

## Full Length Research Paper

# Assessment of Performances of High School Students in Akure South Local Government Area, Nigeria

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In this study, the researcher sets out to statistically assess the difference in group mean performances of seven (7) High Schools in Akure South Local Government Area of Ondo State, Nigeria. The data collected is based on the final examination performance of 11th Grade (Senior Secondary School 2) students in Mathematics and English Language in 2012/2013 academic session. 50 students were selected in each of the 7 schools, making 350 students in all. Descriptive Statistics on these performances were obtained. Basic normality assumption tests were performed and the use of Welch ANOVA and F-test ANOVA were employed to assess these groups means differences in both Mathematics and English Language respectively. Findings from the result of the analysis reveal a Welch Statistic of 4.759 and a P-

value  $< 0.05$  ( $p = 0.000$ ) for Mathematics; a F-statistic of 22.291 and a P-value  $< 0.05$  ( $p = 0.000$ ) for English Language. These two results are significant, which means that there is strong evidence that the mean performances of the students of the 7 High Schools are unequal. Post-Hoc Tests are thereafter performed and it is found out that there are 5 pairwise differences in the mean performances of the students in Mathematics and 13 pairwise differences in the mean performances of the students in English Language.

**Keywords:** Mean performance, ANOVA, students, high schools, significant difference

## INTRODUCTION

Schools, colleges and universities have no worth without student's performances. Students are most essential asset for any educational institute. The social and economic development of the country is directly linked with students' performance. The students' performance (academic achievement) plays an important role in producing the best quality graduates who will become great leader and manpower for the country thus responsible for the country's economic and social development (Ali et al., 2009).

Mosha, (2014) said that, students' performance was affected by shortage of English teachers and absence of teaching and learning materials. However, findings showed that, the presence of untrained, under-qualified and trained teachers who are incompetent resulted to skip teaching some difficult topics in the syllabus and

students' infrequent use of English language at school and home, large class size, teachers' responsibilities, poor conducive teaching and learning environment in the classrooms, limited home support environment and poverty are among the factors that affecting students' academic performance in English Language.

Graetz, (1995) conducted a study on study on socio-economic status of the parents of students and concluded that the socio-economic background has a great impact on student's academic performance. Pedrosa et al. (2006) in their study on social and educational background pointed out those students who mostly come from deprived socio-economic and educational background performed relatively better than others coming from higher social-economic and educational area. Eamon, (2005) "Those students usually

come out from low socio-economic status or area show low performance in studies and obtained low scores as compared to the other students or their counter parts”.

Leandro and Pelechano, (2004) found out that motivational factors are more relevant to academic qualification than contemporary wisdom when study about wisdom and achievement motivation factors which have correlation with academic performance was carried out. The actual execution of class work in the school setting accounted for adolescents’ academic achievement.

Verma and Singh, (1990) studied cognitive ability, academic achievement and study habits of socially advantaged and disadvantaged adolescent student of 12th grade in Uttar Pradesh and found that the significant 'positive values for cognitive ability, academic achievement and study habits indicated that all the three factors were definitely affected by social disadvantages. Socially advantaged group exhibited higher levels of intelligence, academic achievement and good study habits.

Irfan and Shabana, (2012) worked on “Factors Affecting Students’ Performance”. Their research is based on students’ profile developed on the basis of information and data collected through assessment from students of a group of private colleges. They concluded their study that students’ performance in intermediate examination is linked with their approach towards communication, learning facilities, proper guidance and family stress.

Chugh and Audichya, (2004) studied the academic achievement of the orphan boys of 6 to 12 years. The sample consisted of 30 orphan boys. Finding of study revealed that personal variables like study habits, academic motivation did affect the academic achievement but family variables like parents’ education, occupation, socio-economic status, age did not affect the academic achievement.

The environment variables (both psychological and physical environment) as emotional and social support infrastructural and functional facilities of the orphanage affect the academic achievement.

