Junior Secondary Basic Science performance as Predictor of Senior Secondary Biology performance in Public Secondary Schools In Portharcourt Metropolis

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Abstract

The study investigated if Junior School Certificate Examination (JSCE) results in Basic Science would Predict Senior School Certificate Examination (SSCE) results in Biology in public secondary schools in Port Harcourt Metropolis. The study employed both ex-post facto and correlation designs. A sample of 593 students (303 males and 290 females) was used for the study. Purposive sampling technique was used to select the sample (made up of only students who sat for 2011 JSCE and 2014 SSCE in public schools in Port Harcourt Metropolis of Rivers State). Three hypotheses were tested at .05 level of significance. Data was collected using students Grade chart (SGC) Inventory form. Data was analysed using simple regression analysis. The findings of the study showed that JSCE Basic Science is not a potent predictor of SSCE Biology performance ($\beta = 0.030$, $P > .05$). Also, gender of students who took the JSCE Basic Science had no significant prediction on SSCE Biology performance (Female $\beta = -0.016$, $P > .05$; Male $\beta = 0.066$, $P > .05$). It was recommended that JSCE Basic Science curriculum be reviewed to be in conformity with the SSCE syllabus for science subjects (Biology) in order to enhance its predictive validity.

Keywords: Predictor, Basic Science, Biology

Introduction

Education as a process of teaching and learning involves several processes to achieve its broad goal of producing literate minds. However, education in the field of science trains a person to become scientifically literate, and this begins with Basic Science or Integrated Science in the junior secondary level which later separate into science subjects (Biology, Chemistry and Physics) at the senior secondary level. The whole idea of integration in science is to show the unity, wholeness and interrelationship of the distinct subjects that make up the broader field of science. This interdisciplinary curriculum approach allows the learner to see the concepts and the methodological principles which unites the separate subject matters, thus, harmonizing the knowledge derived from the integration (Brown, 1977; UNESCO-UNICEF, 1971). This approach gives the learner a firm foundation in science which enables him/her to proceed to the separate science subjects such as Biology, Chemistry etc. Biology is of particular interest to this study. It is the science of life or living things in all its forms with reference to its origin, structure, growth, reproduction and behaviour.

Learning without evaluation through tests (internal and external) may be wasteful and ineffective in achieving its broad and specific objectives. This is why test is used to measure the learning that has taken place in a particular subject. Therefore, test is the hallmark of educational achievement and may be conducted by internal or external bodies. Examining bodies are authorities or boards that conduct examination; they are responsible for constructing or developing the test, administering, scoring and publishing the results (Asuru, 2015). Within the school, internal examinations are handled by teachers while external examinations are conducted by external examining bodies such as State Ministry of Education (SMoE) and West Africa Examination Council (WAEC) etc. Some of the examinations conducted by external bodies include; JSCE, SSCE, General Certificate Examination etc.

Junior Secondary Certificate Examination (JSCE) in Basic Science is an external examination (in Nigeria) written by students who have completed their ninth year of basic education (i.e. JSS III or Basic 9) in the field of Basic Science. The JSCE is used for selection or enrolment of students into Senior School (SSI) in Nigeria while, SSCE Biology is an external examination written by students who have completed their senior secondary school education (SS3) in Biology. .

JSCE Basic Science and SSCE Biology are achievement tests; which is a test of ability that determines the extent or degree of success in some past learning activity (Asuk, 2012). Achievement tests are administered after students have undergone some training on a specified curriculum or syllabus. It is worthy to note that a test serves several functions; it is used for prediction, selection, evaluation, placement etc. Relevant to discussion in this study is the use of test for the purpose of prediction. Orluwene (2012) stated that results of tests are used to forecast how well an individual will perform in future tasks. This feature of a test is called "predictive validity." In elaborate terms Kpolovie (2014) averred that predictive validity is a situation in which a stated interval occurs between the predictor (initial test) and criterion tests (later test).Performance in the test (predictor) is correlated with performance at a later period (criterion) and the resultant correlation known as "predictive–validity coefficient." Here, the JSCE Basic Science is the 'predictor' while SSCE Biology is the 'criterion' which occurs after an interval of three years.

The general performance of students in WAEC has been drastically low. The figures below show the percentage performance of students from 2012-2015:

Year	%pass
2012	38.81
2013	38.30
2014	31.28
2015	38.68

Source: WAEC (Compiled from Newspaper Dailies)

While academic performance in sciences (Biology, Chemistry and Physics) has witnessed a consistently high percentage of failure; the situation is worse for Biology as submitted by Olatoye (2002), and this is probably because some of those who take it are non-science students who may not need it for further study as opined by Salim (2000). Unlike the SSCE, students' academic achievement in JSCE conducted by the Rivers State Ministry of Education has been very encouraging; the JSCE performance for 2011 which was used for this study recorded an 87.0% pass. Consequently, researchers have embarked on series of studies to address the issue of poor SSCE results using different variables.

