

Original Research Article

Reliability of Senior Secondary Certificate Examination Multiple Choice Physics Questions from 2016 – 2018 in Rivers State

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Abstract: The study investigated the Reliability of Senior Secondary Certificate Examination Multiple Choice Physics Questions from 2016 – 2018 in Rivers State. The study made use of ex-post facto research design and was guided by one research question. Sample for the study was made up of 330 SSCE Multiple Choice Physics Questions of WAEC and NECO from, 2014 – 2018 consisting of a total of 550 Multiple Choice Items. In the course of determining the reliability indices of the tests, simple Random Sampling Technique was used to compose the Sample of 692 SS3 physics students from eight (8) Secondary Schools in five (5) Local Government Areas out of a population of all the 42,865 Senior Secondary three (SS3) students in Public Secondary Schools in Rivers State in the 2018/2019 academic session. From this sample of 692 SS3 students, only 665 students (i.e. 96.1%) participated in all the tests. Instruments for Data Collection in the study were past SSCE Multiple Choice Physics Question papers of WAEC and NECO of the years 2016 – 2018 which were already validated by these examination bodies. Data generated in the study were analyzed using Kuder-Richardson-20 statistical technique to verify the internal consistency reliability of each of the tests. Findings from the study revealed that the coefficients of internal consistency reliability of each of the instruments in the years (2016 – 2018) studied, was high among all the items, but higher among the items of SSCE Multiple Choice Physics Questions of West African Examinations Council (WAEC). Based on the findings, recommendations were made.

Keywords: Senior Secondary, Examination Multiple Choice, Physics Questions.

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INTRODUCTION

Wikipedia (2018) conceptualized physics as the natural science that studies matter, its fundamental constituents, its motion and behaviour through space and time, and the related entities of energy and force. Physics plays a major role in science education. It is a compulsory subject for senior secondary school students who desire to study such science based courses as Engineering, Medical Sciences, Computer Science, Information and Communications Technology (ICT) etc, to have at least a credit level pass in the subject in the Senior School Certificate Examination (SSCE). While recognizing the monumental role of physics in the development of science and technology in the country, the Federal Government of Nigeria in the National Curriculum clearly stated that “a greater proportion of University Education shall be devoted to Science and Technology” (Federal Republic of Nigeria,

2004 p.33). Despite this observed effort of the Government at encouraging the study of the foundational subjects for Science and Technology Development in the country such as Physics, Chemistry and Biology, it has been discovered over several years, that the downward trend in the academic performance of secondary school students in these subjects, especially physics, has not reversed to any appreciable extent. Science Teachers’ Association of Nigeria STAN (2008) reported that there is a steady lowering in the percentage passes of students both in internal and external examinations such as those conducted by West African Examinations Council (WAEC) and National Examinations Council (NECO). These low performance in the sciences have been attributed to several factors. For instance, Adewumi in Nwaogazie (2013) sees lack of qualified teachers as a contributor to the low academic achievement of students while Onunkwo (2002) attributed it to factors inherent in the test items.

In another dimension, it had been observed that performance of candidates in the examinations conducted by WAEC and NECO varies from year – to – year. That sometimes, performance in NECO seems to be better than that of WAEC. This discrepancy in the performance of candidates in examinations conducted by the two examination bodies had led to the general speculations that questions in examinations conducted by WAEC are more difficult than those of NECO and consequently, less reliable. This belief does not have any empirical back up.

Nworgu (1992) views the reliability of a test as the degree of the consistency of the test in measuring the attribute it purports to measure, while Onunkwo (2002) conceptualizes the reliability of an instrument as the consistency with which that instrument measures the traits, characteristics etc which it was designed to measure. The reliability of an instrument can also be viewed as the extent to which the instrument or items of the test consistently measures any attribute or phenomenon as well as the extent to which same responses on the instrument or test yields the same scores repeatedly and consistently.

