ASSESSING STUDENT'S ACADEMIC PROGRESS IN DEVELOPMENTAL AND UNFRIENDLY MATHEMATICAL COURSES IN DELTA STATE UNIVERSITY

BY

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Abstract

This paper shows evidence of student's assessment academic progress in developmental and unfriendly mathematical courses with special consideration on Real Analysis, Complex Analysis, Topology and Abstract Algebra. In the study, descriptive statistics were used which includes mean, standard error and line chart. For the test of significance variation in the factors considered, one way analysis of variance was used. The tool is one of the parametric tools in statistics which implies it has underlying assumption. All the assumption associated with the statistical tool was tested using linear regression approach. The study reveals that Real Analysis, Complex Analysis, Topology and Abstract Algebra have not improve in terms of performance in recent time (2015-2018). The performance of the students for each year (2015, 2016, 2017 and 2018) and the future values of the students' performance were done using fitted linear regression model.

1. INTRODUCTION

Mathematics is a compulsory science subject that studies numbers, shapes, objects and their properties which are needed as basic requirement for all sciences and technological take off. This boils down to the facts that mathematics is not the subject that is read, but a subject that is practiced and requires constant study if they are to understand the basic properties, concepts and processes involved (Oluchi 2008). In relating to the importance of mathematics, we can say, it is the scientific, industrial, technological and social progress of a developing society like Nigeria.It can also be referred to as an important subject because it is associated with mere academic or career opportunities.

Currently, the performance of mathematics studentsat NCE and undergraduate levels,particularly the majors in the subject in recent times are not encouraging.This can be attributed to the fact that majority of mathematics undergraduate students have been observed to have the bad spirit of procrastinations.This is confirm by the observation by Fevrari and Beck,(1998) that 70% of college of education students and University students engage in frequent academic procrastination.This as a result of the tedious and abstract nature of the course.

Proficiency in mathematics is seen as an essential pressure to ensure in modern society. In Nigeria recent guidelines set by the Ministry of Education regarding mathematics has led to the implementation of mathematics study in the country (Nigeria).

The complementary of factors that can influence mathematics performance is translated by Singh,Granville and Dika (2008) rule that show that high achievements in mathematics is a function of many interrelated variables related to students, teachers, lecturers, peer groups, families and schools. Among students variables attitudes are regarded by several researchers as an important/key factor to be taken into account when attempting to understand and explain variability instudents' performance in mathematics.

Negative attitude in mathematics could be as aresult of frequent repeated failures of problems when dealing with mathematics tasks and this negative attitude may become relatively permanent Students performanceinmathematics may also ne influence by greater differences.Wilson and Nwadiami(2009) stated that students at 100 and 200 level in Nigerian Universities seem to have high positive attitude towards mathematics when compare to students in 300 and 400 level.

1.2 Statement of Problem

The task underlying this research work was assessing students' academic progression in mathematics in Delta State, University, Abraka. It is really a difficult task because even most students studying mathematics in Delta state University, Abraka is still afraid of their outcome.

Most of the courses offered in Mathematics in our Nigerian universities seem to be a threat to some students. These courses include Real Analysis I and II, Complex analysis I and II, Topology and so on. This could be as a result of the fact that they see this courses as being extremely difficult and totally abstract in nature.

The perceived attitude of most students makes them devote little or less time to their academic work, rather they depend on microchip that is, bringing of copied work to the examination hall as a form of assistance (examination Malpractice).The purpose of this study is therefore to access students' academic progression in mathematics in Delta State University, Abraka

1.2 Purpose of study

The specific objectives are as follows

- To use ANOVA through F test and P value to determine students progression in the study of the development al and unfriendly course like Real Analysis, Complex Analysis, Topology and Abstract Algebra in mathematics from 2015-2018
- To determine future progression in theses unfriendly courses through fitted linear regression model
- To determine yearly performance of students in these unfriendly courses

1.3 Significance of Study

- Provide academic records of students to enable parents them havein-depth knowledge of the academic performance of their children.
- To enable able lectures know the category of students to pay much attention to in preparing and delivery of their lesson
- To enable students make necessary adjustment where they have academic challenges in order to increase their academic performance

