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THE AVERAGE UTME AND POST-UTME SCORES IN CHEMISTRY AS PREDICTORS OF ACHIEVEMENT IN BIOCHEMISTRY, INDUSTRIAL CHEMISTRY AND ELECTRICAL ELECTRONIC COURSES IN ENUGU STATE

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ABSTRACT

The study was designed to ascertain the average university tertiary matriculation examination and Post-university tertiary matriculation examination scores in chemistry as predictors of achievement in Biochemistry, Industrial chemistry and Electrical Electronics courses in tertiary institutions in Enugu State. The study adopted a correlational survey research design. One research question and one hypothesis were formulated to guide the study. The study was conducted in public Universities in Enugu State, Nigeria. A sample 990 students was used. This consisted of 572 students from University of Nigeria, Nsukka (Biochemistry = 200, Industrial chemistry = 201, Electrical Electronics = 171) and 418 students from Enugu State University of Science and Technology (Biochemistry = 102, Industrial chemistry = 135, Electrical Electronics = 181) The data for the analysis were obtained from broadsheet containing students' average Unified Tertiary Matriculation Examination and Post-Unified Tertiary Matriculation Examination scores as well as students' first year results from their different universities. The multiple regression technique was used for the analysis and the regression coefficients tested for significance using F-test at 0.05%. The study revealed among others that: average UTME/Post UTME correlated with First year results in Biochemistry (r = 0.25), Industrial Chemistry (r = 0.60), Electrical Electronics (r = 0.21) in Federal University while in state university, only Electrical Electronics (r = 0.20) was positively correlated but Biochemistry (r = 0.09) and Industrial Chemistry (r = 0.04) had no relationships. The researcher recommended among others, that (1). Ordinary level results should be weighted and included in the admission process for better judgment. (2) UTME and Post-UTME chemistry questions across the universities should be standardized across different institutions. (3). Government in collaboration with the university heads should set up a committee to harmonize the processes of screening exercises in public universities.

Keywords: UTME, Post-UTME, Chemistry courses, Public Universities, Chemistry scores, Admission

Introduction

The Joint Admission and Matriculations Board (JAMB) is a Nigerian entrance examination board for tertiary institutions. Screening students before admission, had been in practice in all institutions from the primary to tertiary educational system, since the introduction of education in our country. This was interrupted in the 1970's after the

introduction of JAMB in 1978. JAMB was shouldered with the responsibility of conducting the University entrance examinations for all the candidates seeking for admission into the Universities. Before the creation of JAMB, each university conducted its entrance examination and admitted its candidates based on some laid down principles, which were peculiar to each universities (Ofoegbu and Ojogwu, 2006). The differences in university ownership by the federal, state and private individuals created some difficulties in maintenance of uniform standard and quality control across the universities. Other problems revealed by this system included multiple applications and admissions leading to obstruction of admission chances of other candidates (Ajaja, 2010). The uncoordinated system of admission, into universities, with all the associated problems including marginal increase in the population of admission seekers [(Ayuba, (2015), Okoli, Ogbandah & Ewor (2016)] were sufficient causes for concern to the stakeholders in Nigerian Education System. This perhaps necessitated the set-up of the joint admission and matriculation board (JAMB) in April 1977. Joint Admission and Matriculation Board (JAMB) was established in 1978 to conduct, among other functions, Unified Tertiary Matriculation Examination (UTME) and select successful candidates for admission into all the universities, polytechnics and colleges of education in Nigeria.

According to JAMB (2018), for a candidate to be regarded as being successful in admission into Nigerian universities, the candidate must have met up with the age and entry requirements for that particular course in a particular university. For instance, The candidates for UTME are required to have five credit passes in Mathematics, English Language and three other relevant subjects at the Senior School Certificate Examination (SSCE) or the General Certificate Examination (GCE) ordinary level in not more than two sittings. Chemistry being one of the core science subjects is required both as university matriculation examination subject and as an entry qualification into industrial chemistry, Biochemistry and other Science Technology Engineering and Mathematics (STEM) related fields.

