The Prediction of Student Performance in Chemistry-based Courses in Public Universities Using University Matriculation Entrance Scores in Chemistry

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Introduction

In Nigeria, since independence, access to university education has grown significantly. Initially, each university conducted its entrance examination and selected its own candidates based solely on merit [1]. This individual university admission exercise was not satisfactory as it created too much room for wastage of admission slots through multiple offers to one candidate while depriving others of placement slots into the universities of their choice [2]. As the number of universities increased marginally, this marked the genesis of centralized and coordinated university admission system that led to the establishment of Joint Admission and Matriculation Board (JAMB) in 1978 to undertake the process of admission into all the universities, polytechnics and colleges of education in the country.

Since the inauguration of JAMB, the Nigerian universities have continued to grow in number as demonstrated with the corresponding growth in the number of students who seek admission each year. For instance, there are about thirty-six federal universities, thirty-six state universities and forty-one privately-owned universities at present [3]. This growth, together with systemic inefficiencies such as corrupt practices [4], poor performance of students [5], computer-enabled fraudulent practices [6], examination malpractices [7] and many other complaints against JAMB gave rise to the introduction of another layer of screening exercises by different universities before an offer of admission is extended to potential successful candidates. For instance, in the University of Lagos alone, about one hundred and sixty students were expelled because of computer-aided manipulation of students' scores. This was discovered due to the substandard performance of the students whose admissions scores were manipulated to gain placement into the university. To ameliorate this impending catastrophe in the educational sector, education stakeholders resolved to resuscitate and reverse the ailing educational standard. As a result, JAMB was created and tasked with the role of a clearing house for all admission processes for all universities and colleges in the country. One of the primary responsibilities of JAMB is to ensure that students do not have multiple admissions, while individual universities were tasked with the conduct of all entrance examinations.

Obe [8] argued that the JAMB mandate and the screening scores are negatively correlated. This is because a high scorer in JAMB did not come out as a high scorer in any given test as an undergraduate student. A candidate who scores two hundred and twenty in JAMB and scored 48% in the test implies that his university matriculation examination (UME) score is about 52%. According to [9], the former president of Nigeria, Olusegun Obasanjo accused JAMB officials and the organizers of the entry examinations into post-secondary institutions of massive corruption which has negatively impacted the standard of university education in the country. Another instance of a JAMB admitted candidate who got the highest score in UME but withdrew in the first year due to her inability to cope with tertiary education rigors was reported by [5]. Over the years, universities, polytechnics and other tertiary institutions placed high expectations and hopes on students who came in with very high JAMB scores but ended up very disappointed because many of such students fail to make it even beyond their first year due to poor academic

performance. Many of these students eventually joined bad gangs out of frustration, ultimately, dropping out of school. Their troubles were expressed out in deviant behaviors that turned universities and other post-secondary institutions into battle grounds, replete with physical violence and making the environment unsafe for conducive teaching and learning [10]. A number of these students request for change of academic majors after some years and those who have nowhere to go predictably take out their frustration on one another and the university community through gang and cult violence.

Learning in any subject area, particularly chemistry, is a cumulative process. Students' pre-existing beliefs influence how they learn new scientific knowledge and how it plays an essential role in scientific learning [11]. The importance of chemistry as a science subject in fulfilling the technological needs of the society was emphasized by [12] and who, in turn, noted that noted that lots of technological advancement being made in the field of medicine, pharmacy, engineering, agriculture and others are largely made or based on the studies conducted in the field of chemistry. As reported by [13], a country cannot have a strong scientific and technological enterprise without a strong foundation in chemical education. Therefore, [14] described chemistry as the bride of science due to its indispensable role in all science and technology endeavors. Often regarded as a central science, it has strong interactions with biological, medical, earth and environmental sciences, physical and mathematical sciences. In his research, Ezeliora [15] concurred that the power of chemistry is what creates an enabling infrastructure that delivers food, medicine and materials which are the hallmark of modern life.

Chemistry is taught in all the secondary schools in Nigeria and one is expected to obtain a certain grade in chemistry as one of the entry requirements into major STEM fields [11]. Ideally, students can find chemistry programs that support their interests in academic or educational goals, graduate school education, medical and health professions, biotechnology education, business or as a complement to other studies in the natural science, humanities or social sciences. Chemistry is required both as a university matriculation examination subject and as an entry qualification into engineering and other STEM related fields.

