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PREDICTING THE PERFORMANCE IN WASSSCE CHEMISTRY THROUGH MATHEMATICS AND ENGLISH LANGUAGE MOCK RESULTS IN RIVERS STATE

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ABSTRACT

This study was conducted to determine whether the performance of students in West African Senior School Certificate Examination (WASSCE) Chemistry could be predicted from the grade they scored in Mathematics and English at the 2019 Mock Examination. The results of 200 students in five secondary schools in Ahoada East Local Government of Rivers State were collected and analyzed using stepwise multiple regression analysis. Results showed that performances of students in Mathematics could be used to predict results of SSCE Chemistry. The researchers also found out that results in English Language alone had a low predictive value of performances in Chemistry. The researchers however recommended that credit pass in English Language should not be made compulsory for students who would like to study science and applied sciences. Also, mathematics teachers should put in more effort in teaching the subject because of its importance to science in general and technological advancement in particular.

Keywords: Predicting Chemistry performance, Mathematics, English Language, Mock results, Applied Science, SSCE, WASSSCE,

Introduction

Examinations in Nigerian schools dated back to the advent of formal education. The 1887 Education Ordinance made provision for public examinations in schools that have attained the requisite percentage of proficiency (Adesina, 2017). Thus the National Policy of Education (2014) stipulated that all secondary schools should gear their programmes to meet the requirements of examinations being conducted for the Senior School Certificate. The pattern of grading candidates' scores in the examinations is such that the distinction grade is represented by A1 to B3. The credit grade is represented by C4 to C6. The ordinary pass grade is represented by D7 and E8 while the failure grade was represented by F9 (WAEC, 2002). It needs to be mentioned however, that the distinction and credit grades are the only requisite qualifications for admissions into universities in Nigeria and candidates must have at least credit in five subjects including English Language in order to qualify for admission (JAMB, 2020). Thus, examinations occupy a unique position as a measure of quality within the educational system in Nigeria. They

are either internal or public. Internal examinations are the examinations that are set by teachers within a school system like mock (external) examination. These could be in the form of tests and end of term examinations. Public examinations on the other hand, are examinations that are conducted by recognized examining bodies. As such, the examinations such as the Senior Secondary Certificate (SSC) examinations and the Junior Secondary Certificate (JSC) are regarded as external examinations. They are examinations that are designed and organized under specific terms and conditions and are based on norms that were regarded as standards (Salami 1992). They are designed to evaluate performance at the end of a course of study or programme.

In Nigeria, students depending on their relevant levels have to sit for the main terminal examination known as the Senior Secondary School Certificate Examination (SSSCE) conducted by two public examination agencies namely: the West African Examination Council (WAEC) and the National Examination Council (NECO). This is the examination taken by candidates in

their last stage of secondary education, that is, candidates in the third and final year of their secondary education. The West African Senior Secondary School Certificate Examination (WASSCE) administered by WAEC is a type of standardized test conducted for its member countries namely: Ghana, Liberia, Nigeria, Sierra- Leone and The Gambia (West African Examination Council, WAEC, 2016). The academic school-leaving qualification awarded upon successful completion of the examinations is the West African Senior School Certificate (WASSCE). The WAEC was established by law in 1952 with headquarters in Accra, Ghana and national choices in all member countries with the mandate to conduct such examinations and award certificates of comparable standard to those of similar examining authorities, world-wide.

To understand many scientific concepts, many of our students have different problems because of poor background in English Language. There are some cases where passages in English language are translated into vernacular before students could have a very good understanding of the passage. This is confirmed

by the West African Examinations Chief Examiner's report on Senior School Certificate Examination May/June 1997, cited by Adesoji (2018) which states that, "the performances of candidates in English Language has been steadily deteriorating in the recent past" (p.162). The main cause of this downward trend could be traced to poor preparation of candidates by the institutions. For instance, the candidates' weaknesses in English Language Part A (essay) include the under-listed.

(i) The inability to spell and punctuate correctly.
(ii) The inability to express ideas correctly in English Language.
(iii) Incorrect grammar.
(iv) The ignorance of the difference between a sentence and a phrase.
(v) The use of wrong words and immature vocabulary.

English Language is an important tool for effective communication in any educational system. Its mastery is necessary if one must perform well in examinations and in sound reports writing (Ejimaji, 2014).

Poor performance result from students' carelessness, poor study habit, lack of motivation, inappropriate teaching methods, students behaviour, peer group influence, poor home

background, unqualified teachers, or instructional and evaluation process that do not recognize learners' individual differences. Generally, under-achievement in science subjects particularly Chemistry has remained a feature in West African Senior School Certificate Examination (WASSCE) annually (Ejimaji, 2014). The importance of Chemistry in the development of any nation cannot be underrated especially in Nigeria where petroleum and petrochemical activities are the main stay of her national economy. Students' academic performance in the sciences is crucial for national development and the attainment of the Millennium Development Goals.