Research on effective schools has also been conducted in Africa. Verspoor, (2006) researched on what determines education quality in sub-Saharan Africa (SSA) and identified the following: classroom factors (time, grouping procedures, instructional strategies) are key, school factors (leadership, emphasis on academic achievement and staff development) enable and reinforce, system factors (vision, standards, resources, relevant curriculum, incentives) provide direction, and community factors (home environment, support for education) ensure local relevance and ownership. The Association for the Development of Education in Africa (ADEA, 2006) notes that in addition to these quality-affecting factors, improvements in education quality and better learning achievements of students in SSA will

ultimately be determined in classrooms by motivated teachers who have the skills and resources to respond effectively to students’ learning needs. ADEA, (2006) continued to say that effective schools are schools that create a supportive environment for such teachers and for classrooms where all students have the opportunity to learn and acquire the knowledge, skills and the attitudes specified in the curriculum. Therefore, as noted by Verspoor (2006), moving towards an in-depth understanding of how schools in Africa can be helped on the path towards effectiveness is thus a central element of the continuing quest for quality.

Ajiboye and Olorunlogbon, (2019) conducted a research on developing a statistical model for average student performance in 2 general subjects in 10 schools around Akure Metropolis, Nigeria. Using principal component analysis, latent factors were extracted from students’ scores and their factor loadings were used to construct average performance measures for the schools. Nine factors were extracted and found to account for over 95% of the variations in students’ academic performance in the schools. From the constructed model, it was found out that most factors contributed positively to higher achievements in English Language but it was a different case in Mathematics in that majority of the factors contributed negatively to the students’ achievements. Only 1 factor out of 9 had negative effect on achievements in English Language while 5 factors out of 9 affected Mathematics negatively. Hence, it shows that there were more factors affecting achievements in Mathematics than English Language. However, the researcher in this work employed the use of Analysis of Variance (ANOVA) to assess and determine the difference in group mean performances of some independently selected High Schools in Akure South Local Government Area of Ondo State, Nigeria.

### **Objective of the study**

The objectives of the study are:

- (a) To determine the schools with the highest and lowest mean performances.
- (b) To assess the mean performance of students in the seven (7) different schools being considered by statistically examining the difference in their group means for the two general subjects under investigation.

### **Research Hypothesis**

In this research, the performance (in scores) of students in each of the two general subjects is the dependent variable while the groups of schools are the dependent variables. Thus, the null and alternative hypotheses respectively become:

*H0: There is no significant difference in mean performances between the seven High Schools.*  
*H1: There is significant difference in mean performances between the seven High Schools.*

**METHODOLOGY**

The researcher used transcription from record method to independently collect data from seven (7) different High Schools in Akure South Local Government Area of Ondo State, Nigeria. The data collected was based on the final examination performance of 11th Grade (Senior Secondary School 2) students in Mathematics and English Language in 2012/2013 academic session. The first 50 students were selected in each of the 7 schools, making a total of 350 students. The 7 different high schools used in this research are outlined below:

- (a) Oyemekun Grammar School, Akure (OGSA).
- (b) Aquinas College, Akure (ACA).
- (c) Adegbola Memorial Grammar School, Akure (AMGSA).
- (d) Akure High School, Akure (AHSA).
- (e) FUTA Staff Secondary School, Akure (FSSSA).
- (f) St. Peter’s Unity Secondary School, Akure (SPUSSA).
- (g) Akure Secondary Commercial School, Akure (ASCSA).

Descriptive statistics such as the mean, standard deviation and variance were used to describe the data based on the performance of each of the students being considered in the study. In order to ascertain the basic assumptions underlying the ANOVA, histogram with normality curve was used to assess the normality of the data. For a more thorough and confirmatory normality check, the Kolmogorov-Smirnov and Shapiro-Wilk normality tests were used. Also, Levene’s test was conducted for equality of variance. Finally, the F-test was carried out for the ANOVA in order to test and determine the equality in groups mean performance of the students in the different schools under investigation.