Chemistry, because of its scope and potentials, is quite unique in its connection with several aspects of modern life. Its role as a transforming agent is recognized as crucial, especially in developing countries. In Nigeria, for example, mastering chemistry content is one of the greatest challenges students have. Surprisingly, many students are not aware of a chemists' role in the overall well-being of the society. Chemistry departments in the colleges and universities are therefore being challenged to broaden their curricula to make chemistry students aware of chemists' role in the society. The pitfalls in the process of the development of curriculum created a big gap between curricular learning targets and level of student's cognitive abilities which comes with age [16]. Chemistry departments, through a variety of courses and programs, provide opportunities for students to explore the nature and significance of chemistry for knowledge about ourselves and the world around us [17]. The chemistry field, as a major area of study, provides excellent preparation for graduate study in chemistry, biochemistry, chemical engineering, environmental sciences and the medical sciences. It can also be useful to those whose later professional or business career may be related to chemical materials or processes.

This implies that in developed countries, faculty research projects and curriculum involve undergraduate participation. Thus, the developmental role of chemistry becomes well pronounced appreciated and adequately sustained in the developed countries than in developing countries.

Problem Statement, Scope and Research Question

The entrance examination conducted by the joint admissions and matriculations board (JAMB) and the candidates selection process in almost all the subject areas, including chemistry, has serious problems. These problems range from the students' under achievement in chemistry to the uncoordinated system of admission process by different universities. This gave rise to multiple applications and multiple admissions which, in turn, exacerbated, the current inefficiency and corrupt practices associated with JAMB and UME led to the introduction of Post-UME as a measure of quality control in the system. The doubts about the credibility of the admission process due to the identified associated problems, underscores the need to determine the predictive validity of these admission criteria. Thus the problem of this study put in an interrogative form is: what is the predictive validity of UME chemistry scores for admission into chemistry-based courses in the universities?

This paper examines the university matriculation examination (UME) scores in chemistry as predictors of students' first year (freshman) university achievement in various chemistry-based faculties, namely: Biological sciences, Medical sciences and physical sciences in different universities in Nigeria. Specifically, the paper seeks to determine the predictive validity of the UME chemistry scores for freshman admission into each of the chemistry based courses in different universities. This study will be limited to the determination of the predictive validity of UME, chemistry scores of students, admitted during the 2007/2008 and 2008/2009 academic sessions, with their first year chemistry courses in different universities. Since the work cannot understudy all the chemistry related programs, one program from two different Universities in Enugu State, will be selected for this study, namely: Biological sciences (biochemistry); Physical sciences (pure and applied chemistry) and Medical Sciences (medicine and surgery). The study was guided by the following research question: What is the predictive validity index of UME scores in chemistry for biochemistry, pure and industrial chemistry based courses in different universities. The following null hypotheses will be tested at 5% level of significance:

> Ho_1: Students' university matriculation examination (UME) mean scores in chemistry do not significantly predict their mean performance in each of the chemistry based courses across the universities.

Review of Related Literature.

The role of chemistry in the development and advancement of the scientific base of a nation cannot be over emphasized. United States of America, Nigeria and other nations of the world are not an exception. However, the performance of Nigerian students in chemistry subject area at the

secondary school remains a miserable failure. A study discussed how teaching information literacy through the introduction of scientific literature to first year honors general chemistry students can improve performance in chemistry examinations [18]. Poor performance in chemistry is not peculiar to Nigeria. In Kenya, the achievement of students in chemistry in Kenya certificate of secondary Education (KCSE) has been quite poor over the years. The report shows that the mean score attained by students in chemistry have been considerably below 29%, the minimum score required for a pass in Science subjects in KCSE according to Kenya National Examination Council (KNEC) over the last six years 2007- 2012 [19].

Similarly, international studies of educational performance revealed that USA students consistently rank near the bottom in science and mathematics [20] an indication of poor performance in these subjects. Various studies in Science education in the past and present have tried to uncover the causes and factors that affects low achievement in science among students [21], [22] Such factors include the student factor, teacher factor, societal factor, governmental infrastructural problem, language problem examination body related variables, curriculum related variables, test related variables, textbook related variables and home related variables [23]. However, specific variables such as poor primary school background in science, lack of incentives for test, lack of interest on the part of students. Saage [24] argues that students not interested in hard work, incompetent teachers in the primary school, large classes, and fear of the subject psychologically [25]. Literature in Science education in developed countries of Australia and USA indicate teacher quality as the most important factor inhibiting science learning in Schools that needs to be addressed as argued by [21]. In Nigeria, the pupil's home upbringing tends to affect their attitudes to authority. Children seem to have a natural tendency to explore, find out and collect objects. Too much parental restriction can have a lasting effect on the learner to the extent that he or she becomes afraid to experiment and explore in chemistry and later in life when encouraged to find out for him or her to make individual contribution he may be too inhibited to do so [26]. Another study has shown that parental attitudes were more important in predicting aspiration of pupils towards continuing their schooling and successes in school than status [27]. Making negative remarks also encourages lukewarm attitude towards chemistry. Parental positive or negative attitude can lead to academic adjustment or maladjustment for learners. Furthermore, families in which the parental language is Spanish have especially low rates of participation in literary and other academic activities and that dominance potentially discourages the children in school learning [28]. However some parents over protect their wards to the extent of destroying them completely [23]. Since such parents shun their responsibility to train their children at home such children will develop nonchalant attitude to chemistry and other courses.

