

## Predicting student's performance in SSCE mathematics from their performance in JSCE mathematics

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### Abstract

Mathematics, as a subject, has remained as one of the backbones of education at all levels of learning. Although the recurring decline in mathematics performance at the senior secondary level has become a perpetual concern to stakeholders in the education sector. Therefore, the study investigated the prediction of students' performance in Senior School Certificate Examination Mathematics from the Junior School Certificate Examination performance in Obio/Akpor Local Government Area. A correlational design was adopted for the study. The sample for the study was composed of 464 students, drawn using purposive sampling technique. The study answered two research questions, and tested two hypotheses at 0.05 level of significance. The assembled data was subjected to linear regression statistics. Consequently, the findings revealed that student's 2014 JSCE Mathematics is a significant negative predictor of their 2017 SSCE Mathematics performance ( $F = -0.259, P < 0.05$ ). While 2013 JSCE Mathematics performance does not significantly predict their 2016 SSCE Mathematics performance in public secondary schools in Obio/Akpor L. G A ( $F = 0.018, P > 0.05$ ). Effective testing approaches such as the use of Computer Based Testing (CBT) should be explored in JSCE and WAEC examination, to reduce the influence of extraneous variable in students' Mathematics performance.

Keywords: Mathematics, Senior School Certificate Examination (SSCE), Junior School Certificate Examination (JSCE), Performance, Prediction

## Introduction

Education is described as the complete process of human learning by which knowledge is imparted, useful skills developed and minds trained. Every form of education consists of language and numeracy (mathematical ability) at the core, to enable individuals cope with everyday life in whatever society they find themselves. From ancient time to this contemporary era, language and numeracy (use of numbers) have remained the foundation of all kinds of education and human interaction. Numeracy which is 'Mathematics' is defined as the science of numbers and its operations. Oyedeji, as cited in Orubu (2014), opined that Mathematics is a special language developed for recording the knowledge of the physical world. Simply put, Mathematics is the study of numbers, shapes and patterns. More so, Mathematics is a tool that aids abstract thinking, which facilitates the learning of several subjects or disciplines (Nurudeen, 2007).

No doubt, Mathematics is one of the oldest disciplines in the world as shown in one of the oldest books (the Bible), that the earth was created in six literal days as recorded in Genesis chapter one; "For in six days the Lord made the heavens and the earth, the sea, and all that is in them, and rested on the seventh day" (New King James Version Bible, 1982/2007, Genesis 1; Exodus 20:11). Common to our culture, our parents and grandparents who did not attend formal school were able to trade in their native tongue, which is evidence of mathematical ability (numeracy). With the specialized language of numeracy, they were able to pass down the history of their ancestry by storytelling marked with important dates. Also, they were able to measure time and seasons (a mathematical activity) using their 'local market days' and symbols such as: crowing of the cock, rising and falling of the sun and weather changes, etc. However, the field of language and numeracy had evolved over the years and has become more organized especially in this modern era of formal schooling. Mathematics today is "a diverse discipline that deals with data, measurements and observations from

science, with inference, deduction, and proof; 112

and with mathematical models of natural phenomena, of human behavior, and of social systems" (Roohi, 2012: p. 1).

Meanwhile, the objectives of Mathematics in the Universal Basic Education curriculum amongst others are focused to give learners opportunity to: acquire mathematical literacy necessary to function in an information age, cultivate understanding and application of mathematical skills, become prepared for further studies in mathematics and other related fields, etc. (Federal Ministry of Education (FME), 2012a). More so, Mathematics is very central to the everyday life of the modern society, as it provides the key underpinning of the knowledge in the physical sciences, technology, engineering, ICT, as well as the economic sector such as business, financial services, etc. Furthermore, the application of Mathematics is essential to research because it forms the backbone for most research designs, where it supports several tools for data analysis.

Consequently, a strong background in Mathematics is critical for many careers and job opportunities in today's tech society.

