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Students' Achievement in Basic Science as Predictor of Achievement in Senior Secondary School Biology in Benue State, Nigeria

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The study examined how students' performance in Basic Science can predict their achievement in Senior Secondary School Biology in Benue State, Nigeria. One key objective was identified to guide the research, which led to the formulation of a research question and a corresponding hypothesis, tested at a 0.05 level of significance. The study employed an Ex-post facto research design, with a population of 6,950 students comprising 4,698 Senior Secondary School Student III (SSS3) students who participated in the 2020 NECO SSCE Biology and 2,252 students who sat for the 2017 NECO BECE. The sample included 881 student results. Data collection was carried out using examination items and a proforma, with the assistance of NECO staff to gather students' scores. The data was analysed using Mean, Standard Deviation, and Pearson Product-Moment Correlation (PPMC) for the research questions, while multiple regression analysis was applied to test the hypothesis at a 0.05 significance level. The findings indicated a low positive correlation between BECE Basic Science scores and NECO SSCE Biology scores, suggesting that the 2017 BECE Basic Science scores did not significantly predict the 2020 NECO SSCE Biology achievement. The study concluded that Basic Science scores do not significantly predict Biology achievement in the NECO SSCE. Based on these results, the study recommended that students' placement in science classes at the senior secondary level should not be solely based on their Basic Science performance in the BECE, as other influencing factors contribute to their achievement in science.

I. Introduction

Secondary education is provided for children after primary education, that is, before tertiary education. It is aimed at developing a child better than at the primary level because

it is obvious that primary education is insufficient for children to acquire literacy, numeracy, and communication skills (Ige, 2011 Yusuf, 2009). Secondary School is divided into two, which are Upper Basic (Junior Secondary School) and Senior Secondary School. The Upper Basic is the first three years of secondary education. The curriculum at this phase is pre-vocational and academic in scope. Core pre-vocational and non-prevocational subjects are included in the curriculum. The core subjects include English Language, Mathematics, French, and a major Nigerian language other than that of Environment, Basic Science, Social Studies, Citizenship Education, and Basic Technology. The pre-vocational subjects include Agricultural Science, Business Studies, Home Economics, Local Crafts, Fine Arts, Computer Education, and Music while the non-prevocational subjects include Religious Knowledge, Physical and Health Education as well as Arabic. Certification at the end of this phase depends on the performance of a student in Continuous Assessment (CA) and the results of the Junior School Certificate Examination (JSCE), being coordinated by State Ministries of Education or the Federal Ministry of Education (if owned by the Federal Government). A student has to sit for the Junior School Certificate Examination (JSCE) at the end of this phase.

However, the academic achievement of students especially at the Secondary School (SS) level is not only a pointer to the effectiveness or otherwise of schools but a major determinant of the future of youths in particular and the nation in general. The medium through which the attainment of individuals and the nation's educational goals can be achieved is through learning and what comes out of it as the outcome. Learning outcomes have become a phenomenon of interest to researchers and this account for the reason why scholars have been working hard to unravel factors that militate against academic achievement (Aremu & Sokan, 2002). Academic Achievement of a Student in one stage of learning should lead to another stage and even predicts what the next should be, it is on the basis that this research seeks to determine if the Achievement of a student in Basic Science at Junior Secondary School would predict their achievement in Science at Senior Secondary School in Benue State, though this can be achieved through the use of assessment scores obtained by the students in junior secondary school.

Assessment in education is regarded as a procedure for obtaining information for making decisions about students, curriculum, programs, and policies. Also, Ojerinde, (2014) viewed assessment as the process of getting information for decision-making. Assessment in education is best described as activities to determine the importance, size, or value of teaching and learning. Assessment is important to provide a picture of curricular goal attainment and quality of instruction. It enables the teacher to gather information about the students' progress, program goals, and objectives as well as the extent to which methods of instruction deployed in the classroom are helping the students achieve these goals.

Assessment is, therefore, an indispensable ingredient, condiment, and tool for determining efficiency at work or play, mastery of delivered instructions, decision making about policy, curriculum, and programme; placing, classifying, managing selecting

promoting, and certifying students' needs to evolve from the most suitable, equitable and reliable method. For any assessment to be able to measure what it sought to measure, the assessment must be valid. Validity refers to the degree of accuracy of an instrument measuring what it ought to measure. This is the evidence and theory that support the interpretations of test scores entailed by proposed uses of tests. There are four main types of validity: face validity, content validity, construct validity, and predictive validity. For this study, predictive validity would be the focus.