Industrial chemistry is a branch of chemistry that applies physical and chemical processes for the transformation of chemical raw materials to finished products that are useful to humanity. It is one of the courses offered in the faculty of physical sciences or applied natural sciences in the Nigerian universities. Industrial chemistry has a strong relationship with chemical industries and factories (Hornby, 2010). On the other hand, Biochemistry is a course offered in the faculty of Biological sciences that brings together biology and chemistry. It is a branch of science that explores the chemical processes within and relates to living organism. Before a candidate is offered admission into B.Sc Biochemistry or B.Sc chemistry courses in Nigerian universities, he or she must obtain a credit pass in Chemistry, Biology, Physics, Mathematics and English.

The implication is that, Chemistry knowledge and skills are necessary for successful engagement in those programmes. It has a remarkable link with industry and everyday life experiences. Chemistry is therefore required as one of the ordinary level

entry requirements, UTME and Post-UTME subjects to be taken and passed for admission into those chemistry based courses. Chemistry-based courses as used in this work includes, those courses in which chemistry is compulsorily required as ordinary level requirement, UTME subjects. However, the achievement of Nigerian students in chemistry subject area at different levels of secondary and tertiary schools remains an unbearable failure. Poor achievement in chemistry is not peculiar to Nigeria alone but also applicable to some other countries. For instance, the result of students in chemistry in Kenya certificate of secondary Education (KCSE) has been quite poor over the past years. The report shows that the mean chemistry scores attained by students have been below 29%, over the last six years 2007-2012 (Ahmed, Hassan, Abdudallah, Asia, Yussuf & Ali, (2015) identified poor performance in chemistry as one of the challenges facing Tanzanian government, parents and other stakeholders.

In the same way, Darling-Hammond (1997) noted that the international studies of educational performance revealed that USA students consistently rank near the bottom in science and mathematics, an indication of poor performance in these subjects. Previous studies in Science education have tried to uncover the causes and factors that affects low achievement in science among students (Goodrum, Haackling, & Rennie, 2001) including, student, teacher, societal, home and curriculum and extracurricular related variables (Saage, 2009, MC Kenzie & Schweitzer, 2018), difficulty in chemistry topics due to unfamiliar idea, confusing language, insufficient practical works (Agogo & Onda, 2014, Uchegbu, Oguoma, Elenwoke & Ogbuagu, 2016). In developed countries of Australia and USA, teacher quality has been identified as the most important factor militating against science learning in Schools and needs to be addressed according to (Goodrum, Haackling, & Rennie, 2001). Ahmed, et al, 2015) in his study carried out in Tanzania also identified chemistry teachers and students attitude as main causes of students' poor achievement in chemistry. The data from National Examinations Council of Tanzania (NECTA) showed that pass rate (grade A-D) for chemistry were 33%, 31% and 28% for the year 2007, 2008 and 2009 (Halmilton, Mahera, Mateng'e, & Machumu, (2010).

Evidence in literature has shown that, poor achievement of students in previous examinations also affected their achievement in subsequent other examinations, (Nweze & Uzochukwu, 2018, Aina, 2017, Abudulkadir, Sa'adatu & Ogwueleka, (2019), to the extent that the degree awarded institutions have lost confidence in the UTME scores and complained about the poor performance of students in the first-year university examination, though admitted with high UME scores. (Ogbeba, 2010 & Aina, 2015). In the study conducted by Busayo (2011) in one of the Nigerian universities, only 87 of the sampled 200 candidates who scored 200 marks and above in JAMB/UME representing 43.5% passed the post-UME screening test, the remaining 113, representing 56.5% performed poorly, scoring less than 40% in the post-UME screening. Consequent to the lapses noticed in process of admission of candidates

