

Full Length Research Paper

Predictive power of two selection examination scores on senior school certificate examination result of pre-degree science students of Benue State University, Makurdi, Nigeria

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This study examined the predictive power of two selection examination scores on Senior School Certificate Examination (SSCE) result of pre-degree science students of Benue State University Makurdi-Nigeria with a view to seeking alternative to multiple selection examinations. Out of 1240 candidates that came in for Preliminary Science programme for 2007/2008 session, only 380 passed (that is, a minimum of C grade in the five subjects- English, Mathematics, Biology, Chemistry and Physics). Of this number, 220 had records for Mathematics and Physics in SSCE and therefore form the sample for the study and total of 38 entered for UME Mathematics. Three standard examination results in Mathematics and Physics were used for analysis in this study with SSCE as dependent (criterion) variable and Prelim and UME scores as independent (predictor) variables. Scores from the three examinations were collated and used for analyses. The examinations were considered reliable and valid based on the fact that they were set by experts, subjected to necessary test conditions and had consistent records of good standard. Using multiple regression for analysis, it was found that Prelim and UME Mathematics did not significantly predict SSCE Mathematics, $F_{2, 38} = 1.278$, $p > 0.05$. While Prelim Physics and UME Physics significantly predicted SSCE Physics ($F_{2, 209} = 3.789$, $p < 0.05$), the same could not significantly predict SSCE Mathematics ($F_{2, 210} = 2.745$, $p > 0.05$). It was recommended among others that the current selection examinations be improved upon through strict supervision especially UME to guarantee their public acceptance and credibility.

Key words: Selection examination, predictive power, preliminary science, examination malpractice, standard.

INTRODUCTION

Evaluation in schools is basically for two purposes. It is either for formative or summative purpose. Traditionally evaluation has been taken to mean measuring students' achievement in a particular branch of school learning. It has been equally used interchangeably with the term assessment but it is more comprehensive and inclusive than measurement and assessment and may not be based on measurement (Okpala and Onocha, 1994). However, sometimes the evaluation role could be slighted if the circumstances surrounding the examinations send in fear or doubt. Cardinal among such

circumstances is examination malpractice which manifests in the students later as they further their education or even results in unusual performance to the extent that the trend established is truncated.

In school setting, emphasis is placed highly on the outcome of the examination (termly/yearly and end of course) which is a reflection of the cognitive aspect of their learning as the evaluation mode. Energy will not be dissipated to examine the incomprehensiveness of the evaluation mode but rather examine the extent to which one can rely on the examination results. Examination in broad perspective is an instrument for testing, assessment, evaluation and accreditation. It is used for the purpose of selection, placement, certification and promotion. Thus schools, factories and industries and in

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every human endeavour, examination is a potent instrument for the judgement of knowledge or competence. For any examination to be credible, it must possess key elements which are validity and reliability. These key elements can only be present if the examination is free and fair, devoid of partiality, cheating and all sorts of malpractice (Liman, 2006). Records abound that examination malpractice is a threat to survival of education in Nigeria (Laha, 2008; Akoja and Onwuegbuna, 2008).

All examinations are guided by a code of ethics, translated into rules and regulations. Therefore any unethical action that could lead to flouting of these rules and regulations constitute examination malpractice. Worldwide, examination malpractice is seen as an academic crime committed before, during and after an examination by means contrary to what is required for the realization of the purpose for conducting any examination. Maduabum (2001) and Afikbo (1997) define examination malpractice as any wrong doing committed before, during and after an examination which tends to jeopardize the creditability of the certificates issued. It is the fear of suspected examination malpractice over the years as most candidates who come in with high grades could not defend them on entry into the university in addition to other numerous reasons that necessitates the introduction of Joint Admission and Matriculation Board (JAMB).