Predictive validity is the extent to which previous test scores relate to criterion scores collected at a future time. Predictive validity, therefore, aims at forecasting the future performance of the testee, and for predictive validity to be established between the predictor and the criterion being measured there must be a high degree of relationship between the scores of the predictor and those of the criterion. Callif, (2011) defines predictive validity as the extent to which a score on a scale or test predicts scores on some criterion measure. It is quantified by the correlation coefficient between two sets of paired measurements obtained for the same target population to indicate the degree of a linear relationship between two variables; the predictor variable and criterion variable. Studies on predictive validity provide a framework for establishing the degree of credibility that can be placed on the result of any prior examination which is purported to serve as the predictor variable. According to Awiranti,et al (in Akanbi, (2021), an examination has become the most established yardstick as well as the most practical way of assessing educational aptitude and achievement towards preparing the younger ones to face life challenges and developing them to meet the nation's manpower requirement. Therefore, this study seeks to predict Senior Secondary School Student Performance in Biology using their Junior Secondary Performance in Basic Science.

Basic science is a course of study that is devised and presented in such a way that helps students gain the concept of the fundamental unit of science. The commonality of the approach to scientific problems will enable one gain an understanding of the roles and functions of science in our everyday life and the world in which we live (Sombo et al, 2014).

Basic Science is taught at the upper basic education level to enable students to build up and concretize the knowledge of science they had at the primary school level and to lay the foundation for the study of the core science subjects such as Biology at the senior secondary level of education in Nigeria. Basic Science is an important subject that is taught at the Upper Basic Education level while core science subjects such as Biology, Chemistry, and Physics are taught at the Senior Secondary level. Basic Science is one of the science subjects that express the fundamental unity of scientific thought (Maduabum, 2011). It is expected that by teaching Basic Science to students at the Basic Education level, every Nigerian student would be given the basic knowledge and understanding of what science is all about and some of the innovations that are taking place around them.

Regrettably, there is a public outcry due to poor achievement of students in science subjects such as Biology, Chemistry, and Physics as evidenced by the Chief Examiner's report

of NECO in recent years (Chief Examiner, 2016, 2017, 2018, 2019 & 2020). The Chief Examiner reported that only a few students obtained a minimum of five credits in Biology, Chemistry, and Physics which are considered one of the requirements to study science-related disciplines in tertiary institutions. It is also evident from the Basic Education Certificate Examinations (BECE) results have been poor (NECO, 2016; & BSEB, 2017).

The foregoing implies that a lot still needs to be done to ascertain the mystery behind the unsatisfactory performance of a student. It could be that the problem lies in the process of selection for Science Classes. The abysmal performance of students in the Senior School Certificate Examination (SSCE) conducted by NECO in Biology has become a major concern. Hence, the present study seeks to ascertain Junior Secondary School Students' achievement in science as a predictor of achievement in senior secondary school biology in Benue State, Nigeria.

II. Statement of the Problem

The successful completion of Junior Secondary Education in Nigeria determines students' placement at Senior Secondary school level. Although students Junior Secondary School Certificate Examination results often reflect outstanding academic achievement, particularly in Basic Science, there is a noticeable decline in their achievement when they take science subjects at the Senior Secondary level in Benue State. Academic achievement in Basic Science at Junior Secondary School level serves as a foundation for understanding biological concepts at the senior secondary level. In Nigeria, Biology is a core subject with significant implications for students' career choices in medicine. Nursing, agriculture and related fields, however despite the assumed linkage between Basic Science and Biology there is insufficient empirical evidence on the extent to which achievement in Basic Science predicts success in Senior Secondary School Biology. Many students who perform well in Basic Science are expected to excel in Biology, yet performance trends in Senior Secondary Certificate Examination especially in science subjects suggest inconsistencies.

Factors such as difference in curriculum implementation, teaching methodology, students' interest and learning resources may influence this relationship. Understanding the predictive strength of Basic Science achievement on biology performance is crucial for improving science education outcomes. This study seeks to investigate the extent to which students' achievement scores in 2017 BECE Junior Secondary School in Basic Science predicts their achievement in 2020 NECO Senior Secondary Certificate Examination Achievement in Biology in Benue State.

Research Questions

The following research question and a corresponding hypothesis was used to guide the study:

What is the relationship between 2017 BECE Junior Secondary School Achievement Scores in Basic Science and 2020 NECO SSCE Achievement in Biology?

