

# Effects of Gender on Academic Achievement of Students Using Demonstration and Discussion Teaching Methods in Senior School Biology in Yenagoa and Ogbia Local Government Areas, Bayelsa State

**Blessing C. CLEOPAS (PhD)**

Department of Science Education  
Faculty of Education, Federal University, Otuoke  
Bayelsa State  
[chinyerecleopas@yahoo.com](mailto:chinyerecleopas@yahoo.com)  
2348066399476

**Patrick C. IGBOJINWAEKWU (Prof)**

Department of Science Education  
Faculty of Education, Niger Delta University  
Bayelsa State  
[earimeka@gmail.com](mailto:earimeka@gmail.com)  
2348094636547

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**Abstract:** This study, effects of gender on academic achievement of students using demonstration and discussion teaching methods in senior school biology in Yenagoa and Ogbia Local Government Areas, Bayelsa State was a quasi-experimental research design. The population of the study was 6,988 Senior School Two Biology students in Bayelsa State. The sample consists of 323 Senior School Two students from 23 Senior Secondary Schools in the above Local Government Areas of Bayelsa State. One research question and one hypothesis guided the study. Three validated and reliable instructional guides namely Instructional Guide on Demonstration Teaching Method (IGDTM), Discussion Teaching Method Guide (DTMG) and Guide on Lecture Teaching Method (GLTM) were used in training teachers to use the methods of teaching. Standardized Biology Achievement Test (SBAT) was used as a reliable instrument for data collection. Data were analyzed using percentage, mean, standard deviation and z-test statistics. The findings of the study were that gender does not determine increase in scores but other factors. The impact of demonstration and discussion methods of teaching on gender is homogenous. Also, demonstration teaching method cannot be carried out effectively in a large population size. Recommendation made was that schools with high population of students should use discussion teaching method instead of demonstration teaching method because demonstration method cannot be effectively carried out in a densely populated classroom.

**Keywords:** Demonstration, Discussion, Biology, Method, Achievement, Gender

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## Introduction

Teaching methods has always been a major concerns for gender either male or female in school environ. Gender is a state of being a male or a female (Igbojinwaekwu, 2016). Jhpiego (2015) defined gender as an expression of traits or attributes associated with certain groups of people with respect to having male or female characteristics. Adekunle (2017) reported that gender

discrimination in teaching and learning of science is still common today in Nigeria. He stated that many studies have linked gender with students' academic achievement in science without conclusion. Arigbabu and Mji (as cited in Alordiah, Akpadaka & Oviogbodu, 2015) affirmed that gender discrimination is prevalent in Nigeria and Africa at large. Nwona and Akogun (2015) noted that there is a misrepresentation and underrepresentation of females in Science, Technology and Mathematics due to gender issue. Jugovic (2017) opined that gender stereotype should be discouraged in all its forms and cultural gender roles that limits female students from taking gender non-stereotypical careers regardless of their interest and abilities. Discrimination by some teachers in science classes is an issue of concern in today's world. The female gender is more vulnerable to gender discrimination and downgrading than males due to cultural and traditional views which stereotyped females to limit their potentials and active participation in science. Due to gender discrimination in Nigeria, socialization style limits the females and affect their view of considering some science career even when they are considered more intelligent than the males (Alordiah *et al*, 2015). Some cultures believe that males are superior to the females. They believe that certain roles are exclusive to the males and they command more attention in the family. This ideology has great effect on Science, Technology and Mathematics. This is in line with Fatokun and Idagboyi (2010) who revealed that Science, Technology and Mathematics have been tagged masculine where typing, food and nutrition, commerce, sewing, among others have been tagged feminine. This notion has an influence on academic attainment of science students. According to Agbaje and Awodun (2014), gender discrimination should not be allowed in education of science regardless of location of schools. Males and females should both be encouraged to offer science, knowing that science is essential in our everyday life. Gender discrimination can make female students in particular to lose interest in science and scare them away from science classes which will adversely affect teaching and learning of biology on the long run. Teachers should encourage both gender especially females to participate actively in class sessions to enhance their performance (Adekunle, 2017; Ezeudu & Obi, 2013). Igwe (2003) opined that gender concern is a vital issue in education and affect students' academic achievement in science.

