

SKEWNESS AND COMPARABILITY OF SCHOOL BASED CONTINUOUS ASSESSMENT SCORES

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ABSTRACT

This study examined skewness as means of determining the nature of distribution of school based continuous assessment (SBCA) scores in selected subjects among Secondary Schools in Ondo State, Nigeria, to determine whether or not there is need for moderation of the SBCA Scores. This is an ex-post-facto research design involving no treatment and non-manipulation of subjects but collection of data from records. Cluster sampling techniques was used to select ten schools from three senatorial districts in Ondo State. Simple random sampling technique was employed to selected one thousand five hundred Senior Secondary Students. This comprised 500 students per subject (one hundred and fifty students per school which was made up of 50 students per subject in each school). The SBCA Scores for year 2005/2006 – 2007/2008 for the selected school formed the data for the study. Data collected were analysed using Coefficients of Skewness and Pearson Product moment Correlation Statistic. Results indicated that SBCA Scores for first year in English language, first, and third year in Mathematics were positively skewed while SBCA Scores for second and third year in English Language, Second year in Mathematics and first, second and third year in Biology showed negative Skewness. There was significant relationship between coefficients of skewness of school based continuous assessment (CSBCA) Scores of first and second year in English Language, Mathematics and Biology. There was no significant relationship between CSBCA scores for first and third year in Mathematics and between CSBCA scores for second and third year in Biology. Based on the findings of the study, some recommendations were made.

Keywords: Skewness, Comparatibility, School Base Assessment, Scores, Biology, English, Mathematics.

INTRODUCTION

One of the outstanding variables that probably determine the academic performance of students in schools has been traced to intelligence. Intelligence has been variously viewed by researchers. Denga (1987) and Vernon (1976) claimed that it is the individual's inherited potentialities for growth (genotype) and the result of interaction with the prenatal and postnatal environment (phenotype) while Wechsler (1958) argued that it is the global capacity of an individual to act purposefully, think rationally and to deal effectively with the environment. Looking critically at the assertions of Denga (1987), Vernon (1976) and Wechsler (1958), it is very clear that the intelligence level of all individuals cannot be the same. This probably accounted for the assertion of Gbore (2006)

that test scores are product or indicator of the individual's intelligence (ability) level in a given task.

Psychologists such as Okoye (1989) and Terman (1916) have brought classification into the intelligence level of man. Ary, Jacob and Razavich (2002) argued that the distribution of many physical and psychological measures takes the shape of a bell with majority gathering at the centre (average) while slightly few are a bit above or a bit below the average when plotted as a frequency polygon. This kind of bell shaped frequency polygon seemingly occur where a set of score is normally distributed. Adeyemi (2002) referred to this as normal curve and according to him, the traits obtainable in human beings should approximate to a normal curve. The curve produced appears to distinctly partitioned scores into below average, average and above average. Alonge (2004), Ary Jacob

and Razavich (2002), Kolawole (2002) and Bandele (1999) stressed that a distribution that tends to produce a bell shaped curve should possess characteristics such as being symmetrical, the mean, mode and median coincide and the curve extends (tapers) in both directions. This is ideal but not all distributed scores could possess all these characteristics.

Alonge (2004) claimed that the bell-shaped nature of the normal curve may change as a result of simplicity/ toughness of assessment instrument or the standard of the testees. Based on this submission, it may be possible for a set of distributed score to produce a curve that tilted to either the left or right side of the line of symmetry. When this occurred, it will make the nature of the normal curve to be skewed.

Skewness shows the degree of tiltedness of test scores in a frequency distribution. This could be either positively or negatively. According to Adeyemi (2002) and Bowerman and O'Connell (2003), when the frequency curve is negatively skewed, it produced a long tail to the left but if the distribution tapers to the right than the left side of the line of symmetry then it is positively skewed. Kolawole (2002) argued that negative skewness is a product of test scores from too easy a test while positive skewness is indicative of distribution derived from test scores from too difficult a test. Closely related to this, Bandele (1999) reiterated that positively skewed curve is a curve for poor academic performance while the negatively skewed curve is for good academic performance.