Research Hypothesis

BECE 2017 Junior Secondary School Students Scores in Basic Science do not significantly predict achievement in 2020 NECO SSCE Biology.

III. Methodology

The research design adopted in this study is ex-post facto design. With a population of 6950 students which comprised 4698 Senior Secondary School Student III (SSS3) who registered and sat for NECO SSCE Biology examinations in the year (2020), and 2252 students who sat for NECO BECE (2017), The population was based on only the school that register for NECO BECE in Benue State. The sample for this study consists of 881 students out of the 6950 who registered and sat 'for BECE (2017) and SSCE (Science Subject) 2020, drawn through multistage sampling technique. The instrument for data collection was a self-constructed Proforma titled "Student Score Retrieval Proforma". The data was analysed using Pearson Product Moment Correlation to answer research question while Regression Analysis was used to test the null hypothesis at a 0.05 level of significance.

Results

Research Question One

What is the relationship between 2017 BECE Junior Secondary School Achievement Scores in Basic Science and 2020 NECO SSCE Achievement in Biology?

Table 1: Pearson correlation of BECE Basic Science score and NECO SSCE Biology score

Pair variable	N	Mean	r.
BECE Basic Science score		34.77	.026
NECO Biology	881	36.24	

N= Total no of students that sat for both SSCE and BECE

Table 1 reveals the relationship between the mean achievement scores of students at JSSCE Basic Science and NECO SSCE Biology, with Mean for BECE is 34.77 and SSCE is 36.24 while r=0.26. This value indicated that there is a low positive correlation (relationship) between BECE Basic Science scores and NECO SSCE Biology of the student.

Test of Hypothesis

Hypothesis One

BECE 2017 Junior Secondary School Students Scores in Basic Science do not significantly predict achievement in 2020 NECO SSCE Biology.

Table 2: Regression analysis of students Basic Science score and NECO SSCE Biology

Model	Sum of Squares	df	Mean Square	F	r.	R square	Adjusted R square	Sig.	Remark
Regression	12.537	1	12.537	.594	0.26	.001	0.000	.441b	NS (Not Significant)
Residual	18542.762	879	12.095						

Total	18555.299	880

P>0.05 Key NS= Not Significant

Table 2 revealed that F-value is 0.594 at df of 880 when P value is 0.441 and alpha (α) 0.05. The result further showed an r value of 0.26, with R squared 0.01. Since (P>0.05) is greater than 0,05, the stated null hypothesis is not rejected. This implied that 2017 BECE Junior Secondary school Scores in Basic Science do not significantly predict achievement in 2020 NECO SSCE Biology.

IV. Discussion

The findings from the results revealed that achievement of students in JSSCE BECE is related to students' achievement in Biology SSCE NECO but did not predict success in later examinations. This finding is in consonant with the findings of Ale and Omolara (2015); Nweze, (2013); Edokpayi and Suleiman, (2011) whose work on predictive validity of one examination on another clearly showed that one examination did not predict the success of the latter. Furthermore, the findings of this present study negate the findings of Jimoh and Adewuni, (2020); Ukozor and Okorie, (2022); Madu and Collins, (2016), and Faleye and Afolobi (2016) these authors in their separate studies found out that later success is premised on the initial success. The present findings in this study may be attributed to the concise Biology content in the JSSCE Basic Science syllabus, teaching methodology and student's inclination (interest) in terms of their career choice.

V. Conclusion

Based on the findings of the study, it was concluded that achievement of students in Junior Secondary School cannot be the only yardstick for enrolment in science subjects. Though to an extent, their achievement scores predict success in some science subjects. While achievement in Junior Secondary School (JSS) can provide useful insights, it should not be the sole determinant for placing students into science subjects at the Senior Secondary level. A more holistic approach that considers students' performance in Basic Science during the BECE (Basic Education Certificate Examination) could provide a clearer picture of their aptitude for science subjects.

VI. Recommendations

Based on the findings the following recommendations were made:

The Basic Science curriculum at the Junior Secondary level should be better aligned with the Senior Secondary school Biology curriculum to ensure a smooth academic transition.

Teachers should incorporate more hands-on activities, experiments, and real-life applications in both Basic Science and Biology. Make the subjects more engaging to enhance students understanding and interest.

Teachers should undergo regular training and professional development workshops to improve their ability to teach the basic science curriculum effectively.

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