Statement of the Problem

The researchers observed that Secondary School Students in Rivers State perform better in Senior School Certificate Examinations (SSCE) Physics Examination conducted by National Examinations Council (NECO) than in the Senior School Certificate Examination (SSCE) Physics Examination conducted by West African Examinations Council (WAEC). This observed disparity in the performance of students in physics examinations conducted by these two examination bodies whose standards are expected to be the same, therefore, raised some questions about the reliability of the tests conducted by them. The problem of this study therefore, was to determine the Reliability Coefficients of SSCE Multiple Choice Physics Questions of WAEC and NECO from 2016 – 2018 in Rivers State.

Aim and Objective of the Study

The aim of this study was to determine the Reliability Coefficients of Senior Secondary Certificate Examination (SSCE) Multiple Choice Physics Questions of WAEC and NECO from 2016 – 2018 in Rivers State. In more specific terms, the objective of this study was to find out the Reliability Coefficients of SSCE Multiple Choice Physics Questions of WAEC and NECO in Rivers State from 2016 – 2018.

Research Question

The following research question was answered in an attempt to arrive at the findings of the study:

What are the Reliability Coefficients of SSCE Multiple Choice Physics Questions of WAEC and NECO from 2016 – 2018 in Rivers State?

METHODOLOGY

This study made use of ex-post facto research design. Ex-post facto means “from what is done afterwards”. Simon and Goes (2013) are of the view that ex-post facto research design is ideal for carrying out social research when it is either not possible or acceptable to manipulate the characteristics of human subjects or participants in a research. Again, that ex-post facto is a substitute for true experimental research and can be used to test hypotheses on cause – and – effect.

Nwankwo (2013 p 85) is of the view that ex-post facto design is a research design that involves collecting and analyzing data about some variables retrospectively, or about variables which are already in place without manipulating any of them, in order to find out how some of them influence or are related to other variables.

The population of the study was derived from the item banks of West African Examinations Council (WAEC) and National Examinations Council (NECO) Senior Secondary Certificate Examination (SSCE) Multiple Choice Physics Questions from 2014 – 2018 having a total of 550 Multiple Choice items. However, the Reliability Coefficients of the SSCE physics Questions of the years studied were determined using the population of all the 42,865 Senior Secondary School three (SS3) students in Public Secondary Schools in Rivers State in 2018/2019 academic session, while the sample consisted of 692 SS3 physics students who were Senior Secondary School Certificate Examination (SSCE) candidates of WAEC and NECO in the 2018/2019 academic session. Simple Random Sampling was used to compose the sample of students from eight (8) secondary schools purposively selected from five (5) out of the twenty three (23) Local Government Areas in Rivers State. Out of this sample of 692, only 665 SS3 physics students took part in the tests, thus, representing 96.1% of the sample. The two sets of instruments utilized for data collection in this study consisted of West African Examinations Council (WAEC) and National Examinations Council (NECO) Senior Secondary Certificate Examination (SSCE) Multiple Choice Physics Questions of May/June/July of the years 2016 – 2018 which were already validated by the two examination bodies and whose reliability coefficients have also been carried out by West African Examinations Council (WAEC) and National Examinations Council (NECO) respectively, before they were administered to the candidates who wrote these examinations in the years 2016 – 2018. In addition to this, reliability of SSCE Multiple Choice Physics Questions administered to candidates by these examination bodies, was the focus of the present study.

Copies of a pair of each of the instruments for data collection, WAEC Multiple Choice Physics Questions of 2016 tagged (WPQ1) and NECO Multiple

Choice Physics Questions of 2016 tagged (NPQ1), WAEC Multiple Choice Physics Questions of 2017 tagged (WPQ2) and NECO Multiple Choice Physics Questions of 2017 tagged (NPQ2) as well as WAEC Multiple Choice Physics Questions of 2018 tagged (WPQ3) and NECO Multiple Choice Physics Questions of 2018 tagged (NPQ3) respectively, were administered to the students to respond to, for the same 1 hour, 15 minutes duration per instrument/question paper as well as under very similar examination conditions as allowed by West African Examinations Council (WAEC) and National Examinations Council (NECO) respectively. The researchers administered a total of 4,152 WAEC and NECO SSCE Past Physics Question papers over a period of three (3) weeks out of the which 3,900 copies were duly answered and returned, giving a return rate of 96.1%. They were assisted in this arduous task by the services of three (3) trained research assistants to ensure

that the instruments were properly administered and adequately retrieved after being responded to. At the end of each set of tests, the scripts were retrieved, marked and scored based on WAEC and NECO marking guides for the years 2016 – 2018. The data generated were analyzed by the application of Kuder-Richardson 20 (KR_{20}) formula for estimating Internal Consistency measures of reliability.