Literature in science education in the developed nations of Australia and USA identified teacher's quality as the most important factor inhibiting science learning in schools that need to be addressed [21]. In a similar study carried out in Australia, large class sizes, limited resources, inadequate time for preparation, reflection and teachers not collaborating with colleagues were identified as limiting factors in achieving quality of teaching science in secondary schools. Thus teachers' knowledge of subject matter, initial preparedness of teacher, available resources in schools, for example, could impede student's learning effectiveness and teacher's teaching effectiveness [22]. Therefore, there is agreement on the urgent need that teachers' knowledge

and skills in teacher-education programs be upgraded in order to meet up with the growing demand of effective teaching and learning which is required for the present educational needs and aspiration of the country.

Furthermore, teachers training and preparations vary from country to country. In France, for example, it is a five year program of undergraduate studies and teacher's education leading to an intensively supervised year-long internship in schools [29]. Elsewhere in China, educators' with experience describe the progression that teacher's follow as they rise through the ranks and progression vary from region to region but the overall process is generally very consistent nationwide [30]. It is a four year program consisting of two years of general science courses followed by admission to education program course work and field experience in the schools [31]. In the nation of Australia, science teachers undergo four years of tertiary education including at least one year of full-time teacher education [32]. In Germany, teachers spend seven years of intensive training to obtain a degree majoring in two disciplines and two to three more years of intensive teacher preparation with classroom observation and a supervised intensive practice teaching [31]. Currently in Nigeria, colleges of education award Nigeria Certificate of Education for three years. Some award university degree in Science education which lasts for four years with practical teaching practice. From available data, the duration of teacher education in different countries varies and this will have a significant effect on the teacher's knowledge and skills acquired from these different countries. Thus in practice, there will be a remarkable difference in the performance of these categories of teachers in the areas of effective teaching and learning to be carried out in different schools. This, in turn, will affect the performance and quality of graduates from different schools.

However, great effort has been made over the years by science educators to improve science achievement through effective teaching strategies [33], [34], [35], [36]. Therefore, it is expected that the performance/achievement of students in sciences and mathematics should give commensurate returns with the level of effort put forth but Onwuakpa [37] argues that the performance is not encouraging. This could be seen in the poor performance of students on science and mathematics [38], [39]. Thus, continued underachievement at secondary school level by the students pose enormous constraints to the students with ambition to pursue science-based programs [40], and this state of affairs does not augur well for the desired scientific and technological development of nation's impacted [41]. A considerable amount of literature that reported on the academic achievement of students in schools highlighted several factors that affect academic performance of undergraduate students. Two factors that was identified as challenges impacting students' academic success were classified as internal and external factors [42]. The internal factors include is made up of class schedule, class size, environment, teachers role technology and nature of examination. On the other hand, the external factors were made up of extracurricular activities, family and work activities. The findings from [42] show that internal factors are better than external factors. Studies have demonstrated that prior academic performance has significant impact on academic success of first year university students [43]. In contrast, the numerical assessment scores in a subject may not be a true reflection of the knowledge gained by a student on a topic, but remains the most available substitute for measuring overall academic success [44].

Several authors reported that admission criteria are weak predictors of academic performance for 1st year (freshman) students in a dentistry program after examining the correlation between previous academic achievement and the academic success of the undergraduate students of universities [45], [46]. Likewise, the index scores and students maturity in age are the best predictors of academic success for nursing and paramedics students [47]. In the field of Mathematics, Nwokike [47] also reported that prior academic performance in Mathematics is considerably related to academic success for undergraduate degree program students.

