

Predictive Validity of Junior Secondary School Certificate Mathematics and Integrated Science Examinations for Mathematics Students' Academic Performance in Senior Secondary Schools in Ondo State

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Abstract:

The study examined the predictive validity of junior secondary school certificate Mathematics and Integrated Science examinations on academic performance of senior secondary school Mathematics students in Ondo State. Two research hypotheses were generated to guide the study. This study employed ex-post-facto design. Thirty six secondary schools were purposively selected from six Local government areas of the three senatorial districts (Ondo North, Ondo Central and Ondo South). Two Local Government Areas were selected from each of the senatorial districts using simple random sampling techniques. A total of 1,826 2020/2021 SSS3 Mathematics students that came in by JSSCE, had complete record from SSS1 to SSS3, sat for Mathematics in SSS classes and also sat for 2020/2021 WAEC/NECO SSCE were involved in the selected secondary schools. Data collected were analysed using correlation analysis, regression analysis as well as analysis of variance. All the results revealed that JSSC Mathematics examinations and JSSC Integrated Science examinations significantly predict academic performance of students at the SSS2 unified examination in Mathematics, WAEC SSC examinations in Mathematics and NECO SSC examinations in Mathematics ($p < 0.05$). Based on the findings of this study, it was therefore recommended among others, that JSSCE results should remain a yardstick for admitting Mathematics

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students into senior secondary schools.

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Introduction

The Junior Secondary School Certificate Examination (JSSCE) is a public examination (in Nigeria) conducted by each state of the federation through their respective ministries of education for final year students of the Junior Secondary School (JSS) at the end (that is, the third year) of Junior Secondary Schooling while each state develops, administers, marks and award grades and certificates to all public schools under its jurisdiction. The National Examination Council (NECO) is responsible for conduction the JSSCE to all JSS3 students of Federal Government College and other Private Secondary Schools that elect to take NECO conducted examination. The JSSCE is the system adopted in admitting students to senior secondary schools and the admission is controlled by the ministry of Education.

The unified examination is the examination conducted by ministries of education for senior secondary school two (SSS2) at the end of third term. Results of this examination serve as promotion examination to SSS3. While the senior secondary school certificate examinations (SSSCE) on the other hand is a national examination for all Senior Secondary School three (SSS3) students in all secondary schools in the country. It is being conducted and administered by West African Examinations Council (WAEC) and National Examinations Council (NECO). The two examination agencies conduct parallel or equivalent Senior Certificate Examinations in the country. The SSCE was first conducted in 1958 by WAEC and its validity has been ascertained by many researchers like Ojerinde (1986) and WAEC (1994). There is considerable research evidence to show that previous knowledge will affect academic performance. This is perhaps, one of the major reasons for adopting JSSCE as the yardstick for admitting students to senior secondary schools. A student who is hereby admitted is assumed to possess the abilities and skills necessary to cope with the academic challenges/rigours in the senior secondary school, since such a student would have acquired and completed the contents of the junior secondary school curriculum.

However, despite the unique position of examinations in educational system, there have been conflicting reports on the predictive strength of the junior secondary school certificate (JSSC) examination at predicting performance in the senior secondary school examinations (Ondo State Ministry of Education, 2001 and Asaoye, 2003). Some educational researchers such as Adelana (2001) and Sylvester (2007) have advocated for the cancellation of the Junior secondary school certificate examinations on the ground that its predictive value is in doubt. The above inconsistent reports and findings leave one with doubt as to whether JSSCE may have reliable validity. It is therefore necessary in this study to examine the predictive validity of the JSSC Mathematics and Integrated Science examination for Mathematics in predicting subsequent academic performance of students in senior secondary schools in Ondo state.

The study was designed to examine the validity of Junior Secondary School Certificate Mathematics and Integrated Science Examinations for predicting Mathematics students' academic performance in senior secondary schools in Ondo State.

The study was specifically designed.

- (i) to examine the relationship between JSSCE scores in Mathematics and Integrated Science and SSSE scores in SSS2 unified Mathematics examinations and SSC Mathematics examinations.

- (ii) to determine the values of JSSCE scores in Mathematics and Integrated Science and SSSE scores in SSS2 unified Mathematics examinations and SSC Mathematics examinations

Research Hypotheses

The following hypotheses were generated.