According to Agbadinuo(2018), Njoku(2017),Jimoh(2014) and Ejimaji(2014), Chemistry performance at tertiary and secondary levels of education has been poor and deplorable over the years, and this does not mean well for a developing nation like Nigeria. Njoku, revealed that between 1980 and 1991, the annual average pass rate at credit level (grade 1-6) in chemistry was 15.41% while absolute failure rate (grade 9) was 61.82%. This was corroborated further by the Chief examiner's reports of 2006 by

the West African Examination Council which showed a high rate of failure of candidates in Chemistry (West African Examination Council, WAEC, 2019).

WASSCE raw mean and standard deviation performance in some science subjects between 2015 -2019 May/June WASSCE

YEAR	SUBJECTS					
	CHEMISTRY		PHYSICS		BIOLOGY	
	Mean	SD	Mean	SD	Mean	SD
2015	31.00	17.30	25.00	11.06 11.14	21.00 10. 86	
2016	22.00	18.11	25.00	10.25	18.50	10.44
2017	38.00	18.28	25.00	09.00	18.50	09.82
2018	35.00	15.65	26.00	09.43	18.00	09.95
2019	36.00	16.52	20.00		19.00	10.85

Source: Waeconline.org (2018)

From, table 1 it is observed that the general mean performance of candidates is low with the highest mean of 38.00 recorded in Chemistry in 2017, and lowest mean of 18.00 recorded in Physics in 2019, one will conclude that there is a general poor performance in the science subjects. According to Francis (2020) out of the total number of students that sat for the May/June 2019 WASSCE, only 26% obtained credit pass in English, Mathematics and three other subjects only, which accounts for

351,981 out of 1,373,009 from the reports it will be noted that in 2018, WASSCE 13.17% of the candidates obtained credit level pass in English Language, Mathematics and three other subjects which represents about 188,443 candidates. According to Okpala (2020) the result of NECO SSCE result in 2019 May/June only 10% of the 1.8 million candidates had five credits including English Language and Mathematics while the results of thirty two thousand four hundred and fifteen (321,415) were cancelled for alleged examination malpractices (Ejimaji 2014).

Secondary education in Nigeria is associated with a declining trend in students, enrolment and achievement in Chemistry (Adesoji2018). This situation is not likely peculiar to Nigeria as it depicts the general trend world-wide. Also it could be observed from general reports that beside lack of knowledge of the subject Chemistry by the candidates there are problems of English language and Mathematics. From the foregoing, it is speculated whether ability of students in Chemistry could be predicted from their knowledge of English Language and Mathematics.

Purpose of the Study

The study was carried out to determine whether one could predict performance of students in Chemistry from their grades in English Language and Mathematics at the 2019 mock examination results in Rivers State. Specifically, the study was put together to: i. investigate the extent of positive relationship between English Language, Mathematics and Chemistry scores; ii. identify the independent variable (English Language and Mathematics) in mock examination that better predicts performance in Senior School Certificate Examination (SSCE) Chemistry.

Research Questions

The following research questions were formulated based on the purpose of study:

1. To what extent is there positive relationship between English Language, Mathematics and Chemistry?
2. Which of the independent variables (English Language and Mathematics) better predicts performance in West African Senior School Certificate Examination (SSCE) Chemistry?

Hypothesis

One null hypothesis was formulated and tested at 0.05 level of significance.

1. There is no significant positive relationship between English Language and Chemistry performance in mock examination.

Methodology

The research Design of the study is causal comparative (expost facto), this is because data required was collected from existing Senior Secondary Schools, records and does not require the manipulation of independent variables (Ejimaji &Ellah, 2009, kpolovie, 2010).The population of the study consists of all the Senior Secondary School Certificate (SSCE) students that offered Chemistry, English Language and Mathematics in 2019 May/June West African Examination Council Examination conducted in Rivers State with sample size of five hundred and twenty (520) students selected through purposive sampling technique from the Senior Secondary Schools in Ahoada East Local Government Area.

The instrument for data collection was a form designed by the researcher to enable him collect the West African Senior Secondary School Certificates Results of candidates in the 2019 academic year and their mock results in English Language and Mathematics of the same year in the selected Senior Secondary Schools. The results were collected for analysis using multiple regressions to determine the inter-correlation among the two independent variables

(English Language and Mathematics) and the dependent variable Senior Secondary School Certificate grades in Chemistry.

Results

Table 2

Correlation matrices of the Three Variables

	Chemistry	English Lang.	Mathematics
Chemistry	1.0000	0.7691	0.8998
English Language	0.7691	1.0000	0.7691
Mathematics	0.8998	0.7691	1.0000

n= 520

Table 2 shows the correlation matrices of the three variables (Chemistry, English Language and Mathematics) in the present

study. The pairs of variables (English Language = 0.7691; Mathematics = 0.8998) with large correlation coefficients had strong positive relationship with each other.

