for students that are satisfied with the course of study compare to those that are highly satisfied. This implies that, 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 SATISFACTION (1) is 0.855 and this implies that, students that are satisfied with the course of study are 0.855 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 variables fixed. In percentage, the odds of achieving a CGPA of 3.00 or above is $14.5\% = \{(0.855-1)*100\}$ lower for students that are satisfied with the course of study compare to those that are highly satisfied with the course of study.

For the second dummy variable SATISFACTION(2) which stand for moderately satisfied and 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 0.273 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 variables fixed. In percentage, the odds of achieving a CGPA of 3.00 or above is $72.7\% = \{(0.273-1)*100\}$ lower for students that are moderately satisfied with the course of study than those that are highly satisfied holding other independent variable fixed.

For the third dummy variable SATISFACTION(3) which stand for dissatisfied and the 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 SATISFACTION (3) 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 0.039 times lower than the odds of students that are highly satisfied with the course of study holding other independent variable fixed. In percentage, the odds of achieving a CGPA of 3.00 or above is $96.1\% = \{(0.039-1)*100\}$ lower for students that are dissatisfied with the course of study than those that are highly satisfied, holding other independent variables fixed.

For the fourth dummy variable SATISFACTION(4) which stand for highly dissatisfied, the negative sign in its coefficient those that the odds of achieving a CGPA of 3.00 or above is going to be lower for students that are highly 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 highly dissatisfied with the course of study is lower compare to those that are highly satisfied with the course of study. The odds ratio for SATISFACTION (4) is 0.193 and this implies that, students that are highly dissatisfied with the course of study are 0.193 times less likely to achieve a CGPA of 3.00 or above than those that are highly satisfied, holding other independent variables fixed. In percentage, the odds of achieving a CGPA of 3.00 or above is $77.6\% = \{(0.193-1)*100\}$ lower for students that are highly dissatisfied with the course of study than those that are highly satisfied with the course of study holding other independent variables fixed.

4.2 Given Undesired Course of Study GUC

Since the sig (p-value) is 0.044, which is less than 0.05, therefore this predictor variable (GUC) is statistically significant and the negative sign in its coefficient means that, the odds of achieving a CGPA of 3.00 or above is going to be lower for students that are given an undesired course of study (GUC) than those that are not.

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 0.561 times less likely to achieve a CGPA of 3.00 or above than those that are given a desired course of study. In percentage, the odds of achieving a CGPA of 3.00 or above is $43.9\% = \{(0.561-1)*100\}$ lower for students that are given an undesired course of than those that are given a desired course of study holding other independent variables fixed.

4.3 Sex

Since the sig (p-value) is 0.063 which is greater than 0.05, therefore this predictor variable (SEX) 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 1.704 times more likely to achieve a CGPA of 3.00 or above than female students. In percentage, the odds of achieving a CGPA of 3.00 or above is $70.4\% = \{(1.704-1)*100\}$ higher for male students than female students holding other independent variables fixed.

4.4 Age

Since the sig (p-value) is 0.571, which is greater than 0.05, 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 0.970 times more likely to achieve a CGPA of 3.00 or above than those of old age.

In percentage, the odds of achieving a CGPA of 3.00 or above is $3.0\% = \{(0.970-1)*100\}$ higher for younger age students than those that are of old age, holding other independent variable fixed.

4.5 Discussions

The outcome of this research work revealed that given students a desired course of his interest improved its cumulative grade point average (CGPA) significantly; also 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 that students that were highly satisfied with their course of study are more likely to achieve 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 discovered from our findings that students that are 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.

5.0 Conclusion

It appeared that many 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.

The factors investigated in this research work 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.

5.1 Recommendations

The following are the recommendations I think may be of useful solution to the identified factors and other factor as they affect students' academic achievement in Nigeria.

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 been given an undesired course to study so that student academic performance can be improve and the economy of the country.

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.

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.

More research is suggested to explore other variables that influence students' academic achievement.

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