RESULTS

The following results were obtained:

Research Question: What are the reliability coefficients of SSCE Multiple Choice Physics Questions of WAEC and NECO from 2016 – 2018 in Rivers State?

Table-1: Indicating Kuder-Richardson 20 (KR_{20}) Reliabilities of WAEC and NECO SSCE Multiple Choice Physics Questions from 2016 – 2018 in Rivers State.

| | $\frac{K}{k-1}$ | Σpq | VARIANCE | Standard Deviation (SD) | $\frac{\Sigma pq}{Variance}$ | $1 - \frac{\Sigma pq}{Variance}$ | INTERNAL CONSISTENCY RELIABILITY |
|-----------------|-----------------|-------------|----------|-------------------------|------------------------------|----------------------------------|----------------------------------|
| WAEC(WPQ1) 2016 | 1.020 | 1.120 | 103.600 | 10.180 | 0.107 | 0.893 | 0.910 |
| WAEC(WPQ2) 2017 | 1.020 | 10.690 | 68.380 | 8.270 | 0.156 | 0.844 | 0.860 |
| WAEC(WPQ3) 2018 | 1.020 | 10.300 | 76.260 | 8.732 | 0.135 | 0.865 | 0.882 |
| NECO(NPQ1) 2016 | 1.017 | 13.460 | 97.260 | 9.862 | 0.138 | 0.862 | 0.877 |
| NECO(NPQ2) 2017 | 1.017 | 14.870 | 92.342 | 9.600 | 0.161 | 0.839 | 0.852 |
| NECO(NPQ3) 2018 | 1.017 | 13.350 | 107.660 | 10.37 | 0.124 | 0.876 | 0.891 |

The table shows that WAEC (WPQ) 2016 had an internal Consistency Reliability of 0.910 which is high, NECO (NPQ1) 2016 had an Internal Consistency Reliability of 0.877 which is also high but lower than the Internal Consistency Reliability Coefficient of WAEC (WPQ2) 2016 at 0.910. WAEC (WPQ2) 2017 had an internal consistency reliability coefficient of 0.852 which is high but lower than the Internal Consistency Reliability Coefficient of WAEC (WPQ2) 2017 at 0.860. Finally WAEC (WPQ3) 2018 had an Internal Consistency Reliability Coefficient of 0.882 which is high while NECO (NPQ3) 2018 had an Internal Consistency Reliability Coefficient of 0.891 which is high and also higher than the Internal Consistency Reliability Coefficient of WAEC (WPQ3) 2018 at 0.882.

Since all the tests had high Internal Consistency Reliability Coefficients, all the tests were therefore considered reliable. The table further revealed that the SSCE Multiple Choice Physics Questions of WAEC (WPQ1) 2016 had the highest coefficient of 0.910 thereby having the highest reliability, while

NECO SSCE Multiple Choice Physics Questions, NECO (NPQ2) 2017 had the least coefficient of 0.839 thus having the least reliability.

CONCLUSION

In conclusion, the findings of this study have revealed that Senior Secondary Certificate Examination (SSCE) Physics Questions of West African Examinations Council (WAEC) and National Examinations Council (NECO) of the years 2016 – 2018 studied are reliable, with the reliability of the SSCE Questions of WAEC being higher.

RECOMMENDATIONS

1. The services of specialists or experts in the field of Educational Measurement and Evaluation should always be engaged by examiners and Examination Bodies in the arduous task of item analysis in determining Item Discrimination, Difficulty as well as Reliability of testing instruments. This standard should be maintained as a tradition in

- the construction of test items in all Senior Secondary Certificate Examinations (SSCE).
2. Test blue-print/table of specifications should be strictly followed during test construction and item selection for the purpose of ensuring that the proportion of topics covered in the curriculum agrees with the test items in the Senior Secondary Certificate Examinations (SSCE).

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