### **Statement of the Problem**

Gender is the characteristics of boys and girls that are socially defined. It could also be a state of being a male or a female. Jhpiego (2015) defined gender as an expression of traits or attributes associated with certain groups of people with respect to gender. Gender is the characteristics of boys and girls. Researchers (Ezeudu & Obi, 2013; Alordiah *et al*, 2015; Adekunle, 2017) have extensively carried out studies in education on gender and academic performance of students with different variables, in order, to know the position of gender in science and other fields. Numerous strategies have been harnessed over the years to merge the gap created in science, yet, female students are being misrepresented or underrepresented (Nwona and Akogun, 2015). Imagine a culture where a girl goes to school with a stereotypical ideology that makes her an inferior gender in terms of science related courses and professions thereby creating a gap between the boys and girls in science (Jugovic, 2017). Agaje and Awodun (2014) supported that gender discrimination should not be practiced by teachers in education of science, regardless of the location of schools, be it urban or rural schools. The gender percentage in Biology is fairer than in other science subjects as Biology has a high percentage of women than men compared to other sciences. This gap has led to the cry of activist on gender equality, gender balance and gender equity where equal opportunity will be given to both gender in all fields, science education in particular.

### **Purpose of the Study**

The main drive of the study is to ascertain the effects of gender on academic achievement of students using demonstration and discussion teaching methods in senior school biology in Yenagoa and Ogbia Local Government Areas in Bayelsa State.

### **Research Question**

What difference exist between the mean achievement scores of male and female SS2 students taught Biology using demonstration and discussion methods?

### **Hypothesis**

There is no significant difference between the mean achievement scores of male and female SS2 students, taught Biology using demonstration and discussion methods.

### **Method**

The pretest-posttest control group quasi-experimental research design was adopted for the study. The population was 6,988, Senior school Two students taking biology as a subject in the senior secondary school from purposive selection of 23 schools (14 public and 9 private) in two Local Government Areas, and random assignment to treatment and control group was made. Purposive sampling technique was used to get a sample size of 323 biology students. One research question and one hypothesis were used in the study. Three validated and reliable instructional guides namely Guide on Demonstration Teaching Method (GDTM), Instructional Guide on Discussion Teaching Method Guide (IGDTM) and Lecture Teaching Method Guide (LTMG) were used in training teachers to use the teaching methods. One validated and reliable instrument namely Standardized Biology Achievement Test (SBAT) was used for data collection. Standardized Biology Test has been processed for validity and reliability by WAEC. Students taught with demonstration and discussion teaching methods serve as experimental groups while students taught with lecture teaching method serve as the control group. The instrument was administered with the help of research assistants. Data was analyzed using percentage, mean, standard deviation and z-test statistics.

### **Result**

Research Question 1: What difference exist between the mean achievement scores of male and female SS2 students taught Biology using demonstration and discussion methods?

**Table 1:** Summary of Mean Achievement Scores, Pretest and Posttest of Male and Female SS2 Students taught Biology using Demonstration, Discussion and Lecture Methods

Teaching Method	Gender	N	Pretest $\bar{x}$	Posttest $\bar{x}$
Demonstration	Male	85	47.91	46.44
	Female	36	52.19	48.61
Difference			4.28	2.17
Discussion	Male	39	58.28	55.56
	Female	76	54.98	55.71
Difference			3.30	0.17
Demonstration	Male	85	47.91	46.44
	Female	36	52.19	48.61
Difference			0.75	6.35
Lecture	Male	59	48.66	52.79
	Female	28	50.46	63.85
Difference			1.73	15.24
Discussion	Male	39	58.28	55.56
	Female	76	54.98	55.71
Difference			9.62	2.77
Lecture	Male	59	48.66	52.79
	Female	28	50.46	63.85
Difference			4.52	8.14