The F-test assumes that the observations are normally distributed with a common variance, and it is used to test for equality of group means of the observations.

$$F_{K-1, N-K} = \frac{MSB}{MSE}$$

where

$$MSB = \frac{1}{K-1} \sum_{i=1}^k n_i (\bar{Y}_i - \bar{Y})^2$$

$$MSE = \frac{1}{N-K} \sum_{i=1}^k \sum_{j=1}^{n_i} (Y_{ij} - \bar{Y}_i)^2$$

$$\bar{Y} = \frac{1}{N} \sum_{i=1}^k \sum_{j=1}^{n_i} Y_{ij}$$

$$N = \sum_{i=1}^k n_i$$

$$\bar{Y}_i = \frac{1}{n_i} \sum_{j=1}^{n_i} Y_{ij}$$

Levene, (1960) presented a test of homogeneity (equal variance). The test does not assume that all populations are normally distributed and is recommended when the normality assumption is not viable.

$$W = \frac{(N-K) \sum_{i=1}^k n_i (Z_i - \bar{Z})^2}{(K-1) [\sum_{i=1}^k \sum_{j=1}^{n_i} (Z_{ij} - \bar{Z}_j)^2]}$$

where

$$Z_{ij} = |Y_{ij} - \bar{Y}_i|$$

$$\bar{Z}_i = \frac{1}{n_i} \sum_{j=1}^{n_i} Z_{ij}$$

$$\bar{Z} = \frac{1}{N} \sum_{i=1}^k \sum_{j=1}^{n_i} Z_{ij}$$

$$\bar{Y}_i = \frac{1}{n_i} \sum_{j=1}^{n_i} Y_{ij}$$

Glass et al. (1972) affirmed that equality of variances assumption must be met in order to run an ANOVA analysis. However, when it is not accurate to assume that the variances are equal, the alternative (Welch, 1951) is often suggested. Some researchers recommend that this procedure be used when the largest group variance is over four times as large as the smallest group variance while others suggest that little power is lost if this test is always used, even when the variances are almost equal. Welch’s F-test (Field 2009) is designed to test the equality of group means when we have more than two groups to compare, especially in the cases which didn’t meet the homogeneity of variance assumption. However, the assumptions of normality and independency are remained. The main idea of Welch’s F-test is using a weight to reduce the effect of heterogeneity such that the weight is based on the sample size and the observed variance for the each of the groups.

$$W^* = \frac{\sum w_i (\bar{Y}_i - \hat{\mu})^2 / (K-1)}{1 + [2(K-2) / (K^2-1)] \sum h_i}$$

where  $w_i = \frac{n_i}{S_i^2}$ ,  $W = \sum w_i$

$$\hat{\mu} = \frac{\sum w_i \bar{Y}_i}{W}$$

$$h_i = \frac{(1-w_i/W)^2}{(n_i-1)}$$

$$f = \frac{K^2-1}{3 \sum h_i}$$

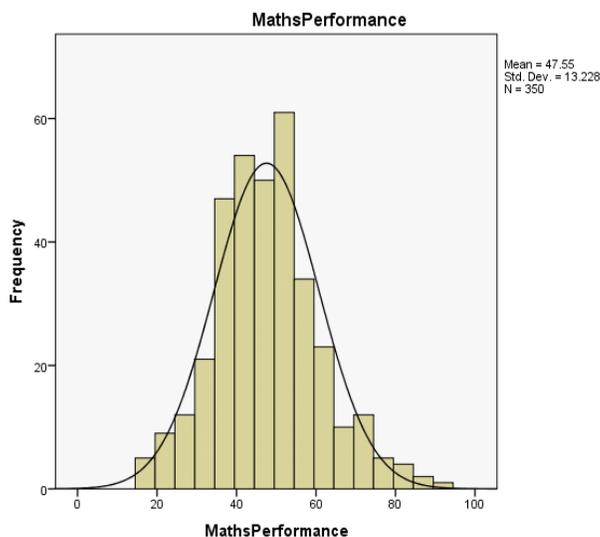
$$S_i^2 = \frac{1}{n_i-1} \sum_{j=1}^{n_i} (Y_{ij} - \bar{Y}_i)^2$$