1. JSSC Mathematics examination score and JSSC Integrated Science will not significantly predict academic performance of students at the SSS2 unified Mathematics examinations
2. JSSC Mathematics examination scores and JSSC Integrated Science examination scores will not significantly predict academic performance of students at the SSC Mathematics examinations.

Methodology

The study is a descriptive research of the ex-post-facto design, as the researcher did not have direct control on the independent variables, since their manifestations had already occurred. They were inherently not manipulated. The data were collected from the examination result sheet sent to school by the Ondo State ministry of Education, known as JSSCE Computer sheet and master marks' sheet records in the school.

The target population for the study consisted of all 2020/2021 SSS3 Mathematics students that came in by JSSCE, had complete examination records from SSS1 to SSS3, sat for Mathematics and Integrated Science in JSSCE, offered Mathematics in SSS classes, and also sat for 2020/2021 SSCE (both WAEC and NECO) in Ondo State secondary schools. The sample for the study consisted of 1,826 SSS3 Mathematics students. All 2020/2021 SSS3 Mathematics students that came by JSSCE, had complete examination records from SSS1 to SSS3, sat for Mathematics and Integrated Science in JSSCE, offered Mathematics and also sat for 2020/2021 WAEC/NECO SSCE constituted subject for the study.

Stratified and purposive random sampling techniques were used to choose the samples. The geographical areas of Ondo State was stratified into three senatorial districts (Ondo North, Ondo Central and Ondo South) simple random sampling technique was then used to choose two local Government Areas from each of the senatorial districts. Six secondary schools from each of the selected Local Government Areas were then selected using purposive random sampling technique. These schools were the top three oldest secondary school with laboratory and library that have been presenting students for WASSCE for over 20 years.

An inventory titled "Students JSSCE and SSSE Academic Performance Proforma" was used to collect the relevant data for the study. The inventory consisted of items that captured information about the students. The items included name of school, local government area, students' score in Mathematics and Integrated Science for 2016/2017, junior secondary school certificate for examinations, the students' score in Mathematics for 2019/2020 unified examinations and 2020/2021 SSC examinations.

The JSSCE scores, scores for SSS2 unified examinations and SSCE were collected in grades. The pattern of grading students' scores in JSSCE was such that the distinction grade is represented by "A" (60 – 100). The credit grade is represented by "c" (50 – 59). The ordinary pass is represented by "P" (40 – 49) while the failure grade is represented by "F" (0 – 39). The pattern of grading students' scores in senior secondary school examinations (internal and

external) are such that the distinction grade is represented by B3 to A1(65 – 100). The credit grade is represented by C6 to C4 (50 – 64). The ordinary pass grade is represented by E8 to D7 (40 – 49) and the failure grade is represented by F9 (0 – 39) (Faleye, 2005) for the purpose of scoring, therefore, JSSCE grades of A, C, P and F were awarded 3, 2, 1 and 0 points respectively while SSE grades of (B3 A1), (C4 – C6), (D7 – E8) and F9 were also awarded 3, 2, 1 and 0 respectively.

The researcher visited the selected schools during the school hours to seek for permission from the Principals for the use of their schools and inform the Principal on the objectives of the study. The researcher used the proforma in each of the selected schools to collect students' grades in Mathematics and Integrated Science for 2016/2017 JSSCE, as well as students' grades in Mathematics for 2019/2020 SSS2 unified examinations and 2020/2021 SSC examinations. Data collected were analysed with the use of correlation analysis, regression analysis as well as Analysis of variance (ANOVA). All the hypotheses were tested at 0.05 level of significance.

Results

Testing of Hypotheses

Hypothesis 1: JSSC Mathematics examination scores, and JSSC Integrated science examination scores, will not significantly predict academic performance of students at the SSS2 unified Mathematics examinations.