The National Policy on Education recommends a pass in Mathematics and English Language at the junior secondary level as criteria for admission of students into senior secondary level one (SSI) (Federal Republic of Nigeria FRN, 2007). In fact, it is also a criterion for admitting students into tertiary institutions in Nigeria. However, for evaluation of secondary education; two forms of examinations are taken, namely: Junior School Certificate Examination (JSCE) and Senior School Certificate Examination (SSCE), which mark the end of learning for both school programmes.

The Junior Secondary Certificate Examination (JSCE) now called Basic Education Certificate Examination (BECE) is an external examination taken by students in the final class (Basic 9 or JSS 3) of the Universal Basic Education (UBE) programme. There are two forms of JSCE, namely: JSCE conducted by State Ministry of Education (SMoE) and JSCE conducted by NECO. While each of the state

(SMOE) develops, administers, scores and awards grades and certificates to all public Junior Secondary schools under its jurisdiction, the NECO JSCE is responsible for conducting JSCE to all JSS 3 students of Federal Unity Colleges, Armed forces secondary schools and other federally established operating secondary schools in Nigeria. In the case of this study, JSCE conducted by State Ministry of Education (SMoE) was chosen for state-owned public schools.

Therefore, JSCE Mathematics is a standardized achievement test used to assess students' knowledge in Mathematics at the end of Junior Secondary Schooling. As such, JSCE is used for selection or enrolment of students into the Senior Secondary School. Thus, any student admitted to the senior secondary school is expected to have the required abilities needed to adapt to the educational task of the senior secondary school. More so, students' JSCE achievement has been very encouraging over the years in the state, having recorded an average percentage pass of 91 percent (Njigwum, 2019).

Equally, the Senior School Certificate Examination (SSCE) is a public examination taken by final year students (SS 3) at the Senior secondary level, which is usually conducted by external examining bodies like West African Examination Council or National Examination Council (Asuru & Njigwum, 2019). For the purpose of this study, SSCE conducted by WAEC was chosen because it is the first choice examination for final year secondary school students, especially in government-owned schools as most of the students find it financially burdensome to write both NECO and WAEC's SSCE/WASSSCE.

Despite the overwhelming advantage of this core subject (Mathematics) to societal growth and national development, the performance of students in SSCE has become a major concern to the entire nation because of the fluctuating performances over the years (Asuru, 2017).

Percentage of students in Nigeria that obtained credit and above (A1- C6) pass in the May/June WASSCE in general Mathematics between 2010 and 2018

Year	% Credit Pass
2010	33.55
2011	38.93
2012	49.00
2013	36.00
2014	31.30
2015	34.18
2016	38.68
2017	42.73
2018	38.33

Source: Adapted from Zalmon and Wonu (2017)

In addition to the above table, the decline in students' academic performance in SSCE Mathematics as observed by WAEC chief examiner's report that maintained that students' Mathematics performance has been very discouraging; and they agreed that the poor run of performance can be traced to a number of factors which include: teachers helping students (examination malpractice), lack of effective teaching and learning (using sufficient drills and in-depth explanation of relevant concepts), poor coverage of syllabus, unavailability of teaching aids to make lessons practicable, students' interest and attitude towards learning, students' ability or prior academic achievement, etc.

(WAEC, 2008, WAEC, 2017; WAEC, 2019a; WAEC, 2019b). However, for the purpose of this study, our scope will be limited to the issue of students' ability or prior academic achievement in the same or related

discipline as a potent variable of academic performance. In the context of this study, performance in the JSCE Mathematics would be a worthy variable to measure students' ability in the higher level taken in the SSCE.