Coefficient of skewness could be determined using

$$\frac{\text{mean} - \text{mode}}{\text{Standard deviation}} \times \frac{x - Mo}{SD}$$

or the mode could be evaded and the coefficient estimated by using the mean, medium and standard derivation. That is,

$$\frac{3(\text{mean} - \text{medium})}{\text{Standard deviation}} \times \frac{3(x - mo)}{SD}$$

Alonge (2004) argued that where the values of two of the measures of centrality are known, then the nature of the distribution can be predicted. The mean, median and standard derivation are good statistical instruments for

determination of level and standard of student's performance in any given test instrument such as standardized tests and teacher-made tests which include the continuous assessment instruments.

Continuous assessment practice in many schools according to Masters and Evans (1986), is a process of collecting and recording marks at various times during a course so that they can be brought together and summed to obtain a total or cumulative score at the end of the course but Ojerinde and Falayajo (1981) examined continuous assessment in a broader and more encompassing manner by defining it as a mechanism whereby the final grading of a student in the cognitive, affective and psychomotor domains of behaviour takes into account, in a systematic way, of all his performances during a given period of schooling. This definition did not only consider the grading of cognitive domain alone but also the affective and the psychomotor domains of the child's behaviour are included in the final grading for the purpose of decision making.

Alonge (2004) argued that continuous assessment shares formative evaluation features because it is periodic. According to him, it requires that results of such periodic evaluation should also form part of the final assessment of the individual student. Though, Oladunni (1998) categorically confirmed that it is mandatory by the policy of government that certificates must be awarded on the basis of a combination of school-based assessment and an external assessment conducted by external examining body or ministry. Observation revealed that west African Examinations Council (WAEC) and National Examinations Council (NECO) are the two examining bodies in Nigeria that conduct senior school certificates examination. While NECO involves the school based continuous assessment scores in the final grading and certification of the students, WAEC appears to have simply jettisoned the inclusion of the school based continuous assessment scores in the final grading and certification of the students based probably on the issue of comparability of standard. The development of quality school based continuous assessment instrument cannot be taken for granted. Gbore (1998) argued that a

classroom teacher who is not trained to develop test often times construct tests which could be too difficult or too easy and hitherto, majority of testees will either fail or pass the test respectively. Denga (1987) also argued that there are classroom teachers who deliberately give too easy a test to his students to receive praise from the students while some other teachers give tests which are above the mental ability of the students to show that they are intelligent and tough. These go a long way to affect the standard of the school based continuous assessment scores.

Ojerinde (1985) doubted the reliability of the continuous assessment scores generated from different assessment instruments in the same subject from the different schools and hence asked whether the raw scores sent by each school could be relied upon.

Awuwoloye (1986) found high correlation between students' school based continuous assessment (SBCA) scores and school certificate examination scores in mathematics with values ranging from 0.71 to 0.86 which was attributed to the good quality staffing of the schools studied. Although, Abe (2006) found out that there was significant relationship among the internal assessment scores derived from Biology, Mathematics and English from the various school studied in Ekiti State, Nigeria but on applying Kurtosis as a statistical tool, he found that the school based continuous assessment (SBCA) scores from the schools were not normally peaked as the scores showed Platykurtic and Leptokurtic distribution as against the expected Mesokurtic distribution. However, Zinderman (1984) argued that it is advantageous for the schools to issue certificate independently as it is the case in the United States of America.

A critical examination of the submissions of Alonge (2004), Oladunni (1998) and Zinderman (1984) may imply that quality of certificates will vary from school to school within the country because of differences that exist in the standard of measurement instruments used as continuous assessment tools by the different teachers for the same subject from different schools. This among other reasons probably prompted the assertion of Alonge (2004) that there is need for uniformity of standard in education

programme that inculcates innovation such as the continuous assessment practice for improvement in academic performance.

It was on this basis that this study was designed to find out the skewness of school based continuous assessment (SBCA) scores in the three core subject areas (Biology, Mathematics and English Language) in senior secondary schools in Ondo State, Nigeria to determine whether it is necessary or not to carry out the statistical moderation of the school based continuous assessment scores.

Research Questions

To guide this study, the following questions were generated

- How are the school based assessment scores in English Language, Mathematics and Biology distributed.
- Is there any significant relationship between the coefficients of skewness of scores in school based continuous assessment (SBCA) first year (CA_1) SBCA second year (CA_2) and SBCA third year (CA_3) in English Language, Mathematics and Biology.