**RESULTS AND DISCUSSIONS**

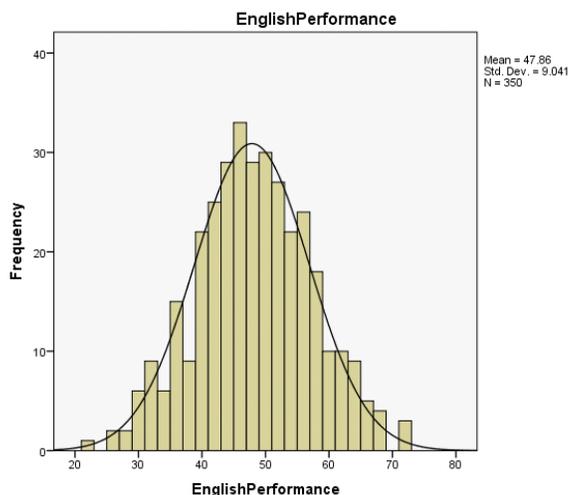
Examining the descriptive statistics in (Table 1), it shows that Oyemekun Grammar School, Akure (OGSA) and Akure High School, Akure (AHSA) had the highest and lowest mean performances with 51.70 and 42.06 respectively in Mathematics. However, FUTA Staff Secondary School, Akure (FSSSA) and Oyemekun Grammar School, Akure (OGSA) had the highest and

**Table 1.** Descriptive Statistics for Mathematics and English Language.

	Mathematics			English Language		
	Mean	S. D	Variance	Mean	S. D	Variance
OGSA	51.70	15.093	227.806	42.28	7.998	63.961
ACA	47.60	11.766	138.449	49.56	6.118	37.435
AMGSA	47.08	16.235	263.585	47.02	8.057	64.918
AHSA	42.06	14.640	214.343	44.28	7.853	61.675
FSSSA	51.62	14.132	199.710	57.26	6.785	46.033
SPUSSA	48.98	8.503	72.306	50.74	8.349	69.707
ASCSA	43.80	6.946	48.245	43.88	8.665	75.087



**Figure 1a.** Histogram showing high school students’ performance in Mathematics.



**Figure 1b.** Histogram showing high school students’ performance in English Language.

lowest mean performances with 57.26 and 42.28 respectively in English Language.

Figures 1a and 1b reveal that the histogram plots with normality curve for the data follow normal distribution,

**Table 2a.** K-S and S-W Tests of Normality for Mathematics

High School	Kolmogorov Smirnov			Shapiro Wilk		
	Statistic	df	P-value	Statistic	df	P-value
OGSA	0.103	50	0.200	0.990	50	0.951
ACA	0.112	50	0.158	0.970	50	0.223
AMGSA	0.071	50	0.200	0.974	50	0.345
AHSA	0.091	50	0.200	0.971	50	0.247
FSSSA	0.092	50	0.200	0.979	50	0.514
SPUSSA	0.108	50	0.200	0.977	50	0.427
ASCSA	0.088	50	0.200	0.969	50	0.207

**Table 2b.** K-S and S-W Tests of Normality for English Language

High School	Kolmogorov Smirnov			Shapiro Wilk		
	Statistic	df	P-value	Statistic	df	P-value
OGSA	0.085	50	0.200	0.975	50	0.381
ACA	0.102	50	0.200	0.968	50	0.198
AMGSA	0.083	50	0.200	0.982	50	0.653
AHSA	0.055	50	0.200	0.985	50	0.763
FSSSA	0.081	50	0.200	0.986	50	0.819
SPUSSA	0.094	50	0.200	0.984	50	0.711
ASCSA	0.100	50	0.200	0.984	50	0.706

**Table 3.** Levene’s Test of Homogeneity of Variance.

Mathematics				English Language			
Levene Statistic	df1	df2	P-value	Levene Statistic	df1	df2	P-value
5.789	6	343	0.000	1.515	6	343	0.172