Consequently, the decline in students' performance in external examinations for specific subjects is a sign that the school curriculum is not satisfactorily achieving its purported objectives for that given subject. This conclusion was made from the fact that tests are measuring tools used to evaluate educational objectives and goals, and as such the performance in this test constitute reliable feedbacks which could be used to make decisions on the worth of the programme either as a part or as a whole. In addition to the perspective advanced, the concept of validity of the test comes to play; the validity of a test has implication on the tests, testees and the programme as a whole. Orluwene (2012) opined that validity is the most important characteristics of a good measurement instrument (or test). Validity is the degree to which a measuring instrument measures what it purports to measure. Validity is simply the relevance of a test. There are four major types of validity which usually depend on the kind of instrument, namely: face, content, criterion related and construct validity (Longiohnnin Obagah & Inko-Tariah, 2014). Although the type of validity relevant to this study is the criterion-related validity, a test is said to have criterion-related validity on the basis of its effectiveness in predicting the examinees' behaviour in specified situations in the future or at the time of testing. Two sets of measures (predictor and criterion) are required in establishing criterion-related validity. There are two forms of estimating criterion-related validity; concurrent and predictive validity. However, the study will explore predictive validity for establishing the magnitude of association between the study variables.

A test is said to have predictive validity if the test can be used to predict what a person can do in future (Ukwuije & Opara, 2012). More so, Kpolovie (2014) elaborated on the concept of predictive validity, as a situation in which a specific time interval occurs between the predictor and criterion tests, and

which the criterion variable undergoes some sort of training. As such, performance of students in the first test (predictor) is correlated with their performance on a later test (criterion) after the stated time interval has occurred; and the resultant correlation is called predictive — validity coefficient. Therefore, the current study

underwent a time interval of three years between the predictor (2013 JSCE Mathematics) and the criterion (2016 SSCE Mathematics). It is important to note that regression analysis is usually employed for prediction studies, as such, the current study employed linear regression for analysis. This is because linear regression (also called Simple prediction) is used for analysis of linear relationship between one independent variable (predictor) and one dependent variable (criterion) (Nwankwo, 2013).

Therefore, it is vital to highlight some of the empirical studies carried out in this area of predictive validity of external examinations by other researchers in an attempt to find solution to this issue of declining academic achievement of secondary school students. Some include; Adeyemi (2008) who investigated "Predicting Students' Performance in SSCE from Performance in JSCE in Ondo State, Nigeria." The results obtained showed JSCE Mathematics is not a predictor of SSCE Mathematics ( $r = -0.09$ ;  $r^2 = 0.0081$ ). Also, the calculated  $r$  (0.09) was less than the greater than the table  $r$  (0.1946). Hence, there was no significant relationship between students' performance in JSC Mathematics and their performance in SSC Mathematics. Also, Kolawole, Ala and Olatunji (2014) studied previous cognitive performance as predictors of academic performance in Senior School Certificate Examination (SSCE) in some selected schools in Nigeria. The paper also determined the relationship and contributions of Common Entrance Examination (CEE) and Junior Secondary School Certificate Examination (JSCE) to students performance in Senior School Certificate Examinations (SSCE). The result showed that showed that performance in JSCE had significantly low but negative contribution to students' performance in SSCE English Language ( $r$

—  $-0.086$ ;  $r^2=0.007$ ;  $P < 0.05$ ). Hence, JSCE contributed negatively to SSCE.

However, Orubu (2014) who carried out a predictive study of J SCE and SSCE Mathematics in Delta and Edo States; reported that a significant relationship exists between JSCE and SSCE Mathematics performance. More so, scores obtained by students in Mathematics at the JSCE tend to predict their ultimate performance in the same subject at the SSCE in Delta State and Edo State (Delta,  $r = 0.032$ ; Edo,  $r^2 = 0.209$ ). Similarly, Ugwuda and Abonyi (2013) conducted a predictive study using NECO JSCE and SSCE in South East Geopolitical zone of Nigeria. They found that a significant relationship exists between JSCE and SSCE Mathematics, although the correlation coefficient is low ( $r = 0.2808$ ;  $r = 0.078$ ). More so, Faleye and Afolabi (2005) in their pioneer study conducted in Osun State; submitted that JSCE poorly predicted students' SSCE performance. However, their result revealed that English and Mathematics ( $r = 0.32$  and  $r = 0.22$  respectively) had a greater predictive capacity than other subjects.