Summary of Insights from Review of Related Literature

From the various studies examined, most centered on the composite scores of such variables as continuous assessment, different examination scores, and so many other variables relating to students, teachers, home, environmental psychological, physiological, sociological variables but not actually subject based as in the case of this present study. The peculiarity of this study was based on the predictive validity of university matriculation examination (UME) as predictor of students' first year (freshman) results in some chemistry based courses in the universities. Some of the results reported positive correlation, and few reported no correlation, just as the result of this study could not establish a reasonable relationship between UME results and students' first year result in biochemistry, medicine and surgery departments. The implication of this is that the research on the relationship between the previous and future academic achievements of students are not yet conclusive. There is therefore the need for more research on this subject as important decisions concerning admission, employment, educational achievement and job placement are facilitated by the predictive study of this kind.
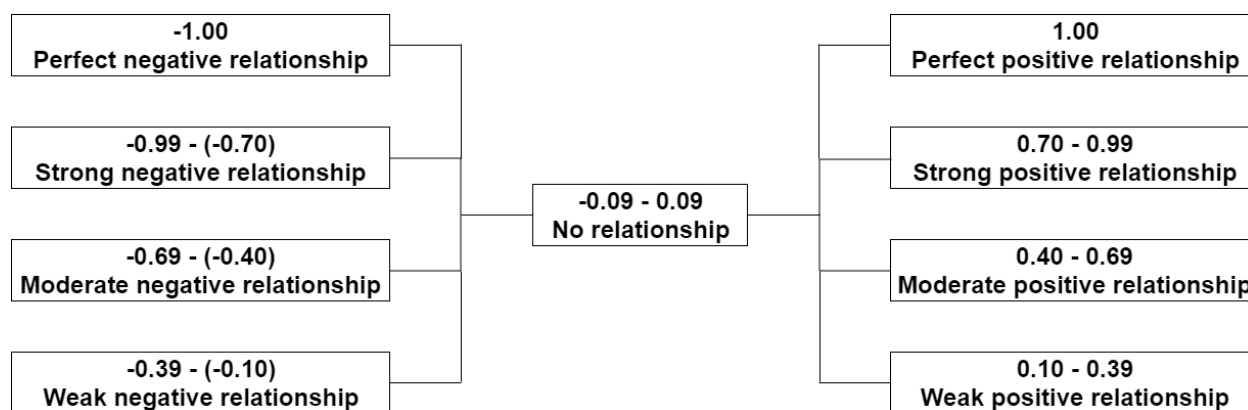
Research Methodology

A multi-stage sampling technique was adopted. Stratified and purposive sampling techniques were used to obtain a total of seven hundred and sixty one(761) students from three departments (strata) from the University of Nigeria, Nsukka and ESUT for 2007/8 Stratified sampling technique was used, to draw students from different strata/departments. Purposive sampling was thereafter used to obtain the students from six (6) chemistry-based departments, three, each from the two Universities were used based on those with the complete records of UME, and first year results.

The data for the study was obtained from documented data that comprised past admission list, UME chemistry scores as well as the student's first year (freshman) results from the students' records in the different universities through their heads of departments and examinations officers. A letter was written to the Registrar and Deputy vice chancellor of Academics of the universities used for this study, and necessary approvals were given requesting each of the department chairpersons to assist the researcher with collecting the relevant data for this study.

Analysis of Data

Data for this study was analyzed using multiple regression analysis. This was used to respond to the research questions as well as analyze the hypotheses. The first year (freshman) chemistry results obtained from each of the sampled universities served as criteria variables while the university entrance scores in chemistry (UME) scores served as predictor variable. These data were coded and analyzed using Statistical Package for Social Sciences (SPSS) version 6, for windows. The multiple regression coefficients were tested for significance using F-test at 0.05% level of significance. In responding to research question 1, UME scores in chemistry served as predictor variable while the mean first year scores for each of the chemistry based courses was used as criterion variable.

The Regression coefficients showed that the degree of relationship between UME scores, and first year scores for each of the chemistry-based courses for the two Universities. It usually lies between,-1 and +1. $r = 0$, which 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 Figure 1.