**Table 4.** Welch Robust Test for Equality of Means for Mathematics.

	Statistic	df1	df2	P-value
Welch	4.759	6	150.425	0.000

**Table 5.** F-Test ANOVA for Mean Performance of Students in English Language.

	Sum of Squares	Df	Mean Square	F	P-value
Between Groups	8002.160	6	1333.693	22.291	0.000

with a skew around the mean. Thus, the multivariate normality of the dependent variable is established by the histograms. The Kolmogorov-Smirnov test is a more robust test for continuous-level variables. Both the Kolmogorov-Smirnov and Shapiro-Wilk tests for each of the group of schools are not significant ( $p > 0.05$ ) as clearly shown in the (Tables 2a and b). Therefore, we cannot reject the null hypothesis that the sample distribution is multivariate normal for the two general subjects under investigation. Examining (Table 3), we find out that the Levene’s test for equality of variance (homoscedasticity) is significant for Mathematics ( $p =$

0.000) but not significant for English Language ( $p = 0.172$ ). Thus, we proceed to conduct the Welch test (Welch ANOVA) to determine the equality of means for Mathematics while we use the F-test ANOVA directly for English Language. However, the Welch ANOVA robust test (for Mathematics) for the equality of means between these 7 independent groups of schools as analyzed in (Table 4) gives a Welch Statistic of 4.759 and a P-value that is less than 0.05 ( $p = 0.000$ ). This shows that there is a significant difference in the mean performances of these schools. Also, the ANOVA in (Table 5) reveals that the F-test for testing the equality of group means is

**Table 6.** G-H Multiple Comparison Test for Mathematics.

S/N	Pair of High Schools	P-value ( $\alpha=0.05$ )
1	OGSA and AHSA	0.026
2	OGSA and ASCSA	0.021
3	AHSA and FSSSA	0.021
4	FSSSA and ASCSA	0.013
5	SPUSSA and ASCSA	0.020

**Table 7.** Tukey and Bonferroni Multiple Comparison Tests for English Language.

S/N	Pair of High Schools	Tukey P-value ( $\alpha=0.05$ )	Bonferroni P-value ( $\alpha=0.05$ )
1	OGSA and ACA	0.000	0.000
2	OGSA and AMGSA	0.038	0.049
3	OGSA and FSSSA	0.000	0.000
4	OGSA and SPUSSA	0.000	0.000
5	ACA and AHSA	0.013	0.015
6	ACA and FSSSA	0.000	0.000
7	ACA and ASCSA	0.005	0.006
8	AMGSA and FSSSA	0.000	0.000
9	AHSA and FSSSA	0.000	0.000
10	AHSA and SPUSSA	0.001	0.001
11	FSSSA and SPUSSA	0.001	0.001
12	FSSSA and ASCSA	0.000	0.000
13	SPUSSA and ASCSA	0.000	0.000

significant as the F-statistic gives 22.291 against a P-value  $< 0.05$  ( $p = 0.000$ ) for English Language.

### Multiple Comparison Tests (MCT)

Multiple Comparison Tests are used to test where the pairwise differences in the mean performance of the students are. We use Games-Howell test for Mathematics while Tukey and Bonferroni are used for English Language.

### Games-Howell Multiple Comparison Test for Mathematics

Games-Howell test is used for Mathematics because there is a violation of homogeneity of variance between the groups (that is, there is unequal group variance). At 0.05 level of significance, the SPSS output shows that the mean performance of students in Mathematics are statistically significant between the following groups of schools, as presented in the (Table 6). However, there was no statistical difference in the students' mean performances in Mathematics between:

(a) ACA and any of the other High Schools.

(b) AMGSA and any of the other High Schools.

### Tukey and Bonferroni Multiple Comparison Tests for English Language

Field (2009, p. 375) recommended to use Tukey for equal group sizes and similar variances or Bonferroni for guaranteed control over Type I error (more conservative) (Table 7).

### Conclusion

Generally, from the result of the analysis, it is noted that Oyemekun Grammar School, Akure (OGSA) had the highest mean performance in Mathematics with 51.70 which was followed closely by FUTA Staff Secondary School, Akure (FSSSA) with mean performances of 51.62; while Akure High School, Akure (AHSA) had the lowest with 42.06. Also, in English Language, FUTA Staff Secondary School, Akure (FSSSA) and Oyemekun Grammar School, Akure (OGSA) had the highest and lowest mean performances with 57.26 and 42.28 respectively. Thus, it follows that FUTA Staff Secondary School, Akure (FSSSA) had the best mean performance when compared with other schools under consideration.