into Nigerian universities, through the University Matriculation Examination (UME), Ajaja (2010) was of the opinion that and the expected roles of universities in the society which is currently on the decline, necessitated the call for an alternative method of admitting students into Nigeria universities. This call gave the universities the power to conduct post-UME screening tests (Ajaja, 2010), believing that the PUME screening test will ensure quality and enhance the best choice of the students to be admitted. In agreement with that, Salim (2006) believed that quality admission will produce quality graduates. The product of quality admission will lead to students' total commitment to their studies as well as decrease in examination malpractices (Alutu and Aluede, 2006). Oketete (2012) asserted that JAMB performed creditably well for over two and half decades without any hitch before the universal devils known as corruption and examination malpractice crept into the system with all the associated problems, to the extent that almost all the examinations (Popoola, 2016), conducted in all levels of education ranging from pre nursery, (where a parent at that level will bribe classroom teacher for the child to take first position) up to tertiary school levels in our country, have been infested with examination malpractice. The PUME is the only way the university can monitor the students they take in on admission Aina, (2015). Akoja and Onmuegbuna (2008) stated that the said exercise was embarked upon as a result of lack of trust in the genuineness of UME results which candidates often parade. Ajaja (2008) gathered that some candidates who had flaunted high scores in their UME results often perform woefully when offered admission. Personal experience of the researcher during external supervision and invigilation of examinations showed that some students hire other persons (Mercenaries) to write the test and so many other examinations on their behalf. Therefore, the effort made by universities to ensure that the candidates offered admission were those who sat for the examinations gave rise to the post-UME test.

Post-UTME (PUTME) is a screening examination conducted by Nigerian universities for successful candidates who were able to meet up with the JAMB and university cut off mark. This was introduced in 2005 by the federal government after receiving series of complaints, petitions from vice chancellors and other stake holders about the inefficiency, poor performance of students, examination malpractice, no credibility, fraudulent and corrupt practices recorded before, during and after UTME as were documented either independently or collectively by the following researchers; (Eghagha, 2005; Akoja and Onmuegbuna 2008, Popoola, 2016). Hence, the attempt by universities to sanitize the university admission process by ensuring that the candidates given admission were those who sat for the examinations gave rise to the post-UME screening test. PUTME was therefore believed to enhance the admission of quality students as well as produce quality graduates (Salim 2006), reduce the rate of examination malpractice, (Alutu and Aluede, 2006) which will in turn make the students to be more dedicated to their studies. The PUTME is the

only way according to (Aina, 2015), the university can monitor the students they take in on admission. With PUTME, deficiencies of the candidates are exposed especially when they are asked to write (Busayo, 2011; Aina, 2015). Nigerian universities as a result, resorted in the using of the average scores of both UTME and PUTME to determine the students' admission into various universities. Just as Busayo (2010) rightly pointed out that, the result of the two examinations was computed to determine the eligibility of candidates for admission into the public universities. From the foregoing, it is expected that candidates who performed well consistently in WAEC, UTME and Post-UTME are likely to perform well in their undergraduate courses. Hence the need for this study that investigated how average UTME and Post-UTME predicts of academic performance of university undergraduates students of the two public universities in Enugu State.

Research Question

The study was guided by the following research question:

1. What are the predictive validity indices of the average UTME and Post-UTME chemistry scores for Biochemistry and Industrial chemistry and Electrical Electronics courses in public universities in Enugu State?

Hypothesis

The following hypothesis guided the study.

Ho_1: Students' average UTME and post-UTME mean scores in chemistry do not significantly predict their mean achievement scores in Biochemistry, Industrial chemistry and Electrical Electronics courses in public universities in Enugu State

Method

The research utilized the correlation survey design. The area of the study was Enugu state that has two Public Universities – University of Nigeria, Nsukka (UNN) and Enugu State University of Science and Technology, Enugu (ESUT). A total population of 1,161 students from Biochemistry and industrial chemistry in UNN and ESUT for two academic sessions were used and distributed as follows: The population of UNN students was 680 students (Industrial chemistry = 230, Biochemistry = 250, Electrical Electronics = 200). The population of ESUT students was 481 (Industrial chemistry = 150, Biochemistry = 131, Electrical Electronics = 200). Multi stage sampling procedure was adopted Stratified sampling, simple random sampling and purposive techniques were used.

Stratified sampling was used because students were in different departments; simple random sampling was used to sample two departments from chemistry-based faculties and purposive sampling was used to pick only those students with the complete records of UTME, post-UTME and the first year results. From the above information, a total number of 572 students was sampled from UNN, 200 Biochemistry students, and 201 Industrial chemistry students and 171students from Electrical Electronics. Total sample from ESUT was 418, 102 students from Biochemistry, 135 students

from Industrial chemistry, and 181 students from Electrical Electronics departments were used for the 2008/9 and 2009/10 academic sessions. Data for the study was collected using a worksheet that contained the students' UTME scores, post-UTME scores as well as the students' first year results assessed from the students' records in their different Universities. Both the research question and hypothesis were analyzed using multiple regression analysis technique respectively.