Joint admission and matriculation board (JAMB) came on board in Nigeria in 1977 and was legally supported by Act no. 2 of 1978 with the intention to harmonise admission into all Universities in Nigeria. One of the reasons behind such decision was to avoid the problem of multiple application and admission to candidates. Secondly, instead of spending much to buy many forms, one form could serve the same purpose though with choice restricted to three universities then and presently only two. Before and even during this period, one's result in Ordinary level (Say West African Examination Council-WAEC) an equivalent of Senior School Certificate Examination (SSCE) was the only basis for selection. With JAMB introduced, it in turn introduced University Matriculation Examination (UME) as a basis for selection in addition to having the required O' level (5 credits including English and Mathematics and three science subjects at not more than two sittings). Recently, precisely in 2005 Post UME screening tests was introduced by almost all universities in Nigeria. Therefore for one to be admitted into any Nigeria Universities, it is the consideration of Post UME screening test, UME score in addition to O' Level results.

This sends fear into many people as the number of examinations required for one to be placed is on the increase and off-course payments is made at each stage which contradicts the purpose for introducing JAMB in 1977. One wonders if solution to how to select quality candidates into universities in Nigeria could come from

the current practice with more and more examinations introduced. For instance, most universities in Nigeria have introduced Pre-degree programme for the sciences and other dry areas to compensate for quality science candidates for science and science related courses. Rather than being an outlet for those with deficiency in O' level results, many candidates see it as a cheap means of entering into the universities and therefore patronise it heavily even when they have no deficiency.

One obvious strategy that appears neglected is to examine these results obtained by a candidate at different stages for the same placement –WAEC/NECO (hereafter referred to as SSCE result), UME, Post UME Screening test and Pre-degree results in some science subjects that performance has been on the decline generally (Kurumeh and Achor, 2008; Samba et al., 2010; Achor et al., 2009). Mathematics and physics are always put together because of some assumed relationship between them- looking fairly abstract, both involving calculations; both are necessary as subject requirements for entry into universities (example, all Engineering courses). Relationship between the two subjects has been established in previous studies in Nigeria (Kurumeh and Achor, 2008; Ayodele, 2005; Babalola, 1979; Ojerinde, 1975) and elsewhere (Kim, 2007; Strokking, 2000; Woolnough, 1994). Hakkinen (2004) found that initial entry points based on past performance in senior secondary school was a good predictor of study credits at university in all fields. The author concluded that grade point average from previous school and aptitude test scores provide the best forecast of success whether the success is measured as grades or completion of higher education. Outside Nigeria, Kim (2007) in the study on predicting students' first semester achievement in a Graduate Entry Dental School in Korea found that undergraduate grade points average (GPAs) and science scores from standardized aptitude tests were highly correlated with academic performance in preclinical years of students.

Benue State University which was established in 1992 has been on the queue with other universities in Nigeria searching for qualitative candidates. At the moment students who come into the university as UME candidates write UME, Post UME screening test in addition to their Senior School Certificate Examination (SSCE) results. Notwithstanding majority who are qualified but could not be placed in Sciences, Vocational and Technical Education and French come in for one year pre-degree programme called preliminary studies. For the sciences the preliminary science programme is for one calendar year intended to brush up the candidates to do well in UME, Post UME screening test and improve their knowledge of the four science subjects (that is Biology, Chemistry, Physics, and Mathematics) and English Language. As part of the cross over requirements, all preliminary science students must score a minimum of 50% (credit pass level) in each of these

five subjects before they can be placed. This examination is regarded as standard examination by the University authority by the way students are taught, examined, supervised as well as the manner in which questions are set and marked.

Rather than attempt all these examinations, the puzzle is, are there no other way of using scores in some of these examinations for selection without necessarily making them write all? For instance, with SSCE results, UME and pre-degree results it should be possible to ascertain the quality of intakes without necessarily having to write post UME screening test again. However, such decisions could only be taken based on empirical evidence which at the moment is scarce in Nigeria in general and Benue State University in particular. For instance, in Benue State University, there are no records to show the predictability of one result on another or how related these examination results are. It is assumed in this paper that since some of the examinations went through strict supervision and other necessary conditions that could guarantee valid and reliable results, if there is a strong relationship between the results, it means putting two of such examinations together could be sufficient to place such individuals without necessarily increasing the number of placement/selection examinations. This is precisely the concern of this present study.