Nonetheless, it was observed that most of the studies in this regard was done outside the target region (Obio/Akpor, Rivers State), more so, in a bid to curb the recurring decline in mathematics performance at the senior secondary level has remained a perpetual concern to stakeholders in the education sector. Thus, it became necessary to study prediction of performance in Senior School Certificate Examination in Mathematics from performance in the Junior School Certificate Examination Mathematics in Obio/Akpor Local Government Area.

### Statement of the Problem

The spate of poor performance in SSCE Mathematics conducted by West African Examination Council (WAEC) has become a regular occurrence in the educational sector of Nigeria in recent years- with the percentage pass of SSCE achievement. Specifically, in 2018, Mathematics (Core) showed a drop in performance from 2017 (42.73% to 38.33%).

Even so, what is more startling is the fact that these students who had poor grades in SSCE Mathematics are the same individuals who obtained very high grades in JSCE and therefore, were enrolled into the senior secondary level. This situation challenges the validity of the JSCE Mathematics as a predictor of students' ability to cope with Mathematics knowledge at the senior secondary level. Also, scholars have presented different results on the predictive validity of JSCE subjects on SSCE achievement in the different states of Nigeria, as

JSCE is state-specific. Therefore, with these prevailing issues, it became necessary for the researchers to embark on the study, to predict students' SSCE Mathematics performance from their JSCE Mathematics grades in Rivers State.

### Hypotheses

The following null hypotheses tested at 0.05 level of significance were postulated:

- HO1: Students' performance in the 2013 JSCE Mathematics does not significantly predict their performance in the 2016 SSCE Mathematics.
- H02: Students' performance in the 2014 JSCE Mathematics does not significantly predict their performance in the 2017 SSCE Mathematics.

### Method

The study employed an ex-post facto and correlational research design. It was ex-post facto because the study was carried out after the events had taken place and data was already in existence. Correlational research is adopted for investigation of the magnitude and direction of relationship that exists between two variables including that a dependent variable (Criterion) and one or more independent variables (Predictor) (Kpolovie, 2010). Kpolovie also added that correlational research is highly suitable for prediction studies. The researchers employed correlational design to allow for the prediction of the criterion variable (SSCE) from the predictor variable (JSCE).

The study population was composed of 1,830 students from public secondary school took both JSCE and SSCE in the same school in Obio/Akpor LGA of Rivers State (Source: Rivers state Ministry of Education, 2019). The sample for the study was 464 students. The chosen sample exceeded the minimum sample size estimated using Krejcie and Morgan graph as cited in Kpolovie (2011).

Next, the sampling method adopted to select individuals for the study was Purposive sampling technique. The researchers purposely selected only students who sat for 2013 and 2014 JSCE Mathematics and, 2016 and 2017 WASSCE Mathematics in the same public schools within the target population (Obio/Akpor).

The data for the study is a secondary data that was obtained directly from the official result document of both Rivers State Ministry of Education and WAEC, which are the examining bodies in charge of JSCE and SSCE respectively.

Junior School Certificate Examination (JSCE) and Senior School Certificate Examination (SSCE) are standardized achievement tests developed and vetted by subject specialist and test experts in the respective examining bodies with regards to the school syllabus. Therefore, the validity and reliability for the two exams has long been established. To support the above claim, it was stated that test used by various public examination bodies (WAEC and SMOE) are often better developed (i.e., have appropriate psychometric properties) than the ones made by teachers in school setting even within the universities (Obioma & Salau, 2007).

The data for this study, which is 2013 and 2014 JSCE Mathematics grades and, 2016 and 2017 WASSCE English grades were collected directly by the researchers from respective authorities which include: School Principals (WAEC results) and Rivers State Ministry of Education (JSCE Results). The data gathered was analyzed using Linear regression analysis, and all the hypotheses were tested at 0.05 alpha level of significance.

### Results

Research Question 1: To what extent does students' 2013 JSCE Mathematics

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performance predict their 2016 SSCE Mathematics performance in Obio/Akpor Local Government Area?