The Regression coefficients showed the degree of relationship between UME scores, post-UME scores, average UME/Post-UME scores and first year scores for each of the chemistry-based courses for the two Universities. It usually lies between-1 and +1. r = 0, indicates no correlation, r=1, means perfect positive correlation. r = -1, shows, perfect negative correlation. If r lies between 0 and 1, it shows positive correlation and if, r lies between 0 and - 1, it shows negative correlation. However, the calculated correlation value for each of the research questions was converted to F-test, using the required table. This was eventually compared with the critical value, at 0.05% level of significance and a degree of freedom of N-1 for inferential decision to be made. In response to the hypotheses, step wise multiple regression analysis tested at 0.05% level of significance was adopted. The summaries of interpretations of level of relationships are given below in table 1

Table 1: Interpretation of correlation coefficient

Correlation coefficient	Interpretation of relationship
1.00	Perfect positive relationship
0.70-0.99	Strong positive relationship
0.40-0.69	Moderate positive relationship
0.10-0.39	Weak positive relationship
-0.09-0.09	No relationship
-0.39- (-0.10)	Weak negative relationship
-0.69-(-0.40)	Moderate negative relationship
-0.99-(-0.07)	Strong negative relationship
-1.00	Perfect negative relationship

(Hamilton, 1990: 481)

Presentation of Results

The results of the study are presented in tables according to the research question and hypothesis. The results for research question 1 are presented in Table 2.

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Table 2: Correlation Coefficients (r) of the average UTME and Post-UTME Chemistry Scores for Industrial Chemistry, Biochemistry Courses

Departments	Federal University			State University		
	R	N	Intptn	R	N	Intptn
Industrial Chemistry	0.60	201	MR (+)	0.04	135	NR
Biochemistry	0.25	200	WR(+)	0.09	102	NR
Electrical-Electronics	0.21	171	WR (+)	0.20	181	WR(+)

Where r = correlation coefficient, Intptn = Interpretation, N = number of cases, MR (+) = moderate (+) relationship, WR (+) = weak (+) relationship and NR = no relationship.

Table 2 shows that in Industrial chemistry, there is moderate positive relationship between average UTME and Post-UTME scores in Chemistry and university first year scores in Industrial Chemistry in Federal university while there is no relationship between the average chemistry scores of UTME and Post-UTME scores and university first year scores in state University. For Biochemistry in Federal University, there is weak positive relationship between average UTME and Post-UTME scores in chemistry and first year University scores while there is no relationship between post-UTME scores in chemistry and first year university scores in the discipline among the students in state University. For Electrical-Electronics, there are weak positive relationship in both the Federal and State Universities between average UME/Post-UME score in Chemistry and students' scores in Electrical-Electronics courses in the Universities.

Table 3 presents the results for hypothesis 1.

Table 2: Regression Analysis Results of average UTME/Post-UTME chemistry on the Academic Achievement of first year students in Industrial chemistry, Biochemistry and Electrical Electronics courses in public universities in Enugu State.

Where S=significant, NS = not significant

Courses	Universities	Multiple R	R^2	R^2 Change	B	BETA	Std Error	% Variance	F.obs	F.Crit	Sig	dF
Industrial	UNN	0.60	0.36	0.36	0.68	0.60	6.49	36.00	163.87	3.84	S	1,201
Chem.	ESUT	0.04	0.001	0.01	-0.36	-0.37	5.39	1.00	0.19	3.92	NS	1,135
Biochem	UNN	0.25	0.06	0.06	0.51	0.25	7.31	6.00	14.86	3.84	S	1,200
	ESUT	0.09	0.01	0.01	0.08	0.09	6.51	1.00	0.59	4.00	NS	1,102
Elect-	UNN	0.23	0.53	0.05	0.53	0.23	9.88	5.0	9.74	3.84	S	1,171
Elect.	ESUT	0.21	0.04	0.04	-0.20	-0.21	6.42	4.00	8.20	3.84	S	1,181