FEEDBACK AND PUBLIC OPINION ON UNIVERSITY SELECTION EXAMINATIONS

This paper is anchored on Gestalt Stimulus-Response (S-R) theory. According to Mukherjee (1978) learners react in response to a source of stimulus. By implication whatever that is introduced into the educational system will produce effect (either negative or positive). Thus as candidates write examinations, the motivating factor therefore is good result (say 5 credits including Mathematics and English), meeting the respective university cut off point for admission, being selected for admission either on merit level or catchment area level. In a view to attain this, parents and candidates strategise yearly to improve their performance to earn them admission and some have even made up to five attempts but to no avail. This then brings desperation and unnecessary anxiety. It is this desperation and unwarranted anxiety that breeds examination malpractice as one of the strategies (though negative) to succeed. The Board conducted the first matriculation examination for entry into all degree awarding institutions in Nigeria in 1978 (JAMB, 2006). Since then there have been various public opinions on the selection examinations and one wonders what positive or negative impacts these views or opinions could have made on the nation and subsequent examinations.

Since 2000 these awarding degree institutions have

lost confidence in the UME scores and have complained about the poor performance of students in their first year university examinations though admitted with high UME scores. This culminated into the current practice of making candidates to write post UME screening tests in their respective universities of choice. This is not the only time Nigerians are complaining about outcome of public examinations. For instance, it is a similar complaint that brought about national examination council (NECO) in 1999 to supplement West African Examination Council (WAEC) though it appears that the ulterior motive was to break the monopoly being enjoyed by WAEC. For instance, Daniel (2005a) says that in 1999 with the creation of NECO to conduct the SSCE side by side the WAEC, WAEC lost the monopoly of conducting the examination. According to the Council (NECO, 2001), its creation was necessitated by the perceived inefficiency of WAEC in the handling of SSCE as a result of excessive workload and the practice in other countries of having their own national examination bodies. According to Nwana (1982), WAEC was criticised for problems of increasing number of irregularities, forgery and long delays in releasing results of examinations and these have done a great deal to undermine the confidence people had in the council.

Trying to seek public view about an examination or the extent to which such examinations meet the standard is not a case for developing countries like Nigeria alone. For instance, the QCA Research Team (2002) conducted a survey in England and Wales. Using press reports and previous studies on public examinations standards for their analysis, it was found that there was a high level of trust in exam boards and the belief that they took steps to ensure that their public examinations were comparable. However, there was no clear consensus among students and teachers about whether current qualifications were more or less valuable than those of the past. In Nigeria, Daniel (2005b) found that people tend to attach significantly different values, attitude, preferences and interpretations to WASSCE and NECO General Mathematics especially with respect to the perceived quality of their question papers and the worth of their results or certificates. This same situation may be extended to selection examinations of which SSCE (WAEC and NECO) is a major component.

The problem on hand in Nigeria today is the issue of relative confidence of the populace in all the selection examinations. To this, Broadfoot (1980) believes that one of the functions of public examination is providing an unbiased basis for selection and maintaining public confidence in standards, which takes precedence over the educational consequences. Public confidence in the operations and certification of examinations is therefore very important. This must have probably informed Daniel (2005b) to say that public confidence is directly proportional to the measure of acceptability of such examination.