Table 1a: The Extent of Prediction between Students' 2013 JSCE Mathematics and their 2016 Performance Descriptive Statistics

Variable	Mean	Std. Deviation	N
SSCE MATHS	2.13	.501	102
JSCEMATHS	2.87	.713	102

  

Model Summary		
Model R	R Square	Std. Error of the Estimate
.018 <sup>a</sup>	.000	.503

a. Predictors: (Constant), JSCE MATHS  
 b. Dependent Variable: SSCE MATHS

To answer the research question one, the results produced an R of 0.018 and R<sup>2</sup> of 0.000. The R<sup>2</sup> of .000 implies that students' 2013 JSCE Mathematics performance predict (account for) 0.0% of the variance in 2016 SSCE Mathematics performance in Obio/Akpor Local Government Area. This implies that 2013 JSCE Mathematics is not a predictor of 2016 SSCE performance.

Hypothesis 1: Students' 2013 JSCE Mathematics performance does not significantly predict their 2016 SSCE Mathematics performance in Obio/Akpor Local Government Area.

Table 1b: Testing the Significance of Standardized Regression Coefficient ( ) for Students' Performance in 2013 JSCE Mathematics and 2016 SSCE Mathematics

Model	Coefficients		
	Unstandardized Coefficients	Standardized T Coefficients	Sig. (P-value)
	std Beta Error		
(Constant)	2.091		10.05 .000
JSCE MATHS	.013	.070 .018	.182 .856

a. Dependent Variable: sscE MATHS

For hypothesis testing, the result showed that the Beta value of .018 is not significant at t =.182, with P > .05. Therefore, the null hypothesis is accepted, meaning that students' 2013 JSCE Mathematics performance does not significantly predict their 2016 SSCE Mathematics performance.

Research Question 2: To what extent does students' 2014 JSCE Mathematics performance predict their 2017 SSCE Mathematics?

Table 2a: The Extent of Prediction between Students' 2014 JSCE Mathematics and their 2017 SSCE Mathematics Performance

Descriptive Statistics

Variable	Mean	Std. Deviation
SSCE MATHS	2.32	.749
JSCE MATHS	3.62	.551

SSCE Mathematics

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.259 <sup>a</sup>	.067	.064	.725

a. Predictors: (Constant), JSCE MATHS  
 b. Dependent Variable: SSCEMATHS  
 Results from Table 2a yielded an R of .259 and R<sup>2</sup> of .067. The resulting R<sup>2</sup> means that 2014 JSCE Mathematics performance predicts 6.7% of

variance in students' 2017 SSCE Mathematics performance.

Hypothesis 2: Students' 2014 JSCE Mathematics performance does not significantly predict their 2017 SSCE Mathematics performance.

Table 2b: Testing the Significance of Standardized Regression Coefficient (r) for Students Performance in 2014 JSCE Mathematics and 2017

b) Coefficients

Model		Unstandardized	Standardized	T	Sig.
		Coefficients	Coefficients (P-value)		
		B	Std. Beta		
			Erro		
			r		
1	(Constant)	3.598	.293	12.260	.000
	JSCEMATHS	-.353	.080	-4.397	.000

a. Dependent Variable: SSCE MATHS  
 Result from Table 2b reveals that Beta (r) value of -.259 produced a t-value of -4.397 which is significant at P < .05. The result is significant and the null hypothesis is rejected. This means that students' 2014 JSCE Mathematics performance significantly predict their 2017 SSCE Mathematics performance in public secondary schools in Obio/Akpor L.G.A. However, 2014 JSCE Mathematics performance is a negative predictor of 2017 SSCE Mathematics performance as shown in the regression equation below, where for every one-unit increase in the predictor variable (2014 JSCE Mathematics), there is a corresponding .353 decrease in the criterion

variable (2017 SSCE Mathematics). The regression equation for predicted SSCE Mathematics scores is  $Y = 0.353x + 3.598$ .