-1.00 Perfect negative relationship		1.00 Perfect positive relationship
-0.99 - (-0.70) Strong negative relationship		0.70 - 0.99 Strong positive relationship
	-0.09 - 0.09 No relationship	
-0.69 - (-0.40) Moderate negative relationship		0.40 - 0.69 Moderate positive relationship
-0.39 - (-0.10) Weak negative relationship		0.10 - 0.39 Weak positive relationship

(Hamilton, 1990: 481)
Figure 1: Interpretation of correlation coefficient

Presentation of results

The results of the study are hereunder presented in tables according to the research questions and hypotheses guiding the study. Research Question 1: What is the predictive validity index of UME scores for each of the following chemistry based courses in different universities: pure and industrial chemistry; biochemistry, medicine and surgery.
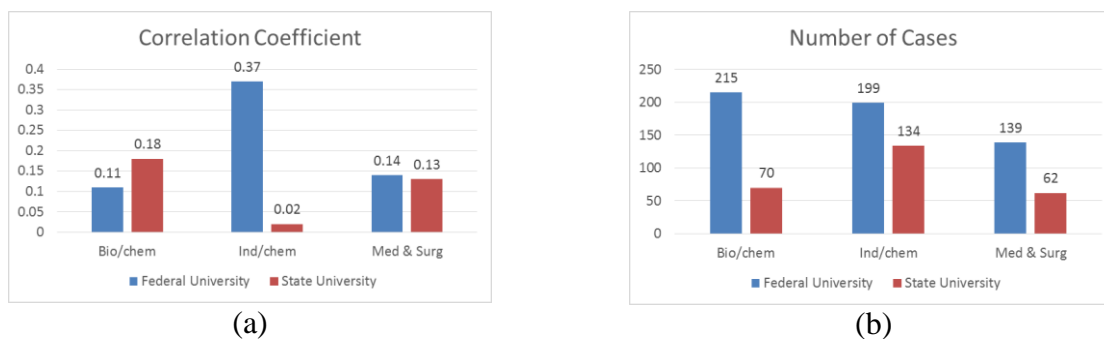
(a)

(b)

Figure 2: Correlation coefficient of UME chemistry scores for the Chemistry based courses in public universities in Enugu State Nigeria

As shown in Figure 2, the predictive validity indices for biochemistry in Federal and State Universities are as follows: 0.11 and 0.18 for industrial chemistry, 0.37 and 0.02 for medicine and 0.14 and 0.13 for surgery. These are interpreted to mean that for biochemistry, there is weak positive relationship in both the Federal and State Universities between students' UME scores in chemistry and their first year scores. In industrial chemistry, while there is weak positive relationship between students' UME scores in chemistry and university first year scores in industrial chemistry in Federal University, there is no relationship between the chemistry UME scores and their first year scores in State Universities. For medicine and surgery, in both the Federal and State Universities, there is weak positive relationship between UME scores in chemistry and the students' first year scores in the discipline.

From the above, it was observed that for Federal Universities, UME scores in chemistry weakly predicted the student's first year (freshman) results in biochemistry, industrial chemistry, medicine and surgery departments. In State Universities, UME scores in chemistry weakly predicted the students' first year results in biochemistry, medicine and surgery but did not predict student's first year (freshman) result in industrial chemistry departments. In other to further ascertain the direction and strength of the relationship, it was further subjected to hypothesis testing and the coefficient of determination R^2 determined as follows:
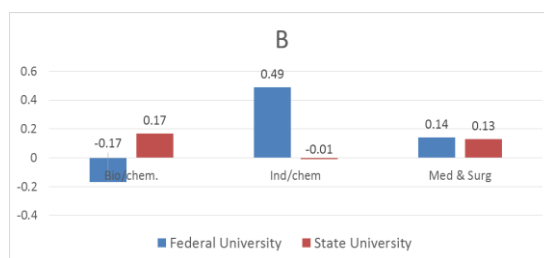
Hypothesis 1:

University matriculation examination (UME) mean scores in chemistry do not significantly predict their mean achievement scores in the first year chemistry-based courses in public university (Figures 3a-j)
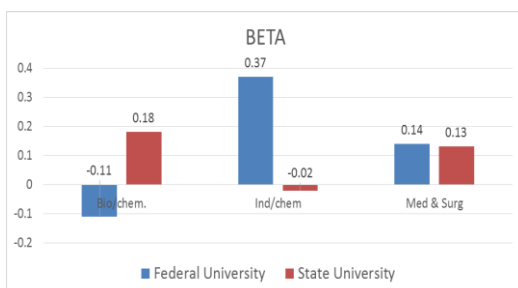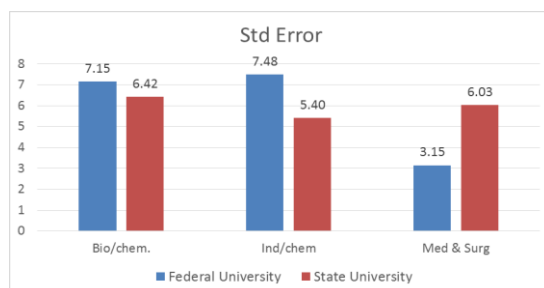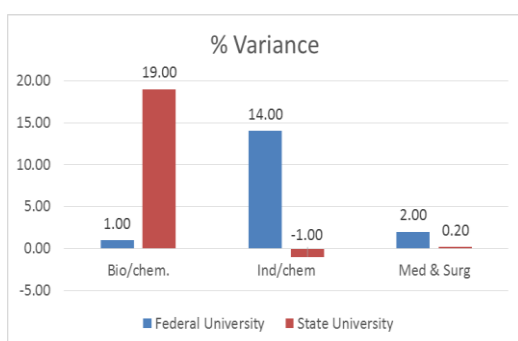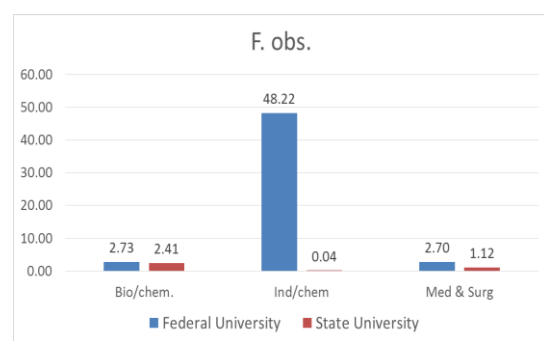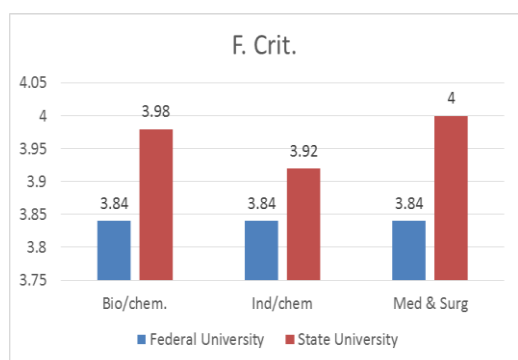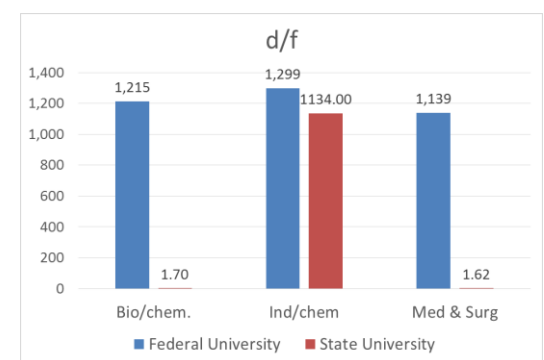

(a)

(b)
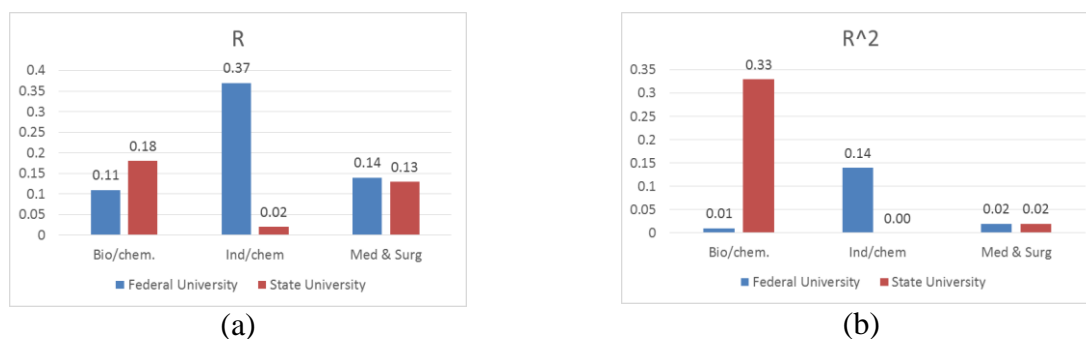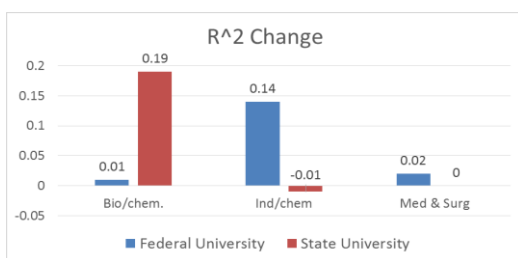
Figure 3: Regression analysis of UME chemistry on academic achievement in 1st year chemistry-based courses in the Federal and State Universities in Enugu state, Nigeria

