# GENDER EQUALITY IN STUDENTS' ENROLMENT IN TAI SOLARIN UNIVERSITY OF EDUCATION, OGUN STATE

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## Abstract

*In Nigeria, governments over the years have made it a point of duty to ensure that female population has the same opportunities as the male population. This study examined gender equality in students' enrolment in Tai Solarin University of Education, Ogun State. Statistical data of all the colleges enrolled for year 2013-2015 was collated. The data was tested using analysis of covariance (ANCOVA), and regression coefficient (β) which shows that there is no significant difference in the enrolment of students. Also there is no gender discrimination in admission of students into various disciplines of the university. Conclusion and recommendation were discussed based on the result obtained.*

***Keywords: Enrolment, Gender equality, women empowerment.***

## Introduction

Gender is defined by Basson [1] as a psychological term describing behaviour and attributes expected of individual on the basis of being born either a male or a female. Gender inequality is a situation of uneven distribution of income, lack of access to productive inputs, such as credit and education, lack of command over property or control over earned income as well as gender bias in labour market and social exclusion between men and women. It also connotes a situation where women do not have the same rights and enlightenments as men to human, social, economic and cultural development and where women do not have equal voice in civil and political life [2, 3]. For many centuries, there has been a universal devaluation of women in Africa. The female sex's social role has been traditionally linked to the home and it has always been assumed that they can find happiness and fulfillment only as mothers and wives [4]. Chabaud [5] emphasizes the fact that formal education not only improves the status of women in society, it also contributes largely to eliminating the inferior stereotyping of women. Thus, expanding education, especially basic formal education has been on objective of the education policies in developing countries over the past two decades [4].

One of the eight (8) milestone of Millennium Development Goals (MDGs) as set by World Leaders in September 2000, for the International Community to meet by the year 2015, is to promote gender equality and empower women. This goal is vital because our society has continued to regress town-wards in quality of life due to lack of empowerment of women who are usually left to cater for the family after the demise or death of the man [6, 7]. The enlarged access to qualitative and functional educational opportunity for all, male and female, is perhaps one of the most effective means to combat poverty, reduce misunderstanding, political and religious intolerance as well as lack of respect for others which had been the major causes of frictions, revolts and intermittent civil crises in the nation. Girls education

would not only contribute to move the nation forward economically, politically, and technologically; it would also go a long way to liberate the women folk from their natural way of dependency, inferiority, superstition and other shackles that impede national development [8].

Review of literatures shows that female gender equitable access rate for higher education in Nigeria is quite unimpressive. For instance, Anho & Onojetah [9] reported that the cumulative under-graduate enrolment overtime in Nigeria from 1980 – 1999 revealed that there is a great disparity between enrolment of male and female. Studies have shown that there is a very poor level of equitably accessibility to university education in Nigeria, whether on the part of women or other educationally disadvantaged groups such as nomads, migrant fishermen and street children [10, 11, 12]. Nwajiuba [11] reported that JAMB lamented the decline in the number of female candidates who sat for the examination from 438, 703 in 2003 to 353, 834 in 2004. As noted by Ahmed [13] a wide gulf still exists in enrolment and retention in favour of males. This means that there is gender inequality in enrolment in university education in Nigeria.

The benefits of education are well established: it raises the quality of life; it improves health and productivity in market and non-market work; increases individuals' access to paid employment and often facilitates social and political participation [4]. Social justice and equity can only be attained when both sexes are given equal opportunities in educational training. Tai-Solarin University of Education being a cooperate member of the global society, has an implied responsibility of helping to achieve this goal. One of the expected means by which it can help in achieving this goal is by gender considerations in enrolment of her students.

**Objective of Study**

The aim of this study is to ascertain statistically gender equality/inequality in students' enrolment in Tai-Solarin University of Education.

**Research Hypotheses**

The following null hypotheses were tested at 0.05 level of significance.

- The treatment effects (enrolment of male and female at each level of studies are equal i.e. $\mu_1 = \mu_2 = \mu_3 = \mu_4$.
- The covariance effects (regression coefficient are not significantly different) i.e. $\beta = 0$

**Methodology**

The study adopted a descriptive research design.

***Source of Data:*** the sources of data is 2013 – 2015 annual report of the academic planning unit of the Tai-Solarin University of Education, Ijagun, Ijebu-ode, Ogun State.