Discussion of Findings

The first result of this study states that students' 2013 JSCE Mathematics performance does not significantly predict their 2016 SSCE Mathematics performance. This finding is very shocking and pathetic, to believe that the result actually says that students' basic mathematical ability (as measured with 2013 JSCE Mathematics performance) has an absolute 'zero' contribution to their later Mathematics achievement at the SSCE level. From this result, the question begging

SSCE Mathematics



for answer will be: if basic Mathematics ability does not contribute to students' performance in SSCE Mathematics, then what are the variables responsible? Several reasons may be considered for the above result. First, a huge disparity exists in the students' JSCE and SSCE performance, where 2013 JSCE recorded a mean score of 2.87 while students 2016 SSCE had a mean performance of 2.13, all on a 4-point scale (Excellent, A =4, very good, B=3, credit, C and fail, fg As such, the high pass rate in JSCE and poor pass rate in SSCE is one of the reasons for the zero prediction. The result may be misrepresented to mean that JSCE mathematics contribute zero variance to SSCE performance, although in actuality, the nature of JSCE test administration is culpable. Unlike SSCE exams, where external supervisors accompany the test paper, in JSCE exams, internal supervisors (usually teachers in the school) are used to supervise and administer the exams. As such, the strictness in conducting the exams is left in the hands of the school administrators, who usually prioritize good performance of their students over strict supervision. As a result, this creates ample avenues for various forms of exam malpractice which eventually confounds students' true ability in their mathematics performances. Therefore, it is no wonder that students' actual mathematics ability that produced good performance in JSCE could not be replicated in their SSCE mathematics result where the testing condition is more thorough.

The result is in agreement to the work of Adeyemi (2008) who reported that JSCE mathematics is not a predictor of SSCE mathematics. However, the studies of Orubu, (2014), Ugwuda and Abonyi (2013) are in disagreement with the current result, as they reported that predicts their

SSCE performance.

On the other hand, the second result highlights that 2014 JSCE Mathematics performance significantly and negatively predicts students' 2017 SSCE Mathematics performance in Obio/Akpor Local Government Area. The result of the study is quite revealing, to find out that basic Mathematics performance negatively predicts students' SSCE Mathematics performance; that is, students' who perform better in JSCE mathematics are likely to perform poorly in SSCE Mathematics and vice versa. This negative regression could be as a result of time lapse between the 2014 JSCE and the 2017 SSCE. Between this time period, some of the students have chosen to become Arts or Commercial students. An experience with the students' population shows that students who chose these disciplines tend to lose interest in mathematics. More so, the reality of a stricter examination condition at the SSCE level tend to make students who may have been less serious with studying mathematics to score low (mean of 2.32), compared with their JSCE scores (with a mean of 3.62).

The finding is corroborated by the work Of Kolawale, Ala and Olatunji (2014) who reported that JSCE is a negative predictor of SSCE. Although some studies disagree with the finding, stating that JSCE mathematics has a greater positive predictive capacity than other subjects (Faleye, 2005; Orubu, 2014; Ugwuda & Abonyi, 2013). The difference in the result is not far from the peculiarity of the study location which is marked with laxness or poor strictness in the supervision of JSCE examinations.

### Conclusion

From the findings of this study, 2013 JSCE Mathematics performance is not a predictor of students' 2016 SSCE Mathematics performance. In fact, students' 2013 JSCE Mathematics performance account for 0.0% of the variance (zero contribution) in 2016 SSCE Mathematics performance in Obio/Akpor Local Government Area. On the other hand, 2014 JSCE Mathematics performance significantly predict their 2017 SSCE Mathematics performance in Obio/Akpor Local Government Area. Although the 2014

JSCE Mathematics performance is a negative as well as a poor predictor accounting for only 6.7% of variance in students' 2017 SSCE Mathematics performance in Obio/Akpor Local Government Area.

The result of the study is subject to the two interpretations; firstly, JSCE Mathematics has a poor predictive validity and contributes negatively to students' SSCE performance. As such, JSCE does not prove to be a robust test for placement of students into the senior secondary level (where SSCE Mathematics is taken). Secondly, the result reveals that students' JSCE performance (basic Mathematics ability) accounts for either little or zero variance in SSCE Mathematics performance. Therefore, 2013 JSCE had no contribution to students' SSCE performance- implying that other extraneous variables such as time lapse, poor supervision in JSCE and examination malpractice may have been responsible for students' acquisition of grades at both the JSCE and SSCE level.