For the students in biochemistry department in a federal university as indicated (Figure 3), the UME score in chemistry had R^2 change of 0.01. This implies that UME scores in chemistry had a predictive power of 1.0% for their achievement in first year biochemistry courses for combined 2007/8 and 2008/9 sessions. The observed F-value is shown to be 2.73. While the critical F-value for 1 and 215 degrees of freedom for both the numerator and denominator at 0.05% level of significance 3.84. Since the observed F-value is less than the critical F-value, the contribution variance of 1.0% to the achievement of students in Biochemistry is not the actual contribution of chemistry but may be attributed to variance error and other intervening variables that could not be controlled. Therefore, the null hypothesis of no significant prediction in respect of the performance in biochemistry by UME chemistry scores is not rejected. That is to say that UME chemistry scores is not a significant predictor of the result of students in biochemistry department.

For the students in pure and industrial chemistry course in a Federal university (Figure 3), the UME scores in chemistry had the R^2 change of 0.14. This indicates that the UME scores in chemistry had a predictive power of 14.0% for their achievement in first year industrial chemistry for combined 2007/8 and 2008/9 sessions. The observed F-value for the UME scores in chemistry is shown to be 48.22 while the critical F-value for 1 and 299 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 14.0 % to the achievement of students in industrial chemistry is the actual contribution of chemistry score and not due to chance error. Therefore, the null hypothesis of no significant prediction in respect of the performance in pure and industrial chemistry by UME chemistry scores is not accepted. This means that UME chemistry scores is a significant predictor of the result of students in industrial chemistry department.

As shown in Figure 3, students in medicine and surgery course in a federal university, the R^2 change for UME score in chemistry is shown to be 0.02. This shows that UME scores in chemistry had a predictive power of 2.00% for their achievement in first year medicine and surgery course for combined 2007/8 and 2008/9 sessions. The observed F- value for UME scores in chemistry is shown to be 2.70. While the critical F-value is 3.84 for 1 and 139 degrees of freedom for the numerator and denominator at 0.05% level of significance. Since the observed F-value is less than the critical F-value, the contribution of variance of 2.00% to the achievement of students in medicine and surgery is not significant.

Thus, the null hypothesis of no significant prediction in respect of the performance in medicine and surgery by the UME scores in chemistry is not rejected. That means that UME chemistry scores do not significantly predict the result of students in medicine and surgery departments**.**

For the students in biochemistry department in a state university (Figure 3), the UME scores in chemistry had R^2 change of 0.19 which is an indication of a predictive power of 19.00% for their achievement in the first year biochemistry. The observed F-Value for the UME scores in chemistry is shown to be 2.41. While the critical F-value for 1 and 70 degrees of freedom for the numerator and denominator at 0.05 level of significant is 3.98. Since the observed F-value is less

than the critical F- value, the aspect of the null hypothesis in respect of the prediction performance in biochemistry by UME chemistry scores is not rejected. That is to say that the UME scores in chemistry do not significantly predict students' performance in biochemistry. That means that the variance contribution of 19.00% of UME scores to the students' score in biochemistry is not the actual contribution of chemistry score but that attributed to error.

For the students in pure and industrial chemistry in state University (Figure 3), the UME score in chemistry had R^2 change of -0.01. This indicates that UME scores in chemistry had a predictive power of -1.0% for their achievement in first year industrial chemistry course. The observed F-value for the UME score in chemistry is shown to be 0.04 while the critical F-value for 1 and 134 degrees of freedom for the numerator and denominator at 0.05% level of significant is 3.92. Since the observed F-value is less than the critical F-value, the aspect of the null hypothesis in respect of the prediction performance in pure and industrial chemistry by UME chemistry scores is not rejected. In other words, the UME scores in chemistry do not significantly predict students' performance in industrial chemistry. That means that the variance contribution of -1.0% of UME score to the students score in pure and industrial chemistry is not the actual contribution of chemistry but that due to error and other intervening variables.

In Figure 3, the UME scores for students in medicine and surgery department in State University shows that chemistry had R^2 change of 0.002 with a predictive power of 0.20% for achievement in first year (freshman) for medicine and surgery department. The observed F-Value for the UME score in chemistry is shown to be 1.12 and the critical F-value for 1 and 62 degrees of freedom for both the numerator and denominator at 0.05% level of significance 4.00. Since the observed F-value is less than the critical F-value, the null hypothesis of no significant prediction in respect of the performance in medicine and surgery is not rejected. That means that UME chemistry does not significantly predict the result of students in medicine and Surgery department. Therefore, the variance contribution of 0.20% of UME score to the students' scores in medicine and surgery is not significant. Thus, the UME scores in chemistry do not significantly predict students' performance in medicine surgery.