***Data Analysis:*** The method used for this study is analysis of covariance (ANCOVA). This method combines the advantage of regression and analysis of variance; hence, we can test for significance difference and regression coefficient ($\beta$) for both male and female enrolment. Suppose $y_{ij}$ are the values of an independent random variable having normal distribution with the respective mean $\mu_i$ and the common variance $\delta^2$. Ordinarily the mathematical model for a one-way analysis of variance is expressed as:

$$y_{ij}= \mu+t_i+e_{ij},\ i=1,2,3,...,t,\ j=1,2,3\ldots,r. \text{ -------- } (1)$$

Where $y_{ij}$= Observed value from the unit *j* receiving treatment *I*

$\mu$ = Overall mean

$t_i$ = effect of treatment *i*

$e_{ij}$= Random error of unit *j* receiving treatment *i*

But because the analysis of covariance combines the advantages of regression and analysis of variance, equation (1) can be expressed as:

$y_{ij}= \mu+t_i+\beta(x_{ij} \quad \bar{x}) + e_{ij}$ ---------- (2)

i=1,2,3,...,t, j=1,2,3…,r.

Where:

$\beta$ = Coefficient of linear regression

$x_{ij}$=Covariate effect

If the treatment effect, ti are assumed in such a way that

$$\sum_{i=1}^{t} t_i = 0, \qquad \sum_{i=1}^{t}\sum_{i=1}^{r}(x_{ij} \quad \bar{x}) = 0 \text{ and } e_{ij} \sim N(0,02) \text{from equation}$$

2) the least square estimate for covariance Error Sum of square (SSE) can be defined as;

$$e_{ij} = y_{ij} \quad \mu \quad t_1 \quad \beta(x_{ij} \quad \bar{x})$$

$$SSE = (e_{ij})^2 = \sum_{i=1}^{t}\sum_{i=1}^{r}(y_{ij} \quad \mu \quad t_1 \quad \beta(x_{ij} \quad \bar{x}))^2 \qquad (3)$$

By differentiating equation (3) w.r.t $\mu$ and equating to zero such $\frac{\partial SSE}{\partial \mu} = 0$ gives;

$$2\sum_{i=1}^{t}\sum_{i=1}^{r}(y_{ij} \quad \mu \quad t_1 \quad \beta(x_{ij} \quad \bar{x})) = 0$$

Dividing

$$2\sum_{i=1}^{t}\sum_{i=1}^{r}y_{ij} + 2\sum_{i=1}^{t}\sum_{i=1}^{r}\mu + 2\sum_{i=1}^{t}\sum_{i=1}^{r}t_1 + 2\sum_{i=1}^{t}\sum_{i=1}^{r}\beta(x_{ij} \quad \bar{x}) = 0$$

Dividing through by (-2)

$$\sum_{i=1}^{t}\sum_{i=1}^{r}y_{ij} \quad \sum_{i=1}^{t}\sum_{i=1}^{r}\mu \quad \sum_{i=1}^{t}\sum_{i=1}^{r}t_1 \quad \sum_{i=1}^{t}\sum_{i=1}^{r}\beta(x_{ij} \quad \bar{x}) = 0$$

$$\sum_{i=1}^{t}\sum_{i=1}^{r}y_{ij} \quad tr\mu \quad r\sum t_1 \quad \beta\sum_{i=1}^{t}\sum_{i=1}^{r}(x_{ij} \quad \bar{x}) = 0$$

$since\ we\ assumed \sum_{i=1}^{r} t_i = 0\ and\ \sum_{i=1}^{t}\sum_{i=1}^{r}(x_{ij} \quad \bar{x}) = 0, it\ follows\ t\ \ at\ \sum_{i=1}^{t}\sum_{i=1}^{r}y_{ij} \quad tr\mu = 0$

$$t\ \ erefore, \mu = \frac{\sum_{i=1}^{t}\sum_{i=1}^{r}y_{ij}}{tr} = \frac{y}{rt} \qquad (4)$$

To obtain the sum of squares for treatment i.e (SSt), differentiate equation (3) w.r.t such that $\frac{\partial SSE}{\partial \mu} = 0$

$$2\sum_{j=1}^{t}(y_{ij} \quad \mu \quad t_1 \quad \beta(x_{ij} \quad \bar{x})) = 0$$

$$2\sum_{j=1}^{t}y_{ij} + 2\sum_{j=1}^{t}\mu + 2\sum_{j=1}^{t}t_1 + 2\sum_{j=1}^{t}\beta(x_{ij} \quad \bar{x}) = 0$$

Dividing through by (-2) yields;

$$\sum_{j=1}^{t} y_{ij} \quad r\mu \quad rt_i \quad \beta \sum_{j=1}^{t} (x_{ij} \quad \bar{x}) = 0$$

It follows that $r\mu + rt_i + \beta \sum_{j=1}^{t} (x_{ij} \quad \bar{x}) = y_i$

$$rt_i = y_i \quad r\mu \quad \sum_{j=1}^{t} (x_{ij} \quad \bar{x})$$

$$t_i = \frac{y_i}{r} \quad \mu \quad \hat{\beta} \left( \frac{x_{ij}}{r} \quad \frac{\bar{x}}{r} \right)$$

$$t \ \ erefore, t_i = \frac{y_i}{r} \quad \frac{y}{rt} \quad \hat{\beta} \left( \frac{x_{ij}}{r} \quad \frac{\bar{x}}{r} \right)$$