### Recommendations

Based on the findings of the study which revealed that students' JSCE performance had both negative and zero contribution to their SSCE Mathematics performance, the following recommendations were made:

1. The State Ministry of Education (SMoEs) should improve on supervision of JSCE examination to prevent extraneous variables such as examination malpractice which leads to high test scores and false evaluation of students' abilities.
2. Effective testing approaches such as the use of Computer Based Testing (CBT) should be explored in JSCE and WAEC examination to reduce the influence of extraneous variable in students' Mathematics performance.
3. The ministries of education and affiliate education boards such as Universal Basic Education etc. should institute yearly continuous assessment for secondary school students that will be externally conducted to monitor students' quality of learning and

achievement in both junior and senior secondary school subjects.

4. It would be better if all the State's Ministries of Education (SMoEs) could come together to conduct a national JSCE as the case of SSCE. This will enable the comparability of JSCE and SSCE performances across different states in Nigeria- for effective diagnosis and solution to the problem of poor performance in Mathematics.
5. It is recommended that a replication of this study be carried out using a larger sample size drawn from all the senatorial zones in the state, for broader generalization of the findings.

## References

- Adeyemi, T. O. (2008). Predicting students' performance in senior secondary certificate examinations from performance in junior secondary certificate examinations in Ondo State, Nigeria. *Middle-East Journal of Scientific Research*, 3(2), 73-81. Retrieved [http://www.idosi.org/mejsr/mejsr3\(2\)/6.pdf](http://www.idosi.org/mejsr/mejsr3(2)/6.pdf)
- Asuru, V. A. (2017). Assessment for, as and of learning: A psycho-legal convergence for national development. Inaugural Lecture, Ignatius Ajuru University of Education, Rumuolumeni, Port Harcourt.
- Asuru, V. A. & Njigwum, A. S. (2019). Predicting students' Senior School Certificate Examination performance in English Language from performance in Junior School Certificate Examination in Rivers State. A paper presented at the annual education summit of Committee of Deans of Education in Nigerian Universities (CODENU), held at Princess Alexandra Auditorium, 2Y – 25<sup>th</sup> October, at University of Nigeria, Nsukka, Nigeria.
- Faleye, B. A. & Afolabi, E. R. 1. (2005). The predictive validity of Osun State junior secondary certificate examination. *Electronic Journal of Research in Educational Psychology*, 5-3(3), 1311-44. Retrieved from [http://www.investigacionpsicopedagogica.org/revista/articulos/5/english/Art\\_5\\_67.pdf](http://www.investigacionpsicopedagogica.org/revista/articulos/5/english/Art_5_67.pdf)
- Federal Ministry of Education (2012). 4-Year strategic plan for development of the education sector: 2011-2015. Lagos: NERDC Press.
- Federal Republic of Nigeria (2007). National policy on education 2008 (6<sup>th</sup> ed.). Yaba, Lagos: NERDC Press.
- Kpolovie, P. J. (2010). *Advanced research methods*. Owerri: Springfield Publishers Ltd.
- Kpolovie, P. J. (2011). *Statistical techniques for advanced research*. Owerri: Springfield Publishers Ltd.
- Kpolovie, P. J. (2014). *Test, measurement and evaluation in education* (2<sup>nd</sup> ed.). Owerri: Springfield Publishers Ltd.
- Kolawole, E. B., Ala, E., & Olatunji, O.A. (2014). Previous Cognitive Entry Points as Predictors of Students' Performance in Senior School Certificate Examination (SSCE) Mathematics in some Nigerian Secondary Schools. *Education Research Journal*, 7-11. Retrieved <http://www.resjournals.com/journals/educational-research-journal/EDU%202014/EDU%202014%20JAN/Kolawole-et-al.pdf>
- Longjohn, I. T. (2014). Test development. In Obagah, M.O.N & Inko-Tariah, D. C. (Eds). *Educational measurement and evaluation*. Port Harcourt: Rodi Printing and Publishing Company.
- Holy Bible, New King James Version (2007). Thomas Nelson Inc. (Original work published 1982).
- Njigwum, A. S. (2019). Predicting senior school certificate examination performance in Mathematics and English Language from the junior school certificate examination performance in Obio/Akpor Local Government Area. Unpublished MEd