Table 1: Regression analysis: SSS2 unified Mathematics examination results as criterion

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Beta	Constant
1. JSSCMTH	0.269	0.072	0.072	0.629	0.269	1.405
2. JSSCS	0.296	0.088	0.087	0.624	0.127	1.076

Dependent variable: UNIMTH

Table 2: Summary ANOVA of the goodness of fit of the regression equation

Model	Sum of squares	df	Mean squares	F _c	F _t
1. JSSC MTH					
Regression	56.115	1	56.115	142.000	3.84
Residual	720.805	1824	.395		
Total	776.920	1825			
2. JSSCS					
Regression	68.197	2	34.098	87.709	3.00
Residual	708.723	1823	.389		
Total	776.920	1825			

$P < 0.05$, significant results

Predictors (constant), JSSCMTH

Predictors (constant), JSSCMTH, JSSCS

Dependent variable: UNIMTH

Table 1 showed that the relationship between the academic performance of students in the JSSC Mathematics examinations, JSSC Integrated science examinations and academic

performance of students at the SSS2 unified Mathematics examinations were low. In SSS2 unified Mathematics examinations, the JSSC Mathematics examinations accounted for 7.2% of the variance, while the JSSC Integrated science examinations accounted for 8.8% of the variance. Beta values showed that JSSC Mathematics examination results had low predictive strength for SSS2 unified Mathematics examinations and JSSC Integrated science examination results had negligible predictive strength for SSS2 unified Mathematics examinations.

From table 2, the F calculated ($F_{cal.} = 142.000, 87.709$) were greater than the F table at 0.05 level of significance. Thus, hypothesis that states that JSSC Mathematics examination scores and JSSC Integrated science examination scores would not significantly predict academic performance of students at the SSS2 unified Mathematics examinations was therefore rejected. This means that JSSC Mathematics examination scores and JSSC Integrated science examination scores significantly predicted academic performance of students at the SSS2 unified Mathematics examinations.

Hypothesis 2: JSSC mathematics examination scores and JSSC Integrated Science examination scores will not significantly predict academic performance of students at the SSC Mathematics examinations

Table 3: Regression analysis: WAEC SSC Mathematics examination results as criterion.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Beta	Constant
1. JSSCS	0.355	0.126	0.126	0.580	0.355	1.829
2. JSSCMTH	0.374	0.140	0.139	0.576	0.120	0.550

Dependent variable: WAECMTH

Table 4: Summary ANOVA of the goodness of fit of the regression equation

Model	Sum of squares	df	Mean squares	F_c	F_t
1. JSSCS					
Regression	88.576	1	88.576	262.985	3.84
Residual	614.344	1824	.337		
Total	702.920	1825			
2. JSSCMTH					
Regression	98.424	2	49.212	148.411	3.00
Residual	604.496	1823	.332		
Total	702.920	1825			

$P < 0.05$, significant results

Predictors: (constant), JSSCS

Predictors: (constant), JSSCS, JSSCMTH

Predictors: (constant), JSSCS, JSSCMTH

Dependent: variable: WAECMTH

Table 3 showed that there were low relationship between the academic performance of students in the JSSC Integrated science examinations, JSSC Mathematics examinations and academic performance of students at the WAEC SSC Mathematics examinations. In WAEC SSC Mathematics examinations, the JSSC Integrated science examinations accounted for 12.6% of the variance while the JSSC Mathematics examinations accounted for 14.0% of the variance. Beta values showed that JSSC Integrated science examination results had low predictive

strength for WAEC SSC Mathematics examinations while the predictive strength of JSSC Mathematics examination results for WAEC SSC Mathematics examinations was negligible. In table 4, the F calculated ($F_{cal} = 262.985, 148.411$) were greater than the F critical values at 0.05 level of significance, thus the hypothesis that states that JSSC Mathematics examination scores and JSSC Integrated science examination scores would not significantly predict academic performance of students at the WAECSSC Mathematics examinations was therefore rejected. This means that JSSC Mathematics examination scores, and JSSC Integrated science examination scores significantly predicted academic performance of students at the WAEC SSC Mathematics examinations.