HYPOTHESES

The following hypotheses were tested in this study:

1. UME and Prelim Mathematics scores of pre-degree science students of Benue State University do not significantly predict their SSCE Mathematics scores.
2. UME and Prelim Physics scores of pre-degree science students of Benue State University do not significantly predict their SSCE Physics score.
3. UME and Prelim Physics scores of pre-degree science students of Benue State University do not significantly predict their SSCE Mathematics score

RESEARCH METHODS

Benue State University, Makurdi was purposely selected on the grounds that it met the general requirements such as:

1. Admission of students yearly into Preliminary Science course.
2. Admission of candidates with a minimum of 5 credits at not more than 2 sittings, being the general requirement for University admission in Nigeria.
3. Many of the Prelim Science students are sent back yearly on the grounds of poor performance meaning that those who are not able to make it are detected. Such people though came in with the minimum requirements probably cheated to get the result which they could not defend an indication of the fact that there is standard in the conduct of Prelim Science programme of the University.
4. Adequate lecturers are recruited to handle teaching in the Prelim Science classes.
5. Students admitted through the one year Prelim Science programme come from all the Local Government Areas in Benue State and many other States in Nigeria which gives the present study a wide coverage. Though a State owned University the Prelim Science programme is not restricted to State indigenes only. This gives the present study opportunity for robust generalization.

A total of 1240 students were admitted into the Prelim Science Programme of the University for 2007/2008 academic session. Out of this number only about 380 passed (that is, a minimum of C grade in the five subjects- English, Mathematics, Biology, Chemistry and Physics). Of this number, 220 had records for Mathematics and Physics in SSCE. Therefore the sample for this study is 220. Yet a very few number entered for Mathematics and Physics in UME because they probably considered them as difficult and could affect their score in UME which is used for placement also. For instance, only 38 entered for UME Mathematics.

SSCE and University Matriculation Examination (UME) conducted by JAMB are standard examinations. For instance, WAEC is controlled by countries in West Africa with questions drawn from all the countries into a pool and subjecting them to all psychometric analysis before final selection. UME though controlled by Nigeria alone passes through similar selection criteria and so it is regarded as a standard examination. Preliminary Science results of Benue State University have been consistent over the years. Though the examination questions were not subjected to psychometric analysis, at least 5 lecturers teach a subject and at the end of the semester each of the five of them or more was asked to set many questions which were scrutinized and a few selected for the students. The issue of examination malpractice has always been far from it as all lecturers teaching a subject and even more invigilate the exams, exam materials kept in safe places as well as very short period (maximum of two weeks) given for marking and

return of scripts. They were therefore considered to be valid and reliable to some extent. In all these three examinations only scores were collated and used in analyses for the present study. This is considered adequate as these examinations have been on for some time and all possible loop holes were given adequate attention.

RESULTS

Data for testing hypothesis 1 are contained in Tables 1 and 2. Table 1 reveals that Prelim and UME Mathematics do not significantly predict SSCE Mathematics, $F_{2, 38} = 1.278$, $p > 0.05$. This is because the calculated value is only significant at 29.1% whereas the accepted probability level in this study is 5%. As can be seen from Table 2 however, the Prelim and UME Mathematics contributed very low Beta value. For instance, Prelim Mathematics accounted for only 16.4% while UME Maths could explain 18.4% which is negative. Table 2 equally reveals that both Prelim and UME Maths do not significantly predict SSCE Maths when considered individually too. Table 1 shows that all the 2 independent variables jointly contributed only 6.6% of the total variance in the students' performance in the dependent variable (based on the R^2 value). Data for testing hypothesis 2 are in Tables 3 and 4.

Table 3 reveals that Prelim Physics and UME Physics significantly predicted SSCE Physics, $F_{2, 209} = 3.789$, $p < 0.05$. Further, Table 4 reveals that though the overall relationship was significant, only Prelim Physics was significantly predicted by SSCE Physics but not UME Physics. Accordingly, UME Physics accounted for only 4.6% of the F value while Prelim Physics accounted for 16.8% as shown by the Beta value in Table 4. Here (based on the R^2 value in Table 3) the two independent variables jointly accounted for 3.5% of the total variance in students' performance in the dependent variable (that is SSCE Physics). Data for testing hypothesis 3 are in Tables 5 and 6.