Answer to research question one, Table 1, pretest result shows male academic achievement mean of 47.91 and female academic achievement mean of 52.19 with a mean variance of 4.28 in favour of female students when taught with demonstration method. At posttest, when taught with demonstration method, male students had mean academic achievement of 46.44 while female students had 48.61. The variance in mean achievement was 2.17 in favour female students. In control group, at pretest, male students had academic achievement mean of 48.66 and female students had academic achievement mean of 50.46 with a difference of 1.80 in favour of female students. When taught with lecture method, male students academic achievement mean was 52.79 and female students academic achievement mean was 63.85 with a difference of 11.06 in favour of female students. This implies that female students had better academic attainment mean than their male counterparts. In discussion method group, at pretest, male academic achievement mean was 58.28 and female academic achievement mean was 54.98 with a variance of 3.30 in favour of male students. At posttest, when taught with discussion method, male students had 55.56 mean academic achievement while female students had 55.71. The difference of 0.15 mean achievement was in favour of female students. In control group, at pretest, male students had academic achievement mean of 48.66 and female students had academic achievement mean of 50.46 with a difference of 1.80 in favour of female students. When taught with lecture method, male students academic achievement mean was 52.79 and female students academic achievement mean was 63.85 with a difference of 11.06 in favour of female students. This implies that female students had better academic attainment mean than their male counterparts. This Table also shows that, at pretest, male students taught with lecture teaching method had better academic achievement mean with a difference of 0.75 mean than their male counterparts taught with demonstration teaching

method. Also, female students taught with demonstration teaching method had better academic achievement mean with a difference of 1.73 mean than female students taught with lecture teaching method. At posttest, male students taught with lecture teaching method had better academic achievement mean with a difference of 6.35 mean than male students taught with demonstration teaching method. Also, female students taught with lecture teaching method had better academic achievement mean with a difference of 5.24 mean than female students taught with demonstration teaching method. Also, at pretest, male students taught with discussion teaching method had better academic achievement mean with a difference of 9.62 mean than their male equals taught with lecture teaching method. Female students taught with discussion teaching method had better academic achievement mean with a difference of 4.52 mean than female students taught with lecture teaching method. At posttest, male students taught with discussion teaching method had better academic achievement mean with a difference of 2.77 mean than male students taught with lecture teaching method. Also, female students taught with lecture teaching method had better academic achievement mean with a difference of 8.14 mean than female students taught with discussion teaching method.

**Hypothesis 1:** There is no significant difference between the mean achievement scores of male and female SS2 students, taught Biology using demonstration and discussion methods.

**Table 2:** Summary of z- test Analysis of Male and Female SS2 Students Achievement taught using Demonstration, Discussion and Lecture Methods

Teaching Method	Gender	N	Posttest $\bar{x}$	SD	df	Z <sub>cal</sub>	Z <sub>crit</sub>	Type of test	P
Demonstration	Male	85	46.44	12.96	119	0.09	1.96	2-tailed	<0.05
	Female	36	48.61	11.62					
Discussion	Male	39	55.56	13.32	113	0.05	1.96	2-tailed	<0.05
	Female	76	55.71	12.88					
Demonstration	Male	85	46.44	12.96	142	2.54	1.96	2-tailed	<0.05
	Female	59	52.79	15.98					
Lecture	Male	36	48.61	11.62	62	3.90	1.98	2-tailed	<0.05
	Female	28	63.85	17.97					
Discussion	Male	39	55.56	13.32	96	0.93	1.98	2-tailed	<0.05
	Female	59	52.79	15.98					
Lecture	Male	76	55.71	12.88	102	2.20	1.96	2-tailed	<0.05
	Female	28	63.85	17.97					

When hypothesis 1, H<sub>01</sub>, was subjected to z-test examination, as revealed in Table 2, it was revealed that the z-calculated value is 0.90 and the z-critical is 1.96 when taught with demonstration method. The alternate hypothesis is rejected while the null hypothesis is accepted since the z-calculated value is smaller than the z-critical. This means that there is no substantial variance in the mean scores of male and female students taught with demonstration method in

academic achievement enhancement in Biology. This implies that demonstration method of teaching biology is gender friendly. It was also discovered from Table 2 that, the z-calculated value is 0.05 and the z-critical is 1.96 when taught with discussion method. The alternate hypothesis is rejected while the null hypothesis is accepted. Since the z-calculated value is smaller than the z-critical. This means that there is no substantial variance in the mean scores of male and female students taught with discussion method in academic achievement enhancement in Biology. This also implies that discussion method of teaching biology is not gender biased.

It was also discovered in Table 2 that the z-calculated value is 2.54 and the z-critical is 1.96 when taught with demonstration and lecture teaching methods. The alternate hypothesis is accepted while the null hypothesis is rejected since the z-calculated value is bigger than the z-critical. This implies that a substantial variance exists in the mean scores of male students schooled with demonstration and lecture teaching methods in academic achievement enhancement in Biology. It was also discovered in Table 2 that the z-calculated value is 3.90 and the z-critical is 1.98 when taught with demonstration and lecture teaching methods. The alternate hypothesis is accepted while the null hypothesis is rejected since the z-calculated value is bigger than the z-critical. This implies that a substantial variance exists in the mean scores of female students schooled with demonstration and lecture teaching methods in academic achievement enhancement in Biology.

