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Research Article

STATISTICAL ANALYSIS OF STUDENTS' ACADEMIC PERFORMANCE IN NIGERIA UNIVERSITIES: A CASE STUDY OF THE UNIVERSITY OF IBADAN, NIGERIA

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ABSTRACT

This paper is a study of students' academic performance in the University of Ibadan. It was discovered that certain number of students who were admitted into the University, for the attainment of a degree, were unable to meet the requirements to be able to graduate on time. A situation where some students have to study longer than the four- year term is undesirable and should be checked. It is this kind of unwanted situation that prompted this project, which seeks for the factors that may be associated with the students' performance, and also looks into the ways and means by which the performance on. As observed from the tests carried out not all the factors have significant effects on the academic performance of the students of the University. Recommendations are therefore put forward to help enhance the academic performance of students in our higher institutions of learning.

INTRODUCTION

Education is generally regarded as a necessary and essential requirement for human development. It is central to socio-economic and technological advancements, and it is critical to self-generating process of positive transformation of modern society. Education is partially about primary socialization, partly about the process of imparting knowledge for progress and development, both of the individual and group levels. Education is not just about literacy and enlightenment. It is about the value formation, value generation and orientation.

Thus, education is a complete process of setting the context for societal self-definition and reproduction. Progress in the Nigerian education has been slow but steady since the colonial era until the end of World War II. As at 1947, Secondary School enrolments were estimated at 10,000 but rose to 36,000 in 1957; 90 percent of these, however were in the South. Such growth was impossible without encountering a lot of problems, several of which were severe as to endanger the entire educational system. Education is the root for advancement and therefore, society without education is not an ideal society because it will never develop. Since education entails learning, an educated person continues to learn new things, and acquire new techniques and methods of human development. Education also involves methods used in developing the body physically, mentally and morally.

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Learning in Nigeria

Nigeria has indigenous form of education, Qu'ranic Schools and the Western educational institutions. The indigenous forms of education include participation in community life to train young people in farming and other occupations. Qu'ranic education is carried out in religious schools called Mediassah. Children learn sections of the Qur'an (the Holy Book of Islam) from the local Alfas or Islamic teachers. Qu'ranic education also includes learning to read and write in Arabic. Although some students go on to specialize in Arabic studies, most children who participate in Qu'ranic education proceed to the Western schools. Nigeria was one of the African countries under the British colonial masters.However in the 19th century, the missionaries came to Nigeria and introduced the Western education which marked the birth of formal education in the country. The major interest of the missionaries was to spread Christianity by the establishment of churches and schools. The sole idea that midwived the establishment of schools was to make as many people as possible literate, so as to enable them read and improve their level of understanding of the Bible which would assist them in the propagation and proclamation

of Christianity. Universal Primary Education (UPE) was introduced in the seventies and education was made compulsory for all the children between the ages of 6 and 15; while both the primary and secondary education were supposed to last six years each. The language of instruction was either English or one of the local languages. Teaching at the secondary and post secondary levels is always in English. About 76% of the Nigerian children attend the primary school, while only 23% attend the secondary.

Education System in Nigeria

The education system in Nigeria requires six years of primary education, a two-tier (three years junior, three years senior) secondary education i.e. junior secondary school and senior secondary school, and four years of tertiary education. This was founded in 1982. At the completion of secondary school education, students sit for the Senior Secondary School Certificate Examination, and if successful, depending on his/her interest and performance or aptitude, has the option of proceeding to Colleges of Education, Technical Colleges, Polytechnics and Universities for further studies. Nigeria has a literacy level of about 60%. To improve the situation further, the present administration introduced the Universal Basic Education (UBE) scheme retaining the primary education at six years but making it compulsory and free for all. Admission into secondary school is based on a common entrance examination.

The junior school certificate is awarded after the first three years. When the student sits and passes the senior secondary examination, at the expiration of the second three years, they are awarded the certificate. The certificates in the junior and senior schools are awarded based on an examination conducted by the West African Examination Council (WAEC). Vocational education produces middle level manpower and it is offered in Technical Colleges or Businesses and Engineering Skill Training Centres. Technical Colleges are the only alternatives to senior secondary schools, as a route to further formal education and training after the junior secondary education. To gain admission into the University, students have to pass the University Matriculation Examination (UME).