The adjusted mean of treatment I can be estimated as

$$t_i = \frac{y_i}{r} \quad \hat{\beta} \left( \frac{x_{ij}}{r} \quad \frac{\bar{x}}{r} \right) \qquad (5)$$

To obtain the Sum of Square due to regression coefficient ($\beta$), differentiate (3) with $\beta$ such that $\frac{\partial SSE}{\partial \mu} = 0$ yields;

$$\sum_{i} t_i \sum_{j} (x_{ij} \quad \bar{x}) + \hat{\beta} \sum_{\iota} \sum_{\iota} (x_{\iota j} \quad \bar{x})^{\widehat{2}} = \sum_{\iota} \sum_{\iota} (x_{\iota j} \quad \bar{x}) (y_{ij} \quad \frac{y}{rt})$$

$$t \ \ erefore, \hat{\beta} = \frac{\left[ \sum \sum y_{ij} \, x_{ij} \quad \frac{y_{ij} x_{ij}}{rt} \right] \quad \left[ \sum \sum y_{ij} x_{ij} \quad \frac{y_{ij} x_{ij}}{rt} \right]}{\left[ \sum \sum {x_{ij}}^2 \quad \frac{x^2}{rt} \right] \quad \left[ \sum \frac{{x_i}^2}{r} \quad \frac{x^2}{rt} \right]}$$

$$\hat{\beta} = \frac{S_{xy} \quad T_{xy}}{S_{xx} \quad T_{xx}} = \frac{E_{xy}}{E_{xx}}$$

Where: $S_{xy} = t \ \ e \ total \ sum \ of \ product$

$T_{xy} = t \ \ e \ treatment \ sum \ of \ product$

$S_{xx} = t \ \ e \ total \ sum \ of \ square$

$T_{xx} =$ $t$ $e\ treatment\ sum\ of\ square$ and

$\frac{S_{xy}^2}{S_{xx}}$ $t$ $e\ sum\ of\ square\ due\ to\ \beta$

**Test of Hypotheses**

The null hypothesis to be tested for the given data are;

1. The treatment effects (Enrolment of male and female students at each level of students are all equal, against the alternatives that they not all equal i.e. $H_0: \mu_1 = \mu_2 = \mu_3 = \mu_4$ against $H_1: \mu_1 = \mu_2 = \mu_3 = \mu_4$ are not all equal in their means. ----------(7)
2. The covariance effects (regression coefficient are not significantly differently,

i.e. $H_0\ \beta = 0$ against $H_1: \beta \neq 0$ ----------(8)

***Decision Rule 1***: Reject $H_0$ if $F_{cal} > F_{\alpha}(t \quad 1)t(r \quad 1) \quad 1$ and conclude that there is significant difference in enrolment of male and female students at $\alpha$=0.05

***Decision Rule 2***: Reject $H_0$ if $F_{cal} > F_{\alpha}(t \quad 2), t(r \quad 1) \quad 1$ and conclude that $\beta \neq 0$ and therefore, there is need for covariance analysis between enrolment of male and female students at $\alpha$=0.05

Therefore the adjusted mean $\bar{y}_1$ is given by:

$$\bar{y}_1{}^1 = \bar{y}_1 \quad \beta(x_{ij} \quad \bar{x}), \quad i = 1,2,3,4 \qquad (10)$$

Where $\bar{y}_i{}^1$ = the adjusted means for male students (M)

$\bar{y}_i$ = the mean of treatment for male students (M) Unadjusted

$\bar{x}_i$ = the mean of treatment for female students (F)

$\bar{x}$ = the overall mean of female students (F)

The standard Error of difference (SED) is useful for comparison of adjusted mean such as;

$H_0 : \mu_i \quad \mu_j = 0$ (11)

And the statistical model is given as;

$$SED_{(ivsj)} = \sqrt{S^2[\frac{(t \quad 1)}{r} + \frac{\bar{x}_i \quad \bar{x}_j}{Exx}} \quad (12)$$

Assuming we are to compare two adjusted means ($\bar{y}_i{}^1 = \bar{y}_j$), the statistical model will be;

$$T = \frac{\bar{y}_i = \bar{y}_j}{SED_{(ivsj)}} \quad (13)$$

The decision rule will be; reject $H_o$, if T > $t_e \frac{\propto}{2}$ and conclude that there is no significant difference between the two means compared.