2. Methodology

In this section, statistical tools used for the achievement of purpose of this research were explained which include Descriptive Statistics(Mean and Chart), One Way Analysis of Variance (ANOVA), Line Charts fluctuations, normality testing usingLevene test and ordinary Least squares regression (OLS)

2.1 Descriptive Statistic (Mean and Chart)

Mean

The mean (x) can be referred to as the average which is computed using the sum of required information over the number of terms. Mathematically, it is computed as

$$\bar{X} = \frac{\sum X_i}{n} = \frac{X_1 + X_2 + X_3 + X_4 + \ldots + X_n}{n} \quad (1)$$

Where n is the number of scoresconsidered. In this study,mean was used to determine the average occurrence of variable of interest such as average scores of the performance of degree students in those developmental and unfriendly courses.

Line Chart:

Line charts are used in data presentation and interpretation for better understanding of the fluctuation of the given observations within a number of observed years. In this study, line charts were used to present data collected for the variables of interest to look at the performance of students developmental and unfriendly courses in terms of increase, decrease or fluctuation from 2015 to 2018

2.2 Analysis of variance (One Way ANOVA with Replication)

The tool is used to determine if there exists significance difference among factors or treatments. It involves more than one factor with replicates.Analysis of variance is an ANOVA that deals with dependent variable(Y) and single independent variables(Xi). In this study research, it was used to test for significance difference among the observations of the average score of students on developmental and unfriendly courses from 2015 to 2018

2.3 Sum of Squares(SS)

Sum of Squares Total (SSTOTAL) is the total variation in the data. This is the deviation of the estimated factor level mean around the overall mean and sum of square error(SSE) is the deviation of an observation from its corresponding factor/level mean. It is also known as Error or within treatments. The calculations are

$$SS_{Factor} = \sum_{j=1}^{c} n\left(\bar{X}_j - \bar{\bar{X}}\right)^2 \quad (2)$$

$$SS_{Error} = \sum_{j=1}^{c}\sum_{i=1}^{n}\left(X_{ij} - \bar{X}_j\right)^2 \quad (3)$$

$$SS_{Total} = \sum_{j=1}^{c}\sum_{i=1}^{n}\left(X_{ij} - \bar{\bar{X}}\right)^2 \quad (4)$$

Where:

p = Number of groups or levels of the factor of interest

n_j = Number of observations in group j

$\bar{X}_j$ = the sample mean of group j

$\bar{0} = \frac{\sum_{j=1}^{m}\sum_{i=1}^{n} X_{ij}}{n}$ is the overall or grand mean (5)

X_{ij} = the ith observation in group or level j

2.4 Obtaining the Means Squares

$$MS_{Factor} = \frac{SUM\ OF\ SQUARES\ TREATMENT}{p-1} \quad (6)$$

$$MS_{Error} = \frac{SUM\ OF\ SQUARES\ ERROR}{N-p} \quad (7)$$

$$MS_{Total} = \frac{SUM\ OF\ SQUARES\ TOTAL}{N-1} \quad (8)$$

2.5 The One Way ANOVA F Test Statistics

$$f_{calculated} \quad \frac{MEAN\ SQUARE\ TREATMENT}{MEAN\ SQUARE\ ERROR} \quad (9)$$

2.6 The one ANOVAF Critical/Tabulated Value

$$f_{critical} = f_{(p-1)(n-1)^*} \quad (10)$$

2.7 Ordinary Least Square Regression (OLS)

In fitting trend models, several methods were proposed by statistical researchers but in this study, OLS was used in fitting the trend of the variables of interest. The dependency of students scores were tested on the years using OLS and future occurrence were predicted using the models formulated. The model can be expressed as

$$y_i = b_0 + b_1 x + e_i \quad (11)$$

Where y_i is the dependent variable and students' scores for each year is the independent variable. b_0 is the intercept on y axis. b_1 is the slope or rate of change of the dependent variable with

respect to the independent variable. The b_0 andb_1 are the parameters in the linear model. Theb_0 can be computed as

$$b_0 = \bar{y} - b_1 x \quad (12)$$

And

$$b_1 = \frac{n\sum_{i=1}^{n} x_i y_i - \sum_{i=1}^{n} x \sum_{i=1}^{n} y}{\left[n \sum_{i=1}^{n} x^2 - \left(\sum_{i=1}^{n} x \right)^2 \right]} \quad (13)$$