Growth of Education in Nigeria

Progress in Nigerian education was slow but steady throughout the colonial era until the end of World War II. By 1950 the country had developed a three-tier system of primary, secondary and higher education based on the British model of wide participation at the bottom, sorting into academic and vocational training at the secondary level, and higher education for small elite destined for leadership. In the North, primary school enrolment rose from 66,000 in 1947 to 206,000 in 1951. In the West (mostly Yoruba areas) enrolment roses from 240,000 to 983,000 in the same period, and in the East from 320,000 to 1,209,000. Secondary level enrolment rose from 10,000 for the country as a whole in 1947 to 36,000 in 1951. In 1957, 90% of these however were in the South. Given the central importance of formal education, it soon became "the largest social programme of all governments of the federation," absorbing as much as 40% of the budgets of some state governments.

Crises of Education in Nigeria

Growth in Nigeria was impossible without incurring a lot of problems, several of which were so severe as to endanger the entire system of education. As long as the country was growing apace in terms of jobs for the educational minority through investment in expanding government agencies and services and the private sector, the growing number of graduates could be absorbed. But the criteria for access to schools and universities led to widespread corruption and cheating among students at all levels, but especially secondary and post secondary. Economic hardship among teaching staffs produced increased engagement in non-academic activities. Added to these difficulties were such factors as lack of books and materials, no incentive for materials, and the negligence of replacement of laboratory equipment.

In this paper, we would like to investigate if:

(i) A student's sex had any effect on their academic performance towards getting a degree.
(ii) A student's age could affect their attaining a high level of academic performance.
(iii) There is a relationship between the population of students and their performance.

At the end of our investigation we will be in a position to make adequate suggestions and recommendations to appropriate bodies concerning the criteria to apply in the future for admission of candidates to the university.

Scope and Coverage

The study covers the performance of students in the Faculty of arts, University of Ibadan, Oyo State, Nigeria between 1996/1997 and 2001/2002 sessions. The work mainly applies the basic statistical methods which include chi-square test, test of hypothesis and ANOVA.

Literature Review

For the success of this work, it is necessary that we understand what the term study is all about. Many students simply define study as reading a book or note over and over again. In looking at the word studying, it is more than merely reading a book or note repeatedly. Also, study is an important aspect of the formal learning process of human being towards achieving good performance. Study behaviour is a complicated process determined by a lot of factors such as personal, cultural, attitudinal, situational, sociogenetic, metabolic cognitive, affective and opportunity factors. Some researchers have attempted to define study behaviour as a systematic behaviour pattern framed and specifically directed at learning to pass examination and get better grades. It requires absolute concentration and attention, vigorous energy and persistence before success is achieved. These researchers are, English (1958), Armstrong (1967), Lyle Tussing (1963), and Robinson (1970). Armstrong (1967) further stressed and cautioned that study is "HARD WORK" and that "before the gates of academic excellence, the higher gods have placed sweat", this means that it requires the investments of absolute concentration and attention, vigorous energy and persistence.

According to a researcher, study includes doing something about academic assignment, setting a goal, concentrating on learning, absorbing the facts, coding and reorganizing the fact in the thought system so that one can recall the relevant facts as answer to question in important examinations. In fact, the whole process of study is psychological; it affects the students thinking, feeling, personality, social interaction, physical activities and even health.

It was also found out that:

(1) Subjects whose study modify students' habits change their beliefs and feelings are academically tasking and difficult.
(2) Students' level of academic performance significantly improved over time

Having critically examined the word "study," then what is the perception or attitude of students towards study? This leads us to the meaning and effect of this perception towards study.
Attitude or perception, as defined by a researcher, is a mental or neural state of readiness, organized through experience exerting a directive or dynamic influence upon the individual response to all subjects and situations with which it is related.
In 1996, a researcher defines attitude as a kind of mental state, representing a predisposition to form an opinion. Attitude is one of the determining factors that aid the development of interest which guides action and the type of attitudes that students have developed towards learning has been directed to a great extent by their academic performance. Thomas (1977) observed that students who have positive attitude perception of a subject teacher perform better than those that have negative perception attitude to their subject. There are also some attitudes which can affect students learning, which have implication on their performance. These attitudes include students' expectations, self-concept, cultural difference and motivation.