The ANOVA tests the null hypothesis that all group mean performances are equal. Using the Welch ANOVA for Mathematics, the P-value  $< 0.05$  ( $p = 0.000$ ). Thus, we reject the null hypothesis and conclude that there is a significant difference between at least one pair of the mean performances. Also, using the F-test for English Language, the P-value = 0.000. This equally means that there is a strong evidence that the mean performances of the students of the 7 High Schools in are unequal. After performing Games-Howell Multiple Comparison Tests for Mathematics, it is found out that there are 5 pairwise differences in the mean performance whereas there was no statistical difference in the students' mean performances in 2 schools and any of the other schools being considered. Finally, Tukey and Bonferroni tests show that there are 13 pairwise differences in the mean performance of the students in English Language.

### Authors' declaration

We declare that this study is an original research by our research team and we agree to publish it in the journal.

### REFERENCES

- ADEA (2006). Higher education institutions in Africa responding to HIV/AIDS. Response of universities and colleges to HIV/AIDS. ADEA Working Group on Higher Education/Association of Africa Universities, Accra, Ghana, ISBN 9988-589-30-1.
- Ajiboye AS, Olorunlogbon OR (2019). Developing a statistical model for average student performance in 2 general subjects in schools around Akure Metropolis, Nigeria. *Journal of Statistics and Management Systems*, 22:5, 813-827, DOI: 10.1080/09720510.2018.1501129
- Ali N, Jusoff K, Ali S, Mokhtar N, Salamt ASA (2009). 'The Factors Influencing Students' Performance at Universiti Teknologi MARA Kedah, Malaysia'. *Canadian Research & Development Center of Sciences and Cultures: Vol.3 No.4*.
- Chugh M, Audichya (2004). Academic achievement of the orphan boys of 6 to 12 years. *Indian Psychological Review*, 63 : 233-235.
- Eamon MK (2005). Social demographic, school, neighborhood, and parenting influences on academic achievement of Latino young adolescents. *Journal of Youth and Adolescence*, 34(2):163-175.
- Field A (2009). *Discovering Statistics using SPSS (And sex and drugs and rock 'n' roll)*, 3rd ed., London: SAGE.
- Glass GV, Peckham PD, Sanders JR (1972). Consequences of failure to meet assumptions underlying the fixed effects analyses of variance and covariance. *Review of Educational Research*, 42(3): 237-288.
- Graetz JY (1995). Socio-economic status in Education research and policy.
- Irfan M, Shabana NK (2012). Factors affecting Students' Academic Performance. *Global Journal of Management and Business Research*. Vol. 12, Issues 9, Version 1.0.
- Leandro PG, Pelechano V (2004). "Contemporary wisdom, motivation and academic performance in adolescents", vol. 30 (135):963-976.
- Levene H (1960). Robust tests for equality of variances. In: *Contributions to Probability and Statistics: Essays in Honor of Harold Hotelling*, I. Olkin, eds. Palo Alto, CA: Stanford University Press.
- Mosha T (2014). English Language Proficiency standards for overseas students who need what level. *Journal of International Education*, 1, (10):311-313.
- Pedrosa, et al. (2006). Educational and Social economic background of graduates and academic performance consequences for affirmative action programs at a Brazilian research university. <http://www.comvest.unicamp.br/paals/artigo2.pdf>.
- Verma BP, Singh AN (1990). 'Cognitive ability, academic achievement and study habits of socially advantaged & disadvantaged adolescent students', *The program Education July 14 (12): 271-276*.
- Verspoor A (2006). Conditions and Factors of Effective Schools in Africa; Paper presented at the ADEA Biennale on Education in Africa, Libreville, Gabon, March 27-31, 2006.
- Welch BL (1951). On the comparison of several mean values. *Biometrika*, 38(1): 330-336.