Table 2 shows that for the students in Industrial Chemistry course in Federal university, their average UTME/ Post-UTME scores in Chemistry had the R^2 change of 0.36. This indicates that the students' average UTME/Post-UTME scores in Chemistry had a predictive power of 36.00% for their achievement in first year Industrial chemistry for the two academic sessions under study. The observed F-value for the average

UTME/Post-UTME scores in chemistry is shown to be 163.87 while the critical F-value for 1 and 201 degrees of freedom for the numerator and denominator at 0.05% level of significance is 3.84. Since the observed F-value is greater than the Critical F-value, the contribution variance of 36.00% to the achievements of students in industrial Chemistry is the actual contribution of chemistry and not due to error. Therefore, the null hypothesis of no significant prediction in respect of performance in industrial chemistry by the average UTME/ Post-UTME chemistry scores is not accepted. This means that the students' average UTME/Post-UTME chemistry scores are a significant predictor of their first-year result in industrial chemistry department.

For students in Industrial chemistry in the state university, Table 2 shows that Post-UTME scores in chemistry had R^2 change of 0.01. This indicates that the average UTME/Post-UTME scores in chemistry had a predictive power of 1.00% for their achievement in first year Industrial chemistry course. The observed F-value for the average UTME/Post-UTME scores in chemistry is 0.19 while the critical F-value for 1 and 135 degrees of freedom for the numerator and denominator at 0.05% level of significance is 3.92. Since the observe F-value is less than the critical F-value, the aspect of the null hypothesis in respect of the prediction performance in Industrial chemistry by the average UTME/Post-UTME chemistry scores is not rejected. In other words, the average UTME/post-UTME scores in Chemistry do not significantly predict students' performance in Industrial chemistry. This means that the variance contribution of 1.00% of the students' average UTME /post-UTME score to the student score in industrial chemistry is not the actual contribution of chemistry but due to error and other intervening variables.

For the students in Biochemistry department in Federal University, the R^2 change for average UTME/Post-UTME scores in chemistry is 0.06. This implies that the average UTME/Post-UTME scores in chemistry had a predictive power of 6.00% for their achievement in first year Biochemistry courses for the two academic sessions under study. The observed F-value for the average UTME/Post-UTME scores in Chemistry is 14.84 while the critical F-value is 3.84 for 1 and 200 degrees of freedom for the numerator and denominator at 0.05 level of significance. Since the observed F-value is greater than the critical F-value, the contribution variance of 6.00% to the achievement of students in Biochemistry is the actual contribution of chemistry and not due to error. Thus the null hypothesis of no significant prediction in respect of the performance in Biochemistry by the average UTME/Post-UTME scores in chemistry is not accepted. This means that the average UTME/Post-UTME scores in chemistry is a significant predictor of the results of students in Biochemistry department.

In Table 2, for students in Biochemistry department in the state university, the average UTME/Post-UTME scores in chemistry had R_2 change of 0.01 with a predictive power of 1.00% for achievement in first year Biochemistry. The observed F-value for the average UTME/Post-UTME scores in chemistry is 0.59 while the critical F-value for 1 and 102

degrees of freedom for both the numerator and denominator at 0.05 level of significance is 4.00. Since the observed F-value is less than the critical F-value, the null hypothesis of no significant prediction in respect of their performance in Biochemistry is not rejected. This means that students' average UTME/Post-UTME chemistry scores do not significantly predict their result of students in Biochemistry department. Therefore, the variance contribution of 1.00% of average UTME/Post-UTME students' scores in Biochemistry is not the actual contribution of chemistry but that due to other variables and error variance.

For the students in Electrical Electronics department in Federal University, the R^2 change for average UTME/Post-UTME scores in chemistry is 0.05. This implies that the average UTME/Post-UTME scores in chemistry had a predictive power of 5.00% for their achievement in first year Electrical Electronics courses for the two academic sessions under study. The observed F-value for the average UTME/Post-UTME scores in Chemistry is 9.74 while the critical F-value is 3.84 for 1 and 171 degrees of freedom for the numerator and denominator at 0.05 level of significance. Since the observed F-value is greater than the critical F-value, the contribution variance of 5.00% to the achievement of students in Electrical Electronics is the actual contribution of chemistry and not due to error. Thus the null hypothesis of no significant prediction in respect of the performance in Electrical Electronics by the average UTME/Post-UTME scores in chemistry is not accepted. This means that the average UTME/Post-UTME scores in chemistry is a significant predictor of the results of students in Electrical Electronics department.