Therefore, we could all see that there is a relationship between study and attitude, that is students attitude towards study has a lot to do with their academic performance. According to Hanson (1975), facility is anything used to meet or used in fulfilling an obligation or purpose. The facility includes building, staff, equipment, idea material, and so on. In order words, an educational facility is anything used to meet an educational need. According to National Educational Research Council (1977), in one of the studies observed that the poor teaching and learning mostly result from unavailability of learning facilities in most schools. The body also stated that effective organization of learning facilities brings about effective learning. Once the learner is able to perceive relationship between one element and another in a learning situation that learning is enhanced through good performance of the student. The presentation of learning materials– the use of graphs, charts, pictures and other audio-visual aids, bring about meaningful learning. They conclude that teaching aids are meant to improve and supplement, and not to replace teaching and learning processes.

MATERIALS AND METHODS

The following are the basic materials or analytical tools used for this research work which enable us achieve the aims and objectives identified earlier.

Chi-square Distribution

This test is used compare the observed frequencies with those we might expect from a given theoretical explanation of the phenomenon under investigation. That is, to determine how well the theoretical distributions (Normal, Binomial, Poisson, etc) fit empirical distributions.

A measure of this discrepancy is given by the X^2 (chi-square) statistics defined as: $X^2 = \sum_{1=i} \frac{(0_i - e_i)^2}{e_i}$

Analysis of Variance (ANOVA)

The technique, known as analysis of variance, employs test based on variance-ratios to determine whether or not significant differences do exist among the means of several group of observations, where each group follows a normal distribution. Analysis of variance is particularly useful when the basic differences between the groups cannot be stated quantitatively. As the number of independent variables increases, the calculations become much more complex and are best carried out on a computer. The term independent variable is what is also referred to as factor or treatment.

One-way Analysis of Variance

One-way analysis of variance is used when we wish to test the equality of k population means. The procedure is based on the assumption that each of the k groups of observations is a random sample from a normal distribution and that the population variance is constant among the groups. The statistical model for one-way classification of analysis of variance is

$$X_{ij} = \mu + y_i + e_{ij}, \qquad i = 1, 2, ..., k$$

Where

$X_{ij} = ij^{th}\ observation$
$\mu = overall\ mean$
$y = i^{th}\ treatment\ effect$
$e_{ij} = random\ error$

ANOVA Table

Sum of Squares	Degrees of freedom	Mean Squares	F
Bssk – 1	$Bms = \frac{Bss}{k-1}$		$\frac{Bms}{kms}$
Wss k (n–1)	$Wms = \frac{Wss}{k(n-1)}$		
Tss kn –1			

RESULTS

Table 1. Performances of 1996/1997 session Graduates in a Faculty

Class of degree	Sex		Total
	Male	Female	
1	1	–	1
2.1	33	43	76
2.2	191	87	278
3	12	3	15
P	2	1	3
Total	239	134	373

Table 2. Performances of 1997/1998 session Graduates in a Faculty

Class of degree	Sex		Total
	Male	Female	
1	–	–	–
2.1	17	10	27
2.2	170	91	261
3	12	5	17
P	4	1	5
Total	203	107	310

Table 3. Performances of 1998/1999 session Graduates in a Faculty

Class of degree	Sex		Total
	Male	Female	
1	1	–	1
2.1	51	18	69
2.2	144	44	188
3	5	2	7
P	7	–	7
Total	208	64	272

Table 4. Performances of 1999/2000 session Graduates in a Faculty

Class of degree	Sex		Total
	Male	Female	
1	1	–	1
2.1	37	15	52
2.2	102	82	184
3	5	2	8
P	7	—	3
Total	203	107	310

Table 5. Performances of 2001/2002 session Graduates in a Faculty

Class of degree	Sex		Total
	Male	Female	
1	1	–	1
2.1	28	18	46
2.2	212	161	373
3	28	26	54
P	2	2	4
Total	271	207	478

Where

1 = First Class Honour
2.1 = Second Class Upper Division
2.2 = Second Class Lower Division
3 = Third Class
P = Pass

Table 6. Overall Performance of 1996/1997-2001/2002 Graduates

Class of degree	Sex		Total
	Male	Female	
1	4	—	4
2.1	166	104	290
2.2	819	465	1234
3	63	39	101
P	16	4	22
Total	1070	611	1681

Classification by Class of Degree and Sex using the Chi-square Distribution

Table 7. Observed Frequencies (O_{ij}) of Students Classified by Degree and Sex

Class of degree	Sex		Total
	Male	Female	
1	4	—	4
2.1	166	104	270
2.2	819	465	1284
3	63	38	101
P	18	4	22
Total	1070	611	1681

Hypothesis Testing

H_0: Academic performance of students and their sex are independent
H_1: Academic performance of students and their sex are related.