Methodology

This is an ex-post-facto research that involved no treatment and non manipulation of subjects since the effect and the cause have already occurred. It merely involved collection of data from records. The population for the study comprised all the senior secondary three III students in Ondo State, Nigeria, while their school based continuous assessment scores for 2007/2008 sets formed the database. Cluster sampling techniques was employed to select ten (10) schools from the three senatorial districts (Ondo North, Ondo Central and Ondo South) of Ondo State. Using simple random sampling technique a total of one thousand five hundred (1500) student was selected for the study. Five hundred students for each of Biology, English Language and Mathematics which consisted 50 students from each school. The researchers contacted the administrators of the selected schools and collected the school copy of the school based continuous assessment scores for the three consecutive years (2005 – 2008). The data collected were then analysed using coefficient of skewness and Pearson product moment correlation.

Results

Question 1

How are the school based assessment scores in English Language, Mathematics and Biology distributed?

In answering this question, the mean, standard derivation and the coefficients of skewness for each of SBCA₁, SBCA₂, SBCA₃ for each of the three core subjects (English Language, Mathematics and Biology) were calculated and cross-tabulated. findings are as shown in Table 1

From Table 1, the distribution of the school based continuous assessment score for SBCA₁ (first year) English Language and SBCA₂ (first year) and SBCA₃ (third years) in mathematics showed positive skewness. This implies that grater number of the students' performance fell to the left side of the mean score than to the right. The table showed further that the SBCA₂ (second year) and SBCA₃ (third year) in English Language, SBCA₂ (second year) in Mathematics and SBCA₁, SBCA₂ and SBCA₃ in Biology showed negatively skewed distribution. This means that the scores of the greater percentage of the students were at the right side of the mean score than to the left. This implies that the test instruments used by the class teachers as continuous assessment instruments for SBCA₁, SBCA₂ and SBCA₃ in Biology were too easy, therefore majority of the students performed excellently well in the tests while the test instruments used for SBCA₁ in English Language, SBCA₁ and SBCA₂ in mathematics were too difficult hence majority of the students performed poorly.

Question 2

Is there any significant relationship between the coefficients of skewness of scores in school based continuous assessment for first year (SBCA₁), second year

(SBCA₂) and third year (SBCA₃) in English Language, Mathematics and Biology? In addressing this problem, the question was transformed into hypothesis "there is no significant relationship between the coefficients of skewness of scores in school based continuous assessment for first year (CSBCA₁), second year (CBSCA₂) and third year (CBSCA₃) in English Language, Mathematics and Biology". To test this hypothesis, the coefficients of skewness of scores for each of the three subjects for each year in each of the ten schools selected for the study was computed. The coefficients of skewness of the SBCA for the first year was correlated with the coefficients of skewness of SBCA scores for second year and for third year separately. Also the coefficients of skewness of SBCA scores for second year was equally correlated with the coefficients of skewness of SBCA scores for third year. The Pearson Product Moment correlation techniques was employed for the analysis and tested for significance of relationships using the r-table at 0.05 level of significance. The results are shown in Table 2.

Table 2 revealed that the calculated correlation coefficient "r" for CSBCA₁ and CSBCA₂, CSBCA₁ and CSBCA₃, and CSBCA₂ and CSBCA₃ were 0.853, 0.611 and 0.743 respectively for English Language and 0.724, 0.130 and 0.524 respectively for Mathematics while for Biology it showed 0.321, 0.362 and 0.079 for CSBCA₁ and CSBCA₂, CSBCA₁ and CSBCA₃, and CSBCA₂ and CSBCA₃ respectively. The calculated 'r' values for CSBCA₁ and CSBCA₂, and CSBCA₂ and CSBCA₃ in English language showed high and positive relationship but indicated moderate and positive relationship between CSBCA₁ and CSBCA₃. In Mathematics, it showed high and positive relationship between CSBCA₁ and CSBCA₂, low and positive relationship between CSBCA₁ and CSBCA₃, but showed moderate and positive relationship between CSBCA₂ and

Subject	N	SBCA	X	SD	Coefficient of Skewness
English Language	500	1	44.07	13.28	0.980 Positive
	500	2	49.08	13.69	-0.107 Negative
	500	3	48.52	12.23	-0.142 Negative
Mathematics	500	1	48.08	17.02	0.183 Positive
	500	2	51.69	14.84	-0.012 Negative
	500	3	49.42	13.34	-0.543 Negative
Biology	500	1	50.17	14.49	-0.149 Negative
	500	2	51.55	13.89	-0.420 Negative
	500	3	48.83	13.83	-0.620 Negative

Table 1. Summary of Coefficients of Skewness of School based Continuous Assessment sores in English Language, Mathematics and Biology