Table 5: Regression analysis: NECO SSC Mathematics examination results as criterion

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Beta	Constant
1. JSSCS	0.248	0.061	0.061	0.485	0.248	1.254
2. JSSCMTH	0.262	0.068	0.067	0.483	0.085	1.093

Dependent variable: NECOMTH

Table 6: Summary ANOVA of the goodness of fit of the regression equation

Model	Sum of squares	df	Mean squares	F_c	F_t
1. JSSCS					
Regression	28.057	1	28.057	119.287	3.84
Residual	429.008	1824	.235		
Total	457.065	1825			
2. JSSCMTH					
Regression	31.295	2	15.647	66.997	3.00
Residual	425.770	1823	.234		
Total	457.065	1825			

$P < 0.05$, significant results

Predictors: (constant), JSSCS

Predictors: (constant), JSSCS, JSSCMTH

Dependent variable: NECOMTH

Table 5 showed that the relationship between the academic performance of students in the JSSC Integrated science examinations, JSSC Mathematics examinations and the academic performance of students at the NECOSSC Mathematics examinations were low. In NECO SSC Mathematics examinations, the JSSC Integrated science examinations accounted for 6.1% of the variance while the JSSC Mathematics examinations accounted for 6.8% of the variance. Beta values showed that JSSC Integrated science examination results had low predictive strength for NECO SSC Mathematics examinations. While the predictive strength of JSSC Mathematics examination results for NECO SSC Mathematics examination was negligible.

In table 6, the F calculated ($F_{cal} = 119.287, 66.997$) were greater than F table at 0.05 level of significance, thus the null hypothesis that states that JSSC Mathematics examination scores and JSSC Integrated science examination scores would not significantly predict academic performance of students at the NECO SSC Mathematics examinations was therefore rejected. This means that JSSC Mathematics examination scores and JSSC Integrated science

examination scores significantly predicted academic performance of students at the NECO SSC Mathematics examinations.

Discussion

Hypothesis one revealed that the academic performance of students in the JSSC Mathematics examinations and JSSC Integrated Science examinations were significant predictors of the academic performance of students in the SSS2 unified Mathematics examinations. This agreed with the findings made by Oladugba (2002) who reported that the JSSC Mathematics examinations and JSSC Integrated Science examinations were significant predictor of the academic performance of students at the SSC Mathematics examinations.

Hypothesis two showed that academic performance of students in the JSSC Mathematics examinations and JSSC Integrated Science examinations were Significant predictors of the academic performance of students at the WAEC and NECO SSC Mathematics examinations. This was in consonance with the findings made by Oladugba (2002) who reported that the JSSC Mathematics examinations and JSSC Integrated Science examinations were significant predictors of the academic performance of students at the SSC Mathematics examinations. This rejected the findings of Adeyemi (2008) who claimed that JSSC Mathematics examinations was not a significant predictor of students' performance at the SSC Mathematics examinations and found no significant relationship between the performance of students in the JSSC Integrated Science and the SSC Mathematics examinations.

The JSSC Mathematics examinations and JSSC Integrated Science examinations were low significant predictors of the academic performance of students at the SSS2 unified Mathematics examinations, WAEC SSC mathematics examinations and NECO SSC Mathematics examinations.

Conclusion

Based on the findings of the study, it was concluded that the academic performance of Mathematics students in the JSSC Mathematics examinations and JSSC Integrated Science examinations were low predictors of the academic performance of Mathematics students at SSS2 unified mathematics examinations, WAEC SSC Mathematics examinations and NECO SSC Mathematics examinations.

Recommendations

Based on the findings of this study, the following recommendations were made.

1. The JSSCE results should remain as a yardstick for admitting Mathematics students into senior secondary schools
2. Government should organize more induction courses, seminars and workshops for teachers to expose them to new strategies in teaching while the state ministry of education should embark upon more inspection and monitoring of schools to ensure that effective teaching and learning take place in schools.
3. The parents should divest themselves of the illusion that grade obtained by their wards in Mathematics at JSSCE is an automatic indicator of the grade they would have at SSCE Mathematics. They should rather get their wards properly equipped to face the greater task that lies ahead in Mathematics. This could take the form of procuring relevant textbooks in all the aspects of Mathematics tested at SSCE

4. The parents and teachers should also provide the much needed atmosphere that is conducive to learning Mathematics.
5. The teachers, students, parents and guardians should get fully prepare for the challenges by the senior secondary school syllabus on Mathematics so that they could do well in SSS2 unified Mathematics examinations and SSC Mathematics examinations conducted by WAEC and NECO
6. The JSSC Mathematics examinations and SSS2 unified Mathematics examinations should be reviewed by government from time to time. The review may be on administration level, marking level or scoring level.

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