Table 5 shows that Prelim and UME Mathematics did not significantly predict SSCE Mathematics, $F_{2, 210} = 2.745$, $p > 0.05$. Similarly, Table 6 shows that SSCE Mathematics did not significantly predict both Prelim and UME Physics. This is buttressed by the Beta values of 8.5 and 10.9% for Prelim and UME Physics respectively that could account for the variance in SSCE Mathematics. This implies that both contributed poorly to the overall F value. Again, the two independent variables jointly contributed only 2.6% of the total variance in students' performance in the dependent variable as shown by R^2 in Table 5.

DISCUSSION AND IMPLICATIONS OF FINDINGS

A finding of this study has indicated that Preliminary Mathematics and UME Mathematics do not significantly

Table 1. ANOVA of Regression for Prelim and UME Mathematics as predictors of SSCE Mathematics.

Model	Sum of squares	Df	Mean square	F	Significance
Regression	118.286	2	59.143	1.278	0.291
Residual	1666.021	36	46.278		
Total	1784.308	38			

R = 0.257; R Square = 0.066

Table 2. Regression coefficients.

Model	Standardized coefficients, beta	T	Significance
Constant		3.828	0.000
UME Maths	-0.184	-1.045	0.303
Prelim Maths	0.164	1.531	0.135

Table 3. ANOVA of Regression for Prelim Physics and UME Physics as predictors of SSCE Physics.

Model	Sum of squares	Df	Mean square	F	Significance
Regression	1022.533	2	511.266	3.789	.024
Residual	27933.163	207	134.943		
Total	28955.695	209			

R = 0.188; R Square = 0.035

Table 4. Regression coefficients.

Model	Standardized coefficients, beta	t	Sig.
Constant		3.012	0.003
UME Physics	0.046	0.627	0.531
Prelim Physics	0.167	2.295	0.023

Table 5. ANOVA of Regression for SSCE Mathematics as predictor of Prelim Physics and UME Physics.

Model	Sum of squares	Df	Mean square	F	Sig.
Regression	548.229	2	274.115	2.745	0.066
Residual	20755.562	208	99.786		
Total	21303.791	210			

R = 0.160; R Square = 0.026

Table 6. Regression coefficients.

Model	Standardized coefficients, beta	t	Sig.
Constant		4.049	0.000
UME Physics	0.109	1.496	0.136
Prelim Physics	0.085	1.170	0.243

predict SSCE Mathematics. By implication those who enter Benue State University with high grade/score in

SSCE mathematics could not be seen to obtain high grade in their UME mathematics and Prelim Mathematics

examination results. It is expected that since most of the candidates freshly finished from the secondary school, the much they know in mathematics remains the same irrespective of the examination they sat for provided that the questions set is at their level in terms of cognitive demand. This result seems to contradict the earlier results. For instance, Afolabi et al. (2007) reported that O' level score in Physics, Chemistry, Biology and Mathematics with the UME score showed a better correlation with the CGPA and Physiology scores of medical students. To the contrary too, Ojerinde (1975) found that there was a positive and significant relationship between candidate's academic achievement in SSCE and the UME performance of the same set of students and that the SSCE has a fair predictive power on the university achievement. Along the same line, Abdullahi (1983) found that there was a significant and positive relationship between UME score and first year University Examination scores in Physics. While the researchers submit that the two earlier studies (Ojerinde, 1975; Abdullahi, 1983) must have come up at a time that examination malpractice was not at a high level in Nigeria, the sharp departure from what has existed before now is a point of worry. Though that of Afolabi et al., (2007) is a recent study, the quality of students involved in the study (that is, Medical students) could have influenced the results. In Nigeria those who opt to read medicine must have confidence in themselves that they can defend their O' level certificates. Secondly the high cut off UME score used for the discipline often help to exclude those who must have passed their O' level through examination malpractice. A situation whereby students come in with high SSCE result that betrays their UME and Prelim science score in the same subject is worrisome.