- Thesis, Ignatius Ajuru University of Education.
- Nurudeen, T. S. (2007). Secondary school students' misconception in solving mathematical problems. *ABACUS: Journal of the Mathematical Association of Nigeria*, 32(1), 84-102.
- Nwankwo, O. C. (2013). A practical guide to research writing (Rev. -e ed.). Port Harcourt: University of Port Harcourt Press.
- Obioma, G. & Salau, M. (2007). The predictive validity of public examinations: a case study of Nigeria. a paper presented at the 33rd annual conference of International Association for Educational Assessment (IAEA) held in Baku, Azerbaijan, 16-21 September. Retrieved [http://www.iaea.info/documents/paper\\_1162d3940.pdf](http://www.iaea.info/documents/paper_1162d3940.pdf)
- Orluwene, G. W. (2012). Fundamentals of testing and non-testing tools in educational psychology. Port Harcourt: Harey Publications Coy.
- Orubu, M. E. N. (2014). The predictive validity of junior secondary school mathematics scores: comparative study of senior secondary school mathematics scores in delta and Edo states. *ISTE International Conference on Mathematics, Science and Technology Education* 19-23 Mopani Camp in Kruger National Park, Limpopo, South Africa.
- Roohi, F. (2012). The role of Mathematics in the Development of Society. [https://www.researchgate.net/profile/David\\_Cole29/post/What\\_are\\_the\\_shortcomings\\_of\\_mathematics\\_to\\_describe\\_physical\\_reality/attachment/5be30cc93843b0067543490a/AS%3A690362272190466%401541606600713/download/Role+of+Mathematics+in+the+Development+of+Society.pdf](https://www.researchgate.net/profile/David_Cole29/post/What_are_the_shortcomings_of_mathematics_to_describe_physical_reality/attachment/5be30cc93843b0067543490a/AS%3A690362272190466%401541606600713/download/Role+of+Mathematics+in+the+Development+of+Society.pdf)
- Ugwuda, O. S. & Abonyi, S. O. (2013). Predictive validity of NECO junior school certificate examination on students' achievement in NECO senior school certificate examination. *Journal of Science Teacher Association of Nigeria*, 2, 1-15.
- Ukwuije, R. P. I. & Opara, M. I. (2012). Test and measurement for teachers (3rd ed.). Port Harcourt: Chadik Printing Press.
- West African Examination Council (2008). Executive summary of entries, result and chief examiners' report on the West African Senior School Certificate Examination (WASSCE) Conducted in Nigeria in 2006. Retrieved from [http://www.waeheadquartersgh.org/index.php?option=com\\_docman&task=doc\\_download&gid=5&Itemid=30](http://www.waeheadquartersgh.org/index.php?option=com_docman&task=doc_download&gid=5&Itemid=30)
- West African Examination Council (2017). Chief Examiners' Reports WASSCE 2016. <https://www.waecgh.org/uploads/examinersReport/2016/Mathematics%20W16.pdf>
- West African Examination Council (2019a). Chief Examiners' Reports WASSCE 2017. <https://www.waecgh.org/uploads/examinersReport/2017/MathematicsW17.pdf>
- West African Examination Council (2019b). Chief Examiners' Reports WASSCE 2018. <https://www.waecgh.org/uploads/examinersReport/2018/MathematicsW18.pdf>
- Zalmon, I. G. & Wonu, N. (2017). Comparative Analysis of Student Mathematics Achievement in West African Senior Secondary Certificate Examination in Nigeria. *European Journal of Research and Reflection in Educational Sciences*, 5(1), 24-31.