For the students in Electrical Electronics department in State University, the R^2 change for average UTME/Post-UTME scores in chemistry is 0.04. This implies that the average UTME/Post-UTME scores in chemistry had a predictive power of 4.00% for their achievement in first year Electrical Electronics courses for the two academic sessions under study. The observed F-value for the average UTME/Post-UTME scores in Chemistry is 8.20 while the critical F-value is 3.84 for 1 and 181 degrees of freedom for the numerator and denominator at 0.05 level of significance. Since the observed F-value is greater than the critical F-value, the contribution variance of 4.00% to the achievement of students in Electrical Electronics is the actual contribution of chemistry and not due to error. Thus the null hypothesis of no significant prediction in respect of the performance in Electrical Electronics by the average UTME/Post-UTME scores in chemistry is not accepted. This means that the average UTME/Post-UTME scores in chemistry is a significant predictor of the results of students in Electrical Electronics department.

Summary of Findings

From the result of the study, the relationships between average UTME and Post-UTME scores in Chemistry and university first year scores in the three science-based courses studied revealed as follows:

1. Moderate positive relationship MR (+), was found in Industrial chemistry, in Federal

university while there was no relationship in state University.
2. For Biochemistry in Federal University, there was weak positive relationship WR (+), but no relationship (NR) was found in state University.
3. There is weak positive relationship found in both the Federal and State Universities for Electrical-Electronics.

Discussion of Findings

The results in respect of no relationship found between the average UTME and Post-UTME and first year results of students in Industrial Chemistry and Biochemistry programmes in State universities are in agreement with Aboma (2009), Ajaja (2010) and Eze, (2014), all of which identified no relationship or very poor correlation between University entrance score and their academic achievement in different institutions. The low and no relationships observed in state university appeared to be a manifestation of what Egbongabsi (2010) said that some state universities do not adhere completely to the laid down principles of admission processes by JAMB, they therefore give admission to their indigenous candidates with poor results. The result of the findings from federal University in respect of positive relationship found between the average UTME and Post-UTME and first year results of students in Biochemistry, Industrial chemistry and Electrical Electronics departments was in agreement with Obioma, Nwufo, Salau and Omole (2010) who reported low correlation between UME/Post-UTME and first year CGPA scores. It is also in line with the works of Keskula, Sammaronu and Perrins (2009) who found that pre-admission grade point average was a significant predictor accounting for 34% of the variance. Obioma and Salau (2007) also reported a low positive relationship in their similar studies, where it was observed that the first-year result accounted for 48% of the final year examinations.

From the trend of relationship observed on the result of the present study, within the departments in the same and different Universities, the researcher therefore attributes the inconsistency in the relationship to, university type, non-uniformity of chemistry questions and standard across the universities as was also observed by Onyekakeyah (2012). The inconsistency in the result could also be attributed to the parental influences, different examination malpractices and the use of quota system in admission of students where non-qualified students are admitted into different schools.

Conclusion

Combined UTME/Post-UTME scores in chemistry moderately predicted students first year results in industrial chemistry, but weakly predicted students first year results in Biochemistry and Electrical Electronics courses in federal university. In State University, combined UTME/Post-UTME did not predict students' first year results in Industrial chemistry and Biochemistry courses, but weakly predicted students' first year results in Electrical Electronics courses. With the above and other information gathered from the research, it can be concluded that the Nigerian Education system is sick and in a state of acute jeopardy.

Recommendations

The following recommendations are made based on the findings of the study:

1. The researcher recommended that ordinary level results should be weighted and included in the admission process for better judgment.
2. UTME and Post-UTME chemistry questions across the universities should be standardized across different institutions.
3. JAMB and tertiary institutions in Nigeria should have adequate concern in raising, maintaining and sustaining the standard of UTME and screening examinations in different tertiary institutions.
4. Government in collaboration with the university heads should set up a committee to harmonize the processes of screening exercises in public universities.
5. Quota system of admission should be discouraged in university.

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