Subject	N	CSBCA ₁ VS CSBCA ₁	CSBCA ₁ VS CSBCA ₃	CSBCA ₂ VS CSBCA ₃	r-table
English Language	500	0.853*	0.611*	0.743*	0.195
Mathematics	500	0.724*	0.130	0.524*	0.195
Biology	500	0.321*	0.362*	0.079	0.195

Table 2. Summary of Relationship Between Coefficients of Skewness (C)in SBCA₁, SBCA₂ AND SBCA₃ in English Language, Mathematics and Biology

CSBCA₃. The table also indicated that the calculated coefficient 'r' the relationship between CSBCA₁ and CSBCA₂, and CSBCA₁ and CSBCA₃ and CSBCA₂ and CSBCA₃ were low and positive in Biology. From the table, it was observed that the r-table value (0.195) is greater than the r-calculated values of 0.130 in Mathematics and 0.079 in Biology; hence there is no significant relationship between CSBCA₁ and CSBCA₃, in Mathematics and also between CSBCA₂ and CSBCA₃ in Biology. There was a significant relationship between CSBCA₁ and CSBCA₂, CSBCA₁ and CSBCA₃ in English language, and between CSBCA₁ and CSBCA₂, CSBCA₁ and CSBCA₃ in Mathematics, also between CSBCA₁ and CSBCA₂, and CSBCA₁ and CSBCA₃ in Biology.

Discussion and Conclusion

The findings of this study showed that the school based continuous assessment scores for first year in English language and first and third year in Mathematics indicated positive skewness while the scores for second and third year in English language, second year in Mathematics and first, second and third year in Biology indicated negative skewness. The result confirmed the assertion of Alonge (2004) that there is need for uniformity of standard in education programme that involves continuous assessment practice which leads to certification. This finding attested to the assertions of Kolawole (2002) and Bandele (1999) that positive skewness is a product of test scores from too difficult a test hence majority of the testees showed poor performance in the tests, while negative skewness is an exhibition of test scores derived from too easy a test hence majority of the testees performed well as indicated by the coefficients of skewness in Biology 1,2 and 3, year 2 and 3 in English language and second year in Mathematics. The result also showed that there was no significant relationship between coefficient of skewness of school based continuous assessment scores for first and third year in Mathematics and second and third year in Biology. This result is in consonance with the findings of Abe (2002) and Bandele (1989) who claimed that there was no significant relationship between internal assessment scores and external achievement test scores. The results also showed

that there was a significant relationship between coefficients of skewness of school based continuous assessment scores for first and second year, first and third year and second and third year in English language, first and second year and second year and third year in Mathematics and between coefficients of skewness of school based continuous assessment scores for first and second year and first and third year in Biology. This finding is in agreement with the finding of Abe (2006) that significant relationship existed in internal assessment scores in Mathematics, English language and Biology.

The distribution of the school based continuous assessment scores as shown by the coefficients of the skewness couple with the indices of the relationship between the scores of the subjects from year to year have indicated that the scores derived from school based continuous assessment may be as a result of either too easy or too difficult tests hence there is urgent need for statistical moderation of school based continuous assessment scores to ensure confidence and guarantee quality over the candidates issued with certificates in as much as the school based continuous assessment scores form part of the criteria for decision-making in the issuance of school leaving certificate and consequently entry certificate into tertiary institutions.

Recommendations

Finally, it is suggested that:

- The school based continuous assessment scores should be regularly moderated and inspected before combining them with external scores for provision of certificate.
- Government should provide experts with orientation on applied statistics in the field of tests, measurement and evaluation for each school to carry out moderation of school based assessment scores or enforce it on the school principals/examination officers to ensure the statistical moderation of the assessment scores of their schools before sending such scores to State Ministry of Education for onward transfer to the examining bodies.
- The examining bodies (WAEC & NECO) should come

up with Teachers' (Manual) Practical textbooks broken down into units and accompanied by the expected exercises and answers with the attached mark to each correct answer for usage in the assessment of the students and there should be impromptu inspection of such activity in the schools by the examining bodies. Any school found defaulting should be regarded as involving in examination malpractices and hence be sanctioned.

- The examining bodies should make provision for a unit in their establishment that will be saddled with the responsibility of ensuring statistical moderation of the school based assessment scores and also conduct induction course/seminars for schools on assessment scores.

It is hoped that the implementation of these recommendations would lead to the ultimate goals of improved academic standard among secondary school students in Nigeria.

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