X^2 = Computation

$$X^2 = \sum \frac{(o_{ij} - e_{ij})}{e_{ij}} =$$

Degrees of freedom = (r -1) (c –1)

Table 8. Expected Frequencies (e_{ij}) of Students Classified by Degree and Sex

Class of degree	Male	Female
1	2.546	1.456
2.1	171.862	98.138
2.2	817.299	466.700
3	84.289	36.711
P	14.004	7.996

$$\therefore \chi^2_{cal} = 6.047$$

Degrees of freedom = (r–1) (c –1)
= (5– 1) (2–1)
= (4) (1)

$$\chi^2_{tab} = X^2_{4.1} = 9.49$$

Decision

Since 6.047 < 9.49 i.e. $X^2 < X^2$ tab, we do not reject the null hypothesis. Therefore, the academic performance of students and their sex are not related i.e. they are significantly independent.

Classification of Class of Degree and Age using the Chi-square Distribution

Table 9. Observed Frequencies (O_{ij}) of Students Classified by Degree and Age

Class of degree	Age		Total
	16-22 yrs	23 and above	
1	4	–	4
2.1	181	89	270
2.2	404	580	1,284
3	50	51	101
P	10	12	22
Total	949	732	1681

Hypothesis Testing

H_0: Age of students and their academic performance are independent
H_1: Age of students and their academic performance are not independent.

$$X^2 = \sum \frac{(o_{ij} - e_{ij})^2}{e_{ij}}$$

Degrees of freedom = (r -1) (c –1)
at 5% level of significance

Table 10. Expected Frequency (e_{ij}) Classified by Class of Degree and Age

Class of degree	Age	
	16-22 yrs	23 and above
1	2.258	1.742
2.1	152.43	117.57
2.2	724.88	55.9.12
3	45.002	43.981
P	12.420	9.580

$$\therefore \chi^2_{cal} = 19.53$$

Degree of freedom = (r–1) (c –1)
= (5– 1) (2–1)
= (4) (1)
$\chi^2_{tab} = X^2_{4.1,0,.05} = 9.49$ at the level of significance

Decision: Since $\chi^2_{cal} > \chi^2_{tab}$, we reject that academic performance of students and their age are related.

Table 11. One-way Analysis of Variance

Class of degree	Age		Total
	16-22 yrs	23 and above	
1	4	–	4
2.1	181	89	270
2.2	704	580	1,284
3	50	51	101
P	10	12	22
Total	949	732	1681

Hypothesis Testing

H_0: There is no significant difference in treatment (Age) means
H_1: There is significant difference in treatment means

Calculation of ANOVA

SST=Sum of Squares Total
SSe=Sum of Square Error
SStr=Sum of Square Treatment

$$SST = \sum Y_{ij}^2 - c - f$$

Where C.F. is the Correction Factor = $\frac{Y^2}{P_n}$

$$SST = \frac{41 + 181^2 + 704^2 + 50^2 + 10^2 + 89^2 + 580^2 + 51^2 + 12^2 + 1681^2}{5X2}$$

=878059 – 282576.1
=595482.9

$$\text{Also, SStr} = \frac{\sum y_i^2}{n} - \frac{y^2}{P_n}$$

SStr =287265 – 282576.1
SStr =4708.9
SSe=SST – SStr
=595482.9 – 4708.9
SSe = 590774

Table 12. ANOVA TABLE

Source of variance	Sum of square	d.f	Mean square	F
Treatment	4708.9	4	1177.225	
Error	590774	5	98462.3	0.012
Total	595482.9	9		

Where:

Degrees of freedom for treatment = p -1 = 4
Degrees of freedom for error = P_n-p = 5
Degrees of freedom for total = P_n –1 = 9
Critical value: F (1 – α), v_1, v_2
$F_{(1-0.05),\ 4,\ 5}$
$F_{0-95,4,5} = 519$

Decision: Since $F_{cal} < F_{tab}$, we do not reject H_0 and conclude that the treatment means are equal i.e. there are not significantly different.