Ahmadu and Amuda (2015) worked on "Predictive Validity of Teacher Made Tests in Relation to Students' Performance in SSCE Sciences in Maiduguri Secondary Schools of Borno State, Nigeria." Data were collected through inventory from a sample of 188 students selected purposively from 10 secondary schools (three public and seven private schools) the data collected were analysed using correlational analysis (Pearson product moment correlation). The results showed that teacher made test is a good predictor of SSCE sciences and that good performance in teacher made test will lead to good performance in SSCE sciences and vice versa.

Elishama (2014)also conducted a study on the "Predictive Validity of JSCE on SSCE in Yola South Local Government of Adamawa State." Data was collected through the Secondary Schools Academic Performance Inventory (SSAPI) from a sample of 665 students selected from five secondary schools through stratified random sampling technique. Data collected were analysed using percentages, z-test and correlation. The predictive variables were 2010 JSCE scores in English, Mathematics, Agricultural Science, Hausa Language, Social Studies and Integrated Science; while the criterion variables were 2013 SSCE scores in English, Mathematics, Agricultural Science, Hausa Language, Government, Chemistry and Biology. The findings showed that JSCE is a poor predictor of performance in SSCE. It also revealed that Integrated Science (Basic Science)

could not effectively predict the performance in SSCE Chemistry and Biology. The above works differ from the present study in the following: target population, different predictor variables and geographic location of study (South South).

With the divergent results of several researchers on the predictive ability of JSCE (and its subjects) on SSCE achievement and the increasing prevalence of poor performances in external examination (especially in SSCE), it has become necessary to study "JSCE Basic Science as a Predictor of SSCE Biology Performance in public Secondary Schools in Port Harcourt Metropolis."

Statement of the Problem

The dismal performance of students in Senior School Certificate Examination (SSCE) conducted by WAEC in the field of science has become a major concern, especially in Biology. This is revealed in WAEC report of student's percentage performance from 2012-2015. It has been observed that students have been having excellent gradesin JSCE and have been consequently admitted into the senior secondary school. This occurrence raises questions on the validity of the JSCE subjects as a yardstick to assess students' capability to cope effectively with related discipline in the senior secondary level. Therefore, it is pertinent to study "performance in JSCE Basic Science as a Predictor of SSCE Biology Performance in public Secondary Schools in Port Harcourt Metropolis.

Hypotheses

The following hypotheses were postulated for the study. These hypotheses were tested at 0.05 level of significance.

Ho_1: Students' JSCE Basic Science performance does not significantly predict their SSCE Biology performance.

Ho_2: Female students' performance in JSCE Basic Science does not significantly predict their SSCE Biology performance.

Ho_3: Male students' performance in JSCE Basic Science does not significantly predict their SSCE Biology performance.

Methodology

The study employed ex-post facto and correlational research designs. It was ex-post facto because the study was carried out after the events had taken place and data was already in existence (i.e. there was no manipulation of data).It also adopted a correlational research design because it was used to determine the degree of association or relationship between two or more variables.This design was used to carry out prediction of the dependent variable (SSCE Biology) by the independent variable (JSCE Basic science).

The population for this study consisted of all the public senior secondary school students who sat for both 2011 JSCE Basic Science and 2014 SSCE Biology in Port Harcourt metropolis. A simple random sampling method was used to select 17 public schools for the study; while, a purposive sampling technique was used to select 593 students (consisting 303 males and 290 females) who sat for both 2011 JSCE Basic Science and 2014 SSCE Biology in Port Harcourt metropolis.

The study made use of a secondary data, which is 2011 JSCE Basic Science and 2014 WASSCE Biology results; and these were collected directly by the researcher from WAEC zonal office in Port Harcourt.

Data collected was analysed using Regression analysis; and all the hypotheses were tested at 0.05 alpha level of significance.

Results

The results of the analysed data for each hypothesis are presented on tables.

Hypothesis 1: Students' JSCE Basic Science performance does not significantly predict their SSCE Biology performance.

Tables 1a &b: Summary of Regression Analysis of Students' JSCE Basic Science on SSCE Biology performance

a) Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	**.030[a]**	**.001**	-.001	10.34995

a. Predictors: (Constant), JSCE BASIC SCIENCE
b. Dependent Variable: SSCEBIO

b) Test of significance of Regression Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	49.089	4.986		9.845	.000
	JSCE BSC	.054	.073	0.030	.731	.465

a. Dependent Variable: SSCEB IO

Tables 1a & b showed that the coefficient R was0.03 and coefficient of determination R^2 was 0.001 (R^2 X 100 equals 0.1%). This implies that only 0.1% of the variance in SSCE Biology performance is explained by their JSCE Basic Science performance. Beta value of 0.03 was not significant at t-value of 0.731, with P > 0.05. Therefore, the null hypothesis was not rejected, meaning that students' performance in Basic Science at JSCE does not predict their performance in Biology at SSCE.