Table 3

Effect of the Independent Variables (Mock Results in English and Mathematics) on Students' Performance in SSCE Chemistry.

Independent Variable:	B	SE.B	Beta	t	Sig
Mathematics:	0.7361	0.1510	0.8730	4.6600	0.0000*
English Language	0.0154	0.1762	0.0150	0.0773	0.9140**
(Constant)	2.1131	0.2015		9.6730	0.0000

*Significant at P<0.05; not significant at P<0.05**

Discussion

It could be observed from the result in the Table 3 that the partial correlation coefficient (B) for English language has a t-value which is statistically not significant (probability exceeds 0.05). The regression equation derivable from the3 is: Y = 2.1131 + 0.0154 (English Language) + 0.7361 (Mathematics).

Where Y = SSCE Chemistry result
X = Mock result of Mathematics
Y = 2.1131 + 0.7361X

Table 4

Effects of Mathematics on student's performance in SSCE Chemistry

Multiple R	Adjusted R	R^2	SE	*t*	Sig t
0.8998	0.8294	0.8211	0.9341	3.2110	0.9100*

*Not Significant at P<0.05

Table 4 indicates the multiple regression correlation of Chemistry result with weighted combination of English Language and Mathematics The multiple R (MR=0.8998), the Adjusted R (Adj.R=0.8294), R Squared (R^2=0.82), while the standard error (SE=0.9341). The *p* value for the regression coefficient indicates whether the relationship between the independent and dependent variables is statistically significant. The independent variables accounted for 82.0% of the variance of the dependent variable (R^2=0.82). The remaining 18% is to be the residual and this could be due to error and other factors not investigated. The significant t-value (0.9100) derived from the regression analysis greater than 0.05, hence, the researchers accept the hypothesis upholding that there is no significant strong relationship between English Language and Chemistry performance in mock examination. The

estimated regression coefficient indicates the direction and strength of the relationship or association between the independent and dependent variables.

Discussion

The findings of the study indicated that students' results in Mathematics could be used to predict their result in Chemistry. The results in English language were found to be irrelevant as far as predicting student's result in Chemistry is concerned. It is an established fact that Mathematics is very useful for the understanding of the physical sciences such as Chemistry and Physics. This finding has also challenged the undue importance laid on English Language in the area of applied science.

The results further corroborate the fact that it was mathematics that could be used to predict students result in Chemistry SSCE. The R^2 value obtained after removing English language showed no difference when the two independent variables (English language and Mathematics) were used in the equation. This simply means that English language does not contribute to the variance of the dependent variable (Chemistry).

Although the performance level was low in the examinations thereby supporting earlier findings (Adesoji, 2018; Njoku, 2017), the performance varied considerably form one subject to another. The findings tend to agree with those of some previous researchers (Ejimaji, 2014;

Jimoh, 2014). The findings were at variance with the findings made by Afolabi and Adewolu (1998) who reported that the Osun State JSC examination is a poor predictor of students in the SSC examinations. The findings indicating that performance in Mathematics mock exams better predicted performance in SSCE Chemistry was however, contrary to the findings made by Agbadinuo (2018) who reported that the JSC Integrated Science could not singly predict the performance of students at the SSC Chemistry and Biology. The findings indicating that the English Language was not a good predictor of performance in SSCE Chemistry negated the findings made by Bello (2019) who claimed that English Language examination was a good predictor of performance at the SSCE Chemistry in secondary schools in Ekiti State, Nigeria. The findings however agreed with the

findings made by Agbadinuo (2018) that the JSS English Language is the best predictor of performance in the SSC English Language. It was however, noticed that multiple regression revealed more about the variables and their relationship with students' credit performance in the SSCE examinations. This might be due to the fact that multiple regression provides an estimate of the variance in the criterion variable accounted for by the predictor variables.

Conclusion

In clear terms, it is obvious that the positive relationship between English Language, Mathematics and Chemistry as examined was high. Also, the independent variable that better predicted performance in SSCE Chemistry is Mathematics; a high predictive strength. It should be realized that scientific facts and principles do not require the knowledge laws governing grammar before one could understand them. Simply put, linear and logistic regression are useful tools for appreciating the relationship between predictor/explanatory and outcome variables for continuous and dichotomous outcomes, respectively, that can be applied in

educational research practice, such as to gain an understanding of predictions based on the academic performance of students.

Recommendations

(1) Based on the findings it should not be mandatory for science and applied science students to obtain a credit pass in English language at SSCE level before being admitted into the Institutions of higher learning.

(2) Mathematics teachers should put in more effort in the teaching of the subject because of its importance to science and consequently for technological development.

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