Table 13. Classification by Sex and Class of Degree

Class of Degree	Male	Female	Total
1	4	0	4
2.1	166	104	270
2.2	819	465	1284
3.0	63	38	101
Pass	18	4	22
Total	1070	611	1681

Hypothesis Testing

H_0: There is no significant difference in treatment (sex) means
H_1: There is significant difference in treatment (sex) means

Table 14. ANOVA TABLE

Source of variance	Sum of square	d.f	Mean square	F
Treatment	21068.1	4	5267.025	
Error	627482.8	5	125496.56	0.042
Total	648550.9	9		

Degrees of freedom for treatment = P -1 = 4
Degrees of freedom for error = P_n-p = 5
Degrees of freedom for total = P_n –1 = 9

Critical value: $F_{\alpha,v1,v2}$

$F_{0.05,\ 4,\ 5}$
$F_{095,\ 4,5} = 5.19$

Decision: Since $F_{cal} < F_{tab}$, we do not reject H_0 and conclude that there is no significant difference.

Table 15. Population of Students per Class of Degree on Yearly Basis

Class of degree	Years					Total
	96/97	97/98	98/99	99/2000	2001/02	
1	1	–	1	1	1	4
2.1	76	27	69	52	46	270
2.2	278	261	188	184	373	1284
3.0	15	17	7	8	54	101
Pass	3	5	7	3	4	22
Total	373	310	272	248	478	1681

Table 16 shows that the percentage of students who have best class of degrees (i.e. first class and second class upper) is very high in the year 98/99 and 99/2000 Compared to other years. We also notice that in the year 1998 and 1999, we have least number of students (272 and 248) compared to other years under consideration. Therefore, we can conclude that there is a relationship between the number of students admitted and their performance.

Concluding remarks

In trying to analyze the data on the academic performance of students in a Faculty in the University of Ibadan between 1996/1997-2001/2002 sessions, It is quite necessary to recall the aims and objectives of this research, and relate these to the results of the analyses of the data used and consequently interpret the results. As mentioned earlier, the aims include finding out if the factors like sex, age and population actually contributed to the academic performance of the students. In admitting students, there is no proportion to the number of males or females to be given admission, hence, students are admitted irrespective of their sex. The tests reveal that the sex of a student does not enhance his/her academic performances, that is, they are not related and the probability of a student having an excellent class of degree does not depend on his/her sex.

Also, for a student seeking admission into the University of Ibadan, a declaration of his/her age is demanded in the form of a birth certificate or age declaration, and students below the age of sixteen are deemed immature and are not qualified for admission. The tests revealed that academic performance and mean ages are related. Also, the mean ages of students classified by classes of degree are significantly different. As the mean age increases, the class of degree also becomes better. Thus, the older the student, the higher the class of degree and vice-versa. So, from the analyses carried out, it was revealed that the percentage of students who had best class of degree (first class and second class upper) was high in some years with the least number of students. We can conclude that there is a relationship between the number of students and their performance. The higher the number of students, the lower the performance.

Recommendations

From the results of the analyses, we make the following recommendations:

Table 16. Percentage of Students and their Population per Class of Degree on Yearly Basis

Class of Degree	Year		Year		Year		Year		Year	
	96/97	%	97/98	%	98/99	%	99/2000	%	01/02	%
1	1	0.21	–	–	1	0.38	1	0.4	1	0.21
2.1	76	20.38	27	8.71	69	35.37	52	20.98	46	9.62
2.2	278	74.53	261	84.19	188	69.12	184	74.19	373	78.03
3	15	4.02	17	5.48	7	2.57	8	3.23	54	11.3
Pass	3	0.80	310	1.61	7	2.57	3	1.21	4	0.84
Total	373	100%	310	100%	272	100%	248	100%	478	100%

1. The use of sex to determine the ratio of male to female number of students to be admitted into the University is not necessary, and should not be practiced
2. The upper age limit of students on admission as well as the lower the age limit should be checked.
3. The school authorities should check the number of students considered for admission so as not to overstretch the available limited facilities resources, both human and material; since our research has revealed better performance in the session with small number of students i.e. the higher the number of students, the lower the performance.

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