**Presentation and Analysis of Results**

The data in table 1 are both male and female students' enrolment into various colleges for the period of 2013 – 2015. A total of 40,641 students were enrolled within the period of study out of which 17,279 are male and 23, 362 are female. It is erroneous to conclude that there is gender inequality since (Female > Male) because such decision has not been subjected to statistical inference.

**Table 1: Shows students' gender enrolment into various colleges for the period of 2013 – 2015**

| Colleges | 2013 | | 2014 | | 2015 | |
|---|---|---|---|---|---|---|
| | Male | Female | Male | Female | Male | Female |
| COSIT | 980 | 1029 | 723 | 987 | 766 | 954 |
| COHUM | 1241 | 1829 | 1075 | 2169 | 1986 | 2341 |
| COEVOAT | 1103 | 1945 | 1772 | 2086 | 1298 | 2017 |
| COSMAS | 1855 | 2114 | 1968 | 2289 | 2512 | 3602 |
| **TOTAL** | **5179** | **6917** | **5538** | **7531** | **6562** | **8914** |
| AVERAGE | 1294.75 | 1729.25 | 1384.5 | 1882.75 | 1640.5 | 2228.5 |

***Source: Academic Planning Directorate TASUED, Ogun State.***

***COSIT:*** **College of Science Information and Technology,** ***COHUM:*** **College of Humanities,** ***COAEVOT:*** **College of Applied Education and Vocational Technology,** ***COSMAS:*** **College of Social Management Science**

Using the data on table 1, the summary of the analysis of variance and covariance are given in table 2a and 2b respectively.

**Table 2a: Summary of Analysis of covariance (ANOCOVA) adjust (ANOVA) for students' enrolment**

| Source of variation | SS | DF | MS | F |
|---|---|---|---|---|
| **Students enrolment** | 2322440 | 5 | 464488 | 3.619 |
| **Error** | 1925430 | 15 | 128362 | |
| **Total** | 4247870 | 23 | | |

* ***The tabulated value for treatment effect (students' enrolment at the levels of studies) is*** $F_{0.05, 6, 4} = 6.16$

**Table 2b: Summary of the Analysis of covariance (ANOCOVA) adjust (ANOVA) for years of enrolment**

| Source of variation | SS | DF | MS | F |
|---|---|---|---|---|
| **Years of enrolment** | 378433 | 2 | 189216 | 1.800 |
| **Error** | 630808 | 6 | 105135 | |
| **Total** | 1009241 | 11 | | |

* *The tabulated value for treatment effect (year of enrolment at the levels of studies) is* $F_{0.05, 3, 4} = 6.59$

**Discussion of Findings**

Since (3.619<6.16), the null hypotheses might be accepted. In other words, the difference among the means obtained for both male and female student enrolment is not statistically significant. This means that there is no gender inequality when considering students enrolment into the university.

Similarly, taking into consideration the enrolment of students within the year, (1.800<6.59), which is also in support of the null hypotheses.

The need for covariance analysis between students enrolment and year enrolment resulted into the estimated regression coefficient; $\hat{\beta}$=0.5187 and the adjusted mean estimated from equation (3) are $\bar{y}_1'$=1407.61, $\bar{y}_2'$=1448.58 and $\bar{y}_3'$=1494.40. The Standard Error of Difference (SED) estimated from the equation

$SED_{(i\ vs\ j)}=\sqrt{S^2\left(\frac{t-1}{r}+\frac{\bar{x}-x_j}{E_{xx}}\right)}$ is as follows:

$SED_{(1\ vs\ 2)}$ = 400.63, $SED_{(1\ vs\ 3)}$ = 400.55, $SED_{(2\ vs\ 3)}$

The estimated T's from T = $\frac{\bar{y}_i'-\bar{\bar{y}}_J}{SED}$

$T_{(x_1 vs\ 2)}$ = 0.2817, $T_{(x_1 vs\ 3)}$ = 0.1599, $T_{(x_2 v_{s\ 3})}$ = - 0.3647 and the critical value is $t_{23(\frac{0.05}{2})}$

Since all the T's < 2.069 we may not reject the null hypothesis H0:$\mu_i \neq \mu_j = 0$. We therefore conclude that there is no significant difference between the two adjusted means compared.

The results is retaliated by Idumange [14] whose study showed that the Nigerian government does not discriminate against females in the field of education. However, this is not in conformity with the earlier findings of Jibril [15] and Azimi [16] who found that there is gender disparity in favour of male students in enrolment in schools. Badejo [17]; Dayo [18]; and UNESCO [19] also revealed that classroom enrolments consistently indicates more male than female students.

## Conclusion

The finding of this study is encouraging considering the fact that there is ample evidence that there is gender equality in admission quota in Tai Solarin University of Education as evidence by the admission quota of the 2013 – 2015 Academic session.

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