Simple regression analysis becomes multiple regressions when the independent variables increase more than 1, that is, multiple regressions involves more than one independent variable. The model is expressed as

$$y_i = b_0 + b_1 X_1 + b_2 X_2 + \cdots b_n X_n + e_i \quad (14)$$

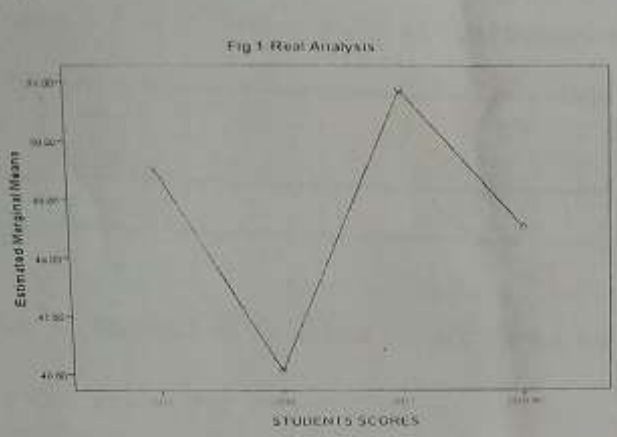
2.8 Testing Normality Assumption

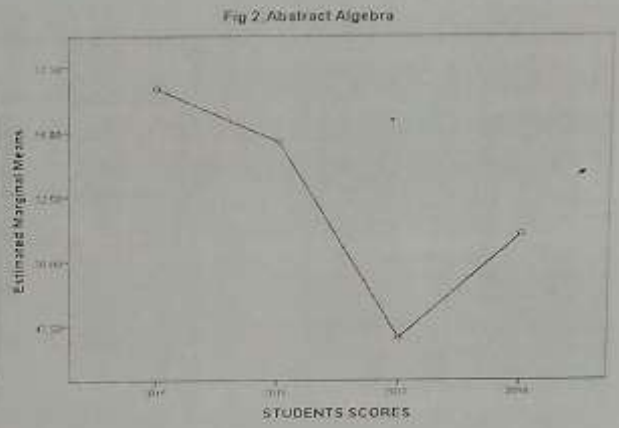
Normality assumption can be evaluated using LeveneStatistic.Data are normally distributed when P value for Levene statistic is greater than (>) 0.05 level of significance

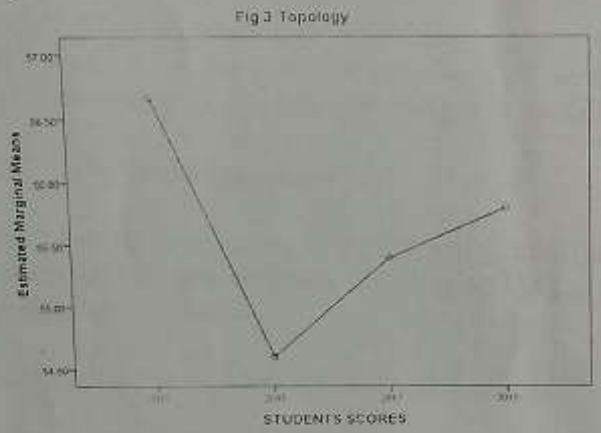
3 Analyses of Data

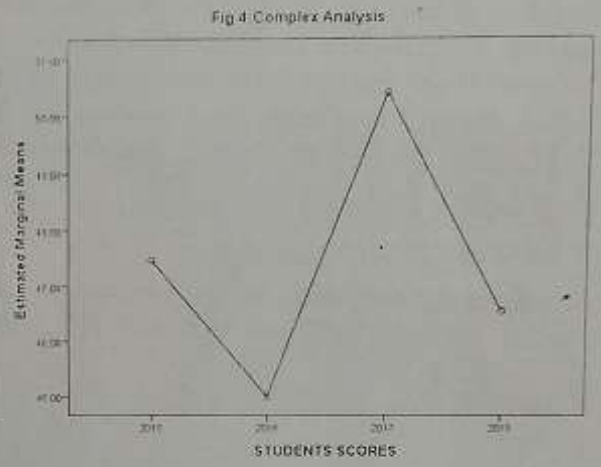
3. 1 Means Plot

Table 1: Means Plot Chart of Real Analysis, Complex Analysis, Topology and Abstract Algebra