Hypothesis 2: Female students' performance in JSCE Basic Science does not significantly predict their SSCE Biology performance.

Table 2a&b: Summary of Regression Analysis of Female Students' JSCE Basic Science on SSCE Biology performance

a) Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	**.016[a]**	**.000**	-.003	10.58478

a. Predictors: (Constant), JSCE BASIC SCIENCE
b. Dependent Variable: SSCEBIO

b) Test of significance of Regression Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	53.59	7.396		7.246	.000
	JSCE BSC	-.029	.109	**-.016**	**-.269**	**.788**

a. Dependent Variable: SSCEBIO

Tables 2a &b produced a coefficient R of 0.016 and coefficient of determination R^2of0.000 (i.e. 0.0% variance). This means there was no association whatsoever between the female students' performance in SSCE Biology and their performance in JSCE Basic Science. The Beta value of -0.016 was not also significant based on its t-value of -0.269, with P >0.05. Thus, the null hypothesis was not rejected. This means that, female students' performance in JSCE Basic Science did not significantly predict their SSCE Biology performance.

Hypothesis 3: Male students' performance in JSCE Basic Science does not significantly predict their SSCE Biology performance.

Table 3a&b: Summary of Regression Analysis of Male Students' JSCE Basic Science on SSCE Biology performance

a) Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	**.066[a]**	**.004**	.001	10.03764

a. Predictors: (Constant), JSCE BASIC SCIENCE
b. Dependent Variable: SSCEBIO

b) Test of significance of Regression Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	46.203	6.692		6.904	.000
	JSCE BSC	.112	.098	**.066**	**1.141**	**.255**

a. Dependent Variable: SSCEBIO

Tables 3a &b showed that coefficient R was 0.066 and coefficient of determination R^2was0.004 (i.e. 0.4% variance). This means only 0.4% of variance in male students' SSCE Biology performance was accounted for by performance in JSCE Basic Science. The Beta value of 0.066 was not also significant based on its t-value of 1.41, with P >0.05. This means that male students' performance in JSCE Basic Science did not significantly predict their SSCE Biology performance

Discussion

The result showed that performance in JSCE Basic Science was not a significant predictor of SSCE Biology performance. This result is similar to the works of Falaye and Afolabi (2005) and Elishama (2014); both studies revealed that performance in Basic Science did not significantly predict performance in SSCE Biology. The result is surprising because Basic Science lays the foundation of science knowledge in students, which acts as the previous knowledge on which to build subsequent science (higher science) learning. The reason for the similarity maybe because the above studies, just like the current work, used SSCE results of students from public schools.

However, there are several works whose findings are dissimilar to the present study, they include: Udo (2011), Adeyemi (2008), Olatoye and Afuwape (2004), Ayan and Garcia (2008). All these findings support the view that performance in Basic Science is a significant predictor of performance in Biology. The difference in result may be related to the locations in which the studies were carried out, as the works were either done outside the state or outside the country.

The result revealed that only 0.1% (almost zero) of the variance in SSCE Biology was associated with JSCE Basic Science performance. Thus, it can be concluded that performance in JSCE Basic Science is not a significant predictor of SSCE Biology Performance in the target area.

The second and third findings of this study showed that both female and male students' JSCE Basic Science performance did not significantly predict their SSCE Biology performance. This result is in accordance with the work of De Winter and Dodou (2011) and Olatoye and Afuwape (2004), which concluded, from their studies that gender is not a significant predictor of students' later science achievement; as both male and female showed no significant relationship in their science performance.

However, the findings of Kim and Lee (2007) differ from the present work; their study revealed that gender was a predictor of later science achievement with females performing better than their male counterparts. This may be due to the fact that females in foreign countries seem to be more ambitious as they seek to overtake the men, all within the ambit of gender equality.

Conclusion

JSCE Basic Science performance is not a significant predictor of SSCE Biology performance. Both female and male students' JSCE Basic Science performance is not also significant predictors of SSCE Biology performance. The entire result revealed that a significant portion of variance in SSCE Biology performance was accounted for by other variables other than JSCE Basic Science performance.

Recommendations

Based on the findings of the study, the following recommendations were made:

1. Government should provide relevant facilities to enhance science teaching in both the junior and senior secondary level so as to improve teaching and increase SSCE science achievements.
2. JSCE Basic Science curriculum should be reviewed in conformity with the SSCE syllabus for science subjects (Biology) in order to enhance its predictive validity.
3. Government should review the "Education for all" policy which results in mass promotion of students (even those who failed). This discourages hard work on the part of the students.
4. Examining bodies should be thorough in

test administration and scoring to avoid extraneous variables that may influence test scores such as examination practice.

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