It was also found in this study that SSCE Physics significantly predicted Prelim and UME Physics. However, only Prelim Physics made significant contribution. This means that scores of the students in SSCE and Prelim Physics seem to agree (either generally low or high). The strictness in UME supervision is likely to have permitted for a deviation in score. Secondly, after one year of remedial studies in Physics, there is the likelihood that the performance of the students could have improved to match the false (but good) SSCE results they came in with. In general, Abdullahi (1983)'s finding that there was a significant and positive relationship between UME score and first year University Examination scores in Physics is in agreement with this finding.

Prelim Physics and UME Physics could not predict SSCE Mathematics score in this study. Both Prelim and UME Physics did not make significant contributions to the overall result. The long standing assumption of the strong relationship between Mathematics and Physics seems to be debased in the current study. In particular the study contradicts the findings of Ayodele (2005), Babalola

(1979) and Woolnough (1994). It may be difficult to compare results of the present study with any study carried out some 20 or more years ago or elsewhere outside Nigeria. This is probably because the prevailing situations surrounding these examinations were not the same. Any examination result which came from halls that tolerated cheating is therefore doubtful.

This study has some implications for selection examinations into Nigeria Universities especially Benue State University, Makurdi. The three examinations considered in this study do not have significant relationship for both Mathematics and Physics in general. They therefore have very low predictive power. Therefore the predictability of SSCE results in Mathematics and Physics by the UME and Prelim results in the two subjects is not in sight. Until issue of examination malpractice is given adequate attention, this remains a herculean task. Consistently across the three hypotheses UME score seem to stand out. It has not at any point predicted any other result considered in the study. This may be attributed to strict supervision often given to the examination in addition to how the examination materials are handled. Rather than increasing the number of selection examinations, blocking the loopholes in the listed examinations to give them public confidence in the operations and acceptability could be a way out.

CONCLUSION AND RECOMMENDATIONS

This study has shown that Preliminary science students' result and their UME Mathematics scores do not predict SSCE Mathematics result. Similarly, Prelim Physics and UME Physics did not predict SSCE Mathematics. However, Prelim Physics and UME Physics were predicted moderately by SSCE Physics. Most of the findings departed significantly from the findings of previous studies from within and outside Nigeria as Preliminary and UME Mathematics as well as Preliminary and UME Physics have low predictive power on SSCE Mathematics and Physics respectively. It was reasoned that examination malpractice could have given rise to the sharp departure from previous findings.

It is certain that continuous increase in the number of selection examinations in Nigeria may not be a solution to the current problem. It is therefore recommended that:

1. Since UME conducted by JAMB appears to stand out, the supervision could be reinforced to give credit to the result obtained. The fact that from previous studies (especially those conducted over 20 years ago and outside Nigeria) it is found that strong and positive relationships exist between the same subjects presupposes that something went wrong along the way and once such problem is addressed the result could become dependable.
2. The current Preliminary science programme being run

by Benue State University is merely a way of creating opportunity for those who could not enter because of the high UME cut off point. Such students come in for the programme and once they are able to make at least a C grade in the entire five subjects and score up to 180 points (sometimes even 160 out of 400) in UME instead of 200 and above for other candidates, their admission is guaranteed. Since such students on the average with lower UME score were used for the present study, the likelihood that it could present a weak point in the findings of the study is there. It is therefore recommended that an extension of the study be made to include students who come into the University through UME. This may give further insight into how to arrest the issue of multiple selection examinations.

3. Until the nation is able to handle the issue of examination malpractice it may be difficult to compare comfortably results and hence analyses based on examinations conducted in Nigeria with that done elsewhere. Deviations from the norm observed in some of the previous studies are pointer to the fact that examination malpractice could have provided grounds for such differences and hence loss of confidence in the selection examinations. As a long term measure emphasis in Nigeria should shift from certificate to actual performance. Benue State University could gradually implement this through annual weeding as is being done currently to remove students who must have found their way in error into the system. Students should get a certain minimum CGPA (cumulative grade point average) at the end of year one to remain in the system.

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