3.3 Analysis of Students Performance in Real Analysis from 2015 - 2018

Table 1:Descriptive Statistics on Real Analysis

STUDENTS SCORES	Mean	N
2015	49.5333	15
2016	46.0667	15
2017	50.8667	15
2018	48.5333	15
Total	48.7500	60

Table 2: Test of Homogeneity of Varianceon Real Analysis

Levene Statistic	df1	df2	Sig.
.612	3	56	.610

3.4 Analysis of Variation among Variables for Years

In this section,One Way Analysis of Variance was used to test for the existence of significance differences in the observations of the variables of interest. The observations were segmented into four namely 2015, 2016, 2017 and 2018 academic session. These served as a factor in the one way ANOVA.The test was conducted at 5% level of significance with implies the P-value of 0.05 would serve the point for decision making, determination of acceptance or rejection of the test hypothesis which is often referred to as the null hypothesis

3.5 The Null Hypothesis

The observations are not significantly different or increase in the past four years.Basic assumption of normality was tested using Levene test. The results of One Way ANOVA for the variables are as follows.

Table 3: One way ANOVA on Real Analysis

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	185.117	3	61.706	.919	.437
Within Groups	3758.133	56	67.110		
Total	3943.250	59			

The P value of 0.437 is greater than 0.05 level of significance which implies there is no significance difference or improvement among the mean scores of students in real analysis from 2015-2018 academic sessions. Therefore there exists enough evidence to accept the null hypothesis and conclude that real analysis of the scores form 2015-2018 has not improve significantly in the last four years. This is an indication that the result of students' performance in Real Analysis for the past four years has not improved significant in recent time.

The P-value of 0.987 for Levene test is greater than 0.05 level of significance. This shows that there is an adequate validation of the assumption of normality. Therefore, the data is normally distributed and follows a linearity pattern with constant variance.

3.3 Analysis of Students Performance in Complex Analysis from 2015 - 2018

Table 4:Descriptive Statistics on Complex Analysis

Year of Academic Session	N	Mean
2015	15	47.4667
2016	15	45.0000
2017	15	50.4000
2018	15	46.5333
Total	60	47.3500

Table 5: Test of Homogeneity of Variances on Complex Analysis

Levene Statistic	df1	df2	Sig.
1.329	3	56	.274

Table 6:One way ANOVA on Complex Analysis

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	232.583	3	77.528	1.845	.149
Within Groups	2353.067	56	42.019		
Total	2585.650	59			

The P-value of 0.149 is greater than 0.05 level of significance which implies there is no significance difference or improvement among the mean scores of students in Complex Analysis from 2015-2018 academic sessions. Therefore, there exists enough evidence to accept the null hypothesis and conclude that complex analysis of the scores form 2015-2018 has not improved significantly in the last four years. This is an indication that the result of students' performance in complex Analysis for the past four years has not improved significant in recent time

The P value of 0.149 for Levene test is greater than 0.05 level of significance. This shows that there is an adequate validation of the assumption of normality. Therefore, the data is normally distributed

3.4 Analysis of Students Performance in Topology from 2015 – 2018

Table 7: Descriptive statistics on Topology

Year of Academic Session	N	Mean
2015	15	56.6667
2016	15	54.6000
2017	15	55.4000
2018	15	55.8000
Total	60	55.6167

Table 8: Test of Homogeneity of Variances on Topology

Levene Statistic	df1	df2	Sig.
.272	3	56	.845

Table 9: One way ANOVA on Topology

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	33.250	3	11.083	.190	.903
Within Groups	3272.933	56	58.445		
Total	3306.183	59			

The P – value of 0.437 is greater than 0.05 level of significance which implies there is no significance difference among the mean scores of students in real analysis from 2015-2018 academic sessions. Therefore, there exists enough evidence to accept the null hypothesis and conclude that Topology of the scores form 2015-2018 has not change or improved significantly

in the last four years. This is an indication that the result of student's performance in Topology for the past four years has not improved significant in recent rime

The P value of 0.903 for Levene test is greater than 0.05 level of significance. This shows that there is an adequate validation of the assumption of normality. Therefore, the data is normally distributed.