Flowing from the foregoing, it is certain that for federal universities, UME chemistry significantly predicted the students first year results in industrial chemistry program indicating that the null hypothesis is rejected. But UME chemistry did not predict significantly the students' first year (freshman) result in biochemistry, medicine and Surgery courses. Therefore the null hypothesis is accepted. For the state universities, the UME chemistry did not predict the students' first year results in any of the departments. This implies that the null hypothesis is accepted for all the departments studied in state University.

Discussion of Results

The result of the study with respect to the relationship between UME-chemistry scores and first year result of students' in biochemistry, medicine and surgery courses in Federal and State Universities indicate no significant relationships. This means that students' performance in UME chemistry does not relate with their performance in their first year result in those departments. In contrast, for the industrial chemistry course in Federal University, positive relationships exists between students' UME scores in chemistry and their first year result. This means that weak

performance in students UME result might lead to the corresponding weak performance in their first year result. In state universities, no relationship was found between UME chemistry scores and their first year result in industrial Chemistry. This implies that increased performance in students UME chemistry does not relate with their performance in their first year result and this signifies inconsistency in the examination. From research findings, these results of weak relationship recorded between the UME chemistry and the students first year scores in industrial chemistry, in State University were confirmed by the respective works of the following researchers. Nwokike [48] reported weak correlation between JAMB entrance scores and academics achievements at both National Certificate in Education (NCE) and Polytechnics levels. This is also in conformity with the works of [46], [49], [50] who observed that public examinations poorly predicted student's University achievement in their different schools and programs.

However, the result showed no relationship between UME and first year results of students in medicine, surgery and biochemistry departments and was similar to the work of Aboma [51] who observed that university entrance scores and aptitude test scores were not significant predictors of university grade point average (GPA). The finding was also consistent with [52] who recorded non-significant relationship between JAMB entrance scores and student's first year results. Similarly, entrance qualifications do not significantly predict academic achievement in science [53]. Contrary to the finding, a relatively significant relationship was found between first year cumulative Grade Point Average (CGPA) and UME scores [54].

The plausible explanation for the general poor correlation and no relationship recorded were indications of doubtful criteria used for admission of candidates [55], [56]. This non-significant relationship between UME and University GPA could be attributed to the view that these examinations are one shot examinations being administered every year at one specific moment [51]. The relatively low number of candidates in Nigeria being offered admission annually has caused desperation on the part of the candidates and their parents, in the bid to be among the few admitted. According to the author, this created more anxiety and cheating during and after the examination and also during admission processes and this might interfere with the result of the study.

Coupled with the prevailing malpractices, credit is awarded to wrong or dishonest candidates while the innocent candidates become affected because their performance are weighted against those of dishonest students; thereby giving some students undue advantage in the process [57]. Consequently, many UME JAMB-administered examination results students used as instruments to secure admission into schools and colleges were not legitimately earned [58]. Students who gained admission fraudulently, sometimes, withdraw in their first year due to their inability to cope with the rigorous academic work [5]. Some students eventually take to the exhibition of deviant behavior and some resort to the unleashing of physical violence on innocent students and faculty [10]. If performance of students in public examinations such as the university matriculation examination were not objective due to irregularities and quality issues within the system, the quality of output being measured becomes questionable [59].

Conclusion

On the basis of the findings of this study, university matriculation examination (UME) in chemistry does not correlate with a student's first year (freshman) results in biochemistry and medicine and surgery courses in both federal university and State Universities in Nigeria. Therefore, it is a weak predictor of student's first year results performance in industrial chemistry course in State University. Furthermore, UME chemistry performance is not a true reflection of a candidates' first year (freshman) courses and this questions the credibility of UME results in the admission of students into the affected departments in public Universities.

Educational Implications of the Study

The study has brought to the knowledge of chemistry Educators in tertiary institutions, school administrators and examination bodies about the mismatch on the result of the present study for different departments in the same university and also in different universities. It is an indication that university matriculation examination (UME) chemistry was not a true reflection of the candidates' ability to do well in their chemistry based courses as a freshman in the university. This calls for an education summit which will bring all the stakeholders in education, JAMB officials, education commissioners and ministers at both the federal, state and local levels, education supervisors, examiners and academic faculty to discuss the fundamental framework for conducting a fair and credible university tertiary matriculation examination (UTME).

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