3.5 Total Analysis of Students Performance in Abstract Algebra from 2015 - 2018

Table 10: Descriptive Statistics on Abstract Algebra

Year of Academic Session	N	Mean
2015	15	56.6667
2016	15	54.6000
2017	15	47.0000
2018	15	51.0000
Total	60	52.3167

Table 11: Test of Homogeneity of Variances on Abstract Algebra

Levene Statistic	df1	df2	Sig.
.077	3	56	.972

Table 12: One Way ANOVA on Abstract Algebra

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	812.050	3	270.683	3.457	.022
Within Groups	4384.933	56	78.302		
Total	5196.983	59			

The P - value of 0.437 is greater than 0.05 level of significance which implies there is no significance difference among the mean scores of students in real analysis from 2015-2018

academic sessions. Therefore, there exists enough evidence to accept the null hypothesis and conclude that real analysis of the scores form 2015-2018 has not improvedsignificantly in the last four years. The P value of 0.987 for Levene test is greater than 0.05 level of significance. This shows that there is an adequate validation of the assumption of normality. Therefore, the data is normally distributed

3.5 Modeling Future Occurrence of the variables Using OLS

The independent variable was scores time and the Real Analysis,Complex Analysis, Topology and Abstract Algebra all served as dependent variable respectively, the models are

3.7 Fitted Trend Equation

$$Y_1(realAnalysis) = 48.533 + 1.000\,X_1(2015) - 2.467\,X_1(2016) + 2.333\,X_1(2017) + 0.000\,X_1(2018) \quad (15)$$

The fitted trend of equation 15 has a very poor coefficients of 1.000 for 2015, -2.467 for 2016 and 0.000 for 2018.This is an indication of poor results in real analysis in 2015, 2016 and 2018

$$Y_2(complexAnalysis) = 46.533 + 9.33\,X_1(2015) - 1.533\,X_2(2016) + 3.867\,X_3(2017) + 0.000\,X_4(2018) \quad (16)$$

The fitted trend of equation 16 has a very poor coefficients of -1.533 for 2016, and 0.000 for 2018. This is an indication of poor results in complex analysis in 2016 and 2018

$$Y_3(Topology) = 55.800 + 0.867\,X_1(2015) - 1.200\,X_2(2016) - 4.000\,X_3(2017) + 0.000\,X_4(2018) \quad (17)$$

The fitted trend of equation 17 has a very poor coefficients of 0.867 for 2015, -2.000 for 2016 and -4.000 for 2017 and 0.000 for 2018. This is an indication of poor results in topology in 2015, 2016 , 2017 and 2018

$$Y_4(AbstractAlgebra) = 51.000 + 5.667\,X_1(2015) + 3.600\,X_2(2016) - 4.000\,X_3(2017) + 0.000\,X_4(2018) \quad (18)$$

The fitted trend of equation 18 has very poor coefficients of -4.000 for 2017 and 0.000 for 2018. This is an indication of poor results in abstract in 2017 and 2018

Conclusion

The descriptive statistics of the four courses shows students' performance in Real Analysis, Complex Analysis, Topology and Abstract Algebra for four years hovering around average or below average. The fitted linear model shows a decrease or a very miniature scores in the performance of the subject. The fitted linear trend model shows a poor performance in this subject in present and future to come.

Convincingly, the Analysis of Variance (ANOVA) table through F test in the variables proves that the students' performance in developmental and unfriendly courses like Real Analysis, Complex Analysis, Topology and Abstract algebra has a significant decrease in the performance. Finally,this is an indication that students offering this course are not doing well in exams

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