It was also discovered in Table 2 that the z-calculated value is 0.93, while the z-critical is 1.98 when taught with discussion and lecture teaching methods. The alternate hypothesis is rejected while the null hypothesis is accepted since the z-calculated value is smaller than the z-critical. This implies that there is no substantial variance in the mean scores of male students in academic achievement enhancement when taught with discussion and lecture teaching methods in Biology. It was also discovered in Table 2 that the z-calculated value is 2.20 and the z-critical is 1.96 when taught with discussion and lecture teaching methods. The alternate hypothesis is accepted while the null hypothesis is rejected since the z-calculated value is bigger than the z-critical. This implies that a substantial variance exists in the mean scores of female students schooled with discussion and lecture teaching methods in academic achievement enhancement in Biology.

## **Discussion**

From research question one, female students taught with demonstration teaching method had higher academic attainment than male students taught with demonstration teaching method but when subjected to z-test analysis, it showed not significant. There is no significant difference in the mean scores of male and female SS2 students taught with demonstration method in academic achievement enhancement in Biology. There is a slight difference in the mean scores of male and female students but it is not statistically significant. This shows that gender does not determine increase in scores but other factors. The impact of demonstration method on gender is homogenous. This is in line with the findings of Basila and Jajau (2019), Omwirhiren and Ibrahim (2016), Ehiwario, Aghamie and Azagbaekwue (2019) and Mbaegbu, Osuafor and Akachukwu, (2020). This is contrary to the findings of Daluba, (2013) and Omwirhiren (2015). They stated that male gender achieved higher than female gender in science. The finding in the study done in the Faculty of Education, University of Benin in Ndu, Okeke and Igbojinwaekwu (2005), asserted that male students had better achievement than female students in both single-sex and co-education schools. The finding of Amedu (2015) also confirmed that there is a variance between the mean grades of male and female students in favour of male students. The finding of Alordiah, Akpadaka

and Oviogbodu (2015) supported that males achieved more than females in mathematics. Their findings contradict the finding of Lawal as cited in Omwirhiren, (2015) and in Ahmad and Asghar (2011) who reported that female gender achieved more than male gender. Contrary to these, the study of Babalola and Fayombo as cited in (Godpower & Ihento, 2017) revealed that the variance observed in students' science achievement was not statistically significant when subjected to test. In support to this, Olutola, Daramola and Bamidele (2016) in their study reported that there is no influence of gender and practical methods on students' academic performance in biology.

From research question one, female students taught with discussion teaching method achieved better than male students taught with discussion teaching method but when subjected to z-test analysis, result showed insignificant. There is no significant difference in the mean scores of male and female students SS2 taught with discussion method in academic achievement enhancement in biology. The difference of 0.15 mean achievement in favour of female students is not substantial. This means that discussion method has uniform effect on both gender. It is gender friendly and not biased. This is in agreement with the findings of Ugwu, Jatau and Gwamna (2020), Ishaku (2019), Olasehinde and Olatoye (2014), Basila and Jajua (2019) and in disagreement with the findings of Ajaja (2011), Omwirhiren, (2015) and in Owoeye and Agbaje (2016).

From research question one, male students taught with lecture teaching method had better academic attainment than male students taught with demonstration teaching method and when subjected to z-test analysis, result showed significant. The reason for a low achievement of male students taught with demonstration teaching method is probably because of large population size. Demonstration teaching method cannot be carried out effectively in a large population size. This is in agreement with Ajaja, (2009) and Mukhwana *et al* (2013).

Female students taught with lecture teaching method achieved more than female students taught with demonstration teaching method when subjected to z-test analysis, result showed significant. This is probably because lecture method of teaching is examination oriented. A student can pass an examination without acquiring knowledge and retention of lesson learnt. This agrees with Nwagbo and Ajaja as cited in (Oghenevwede, 2012).

Also, male students taught with discussion teaching method attained more in achievement than male students taught with lecture teaching method but when subjected to z-test analysis, result showed insignificant.

Female students taught with discussion teaching method had higher academic attainment than female students taught with discussion teaching method and when subjected to z-test analysis, result showed significant. This is probably because female students in the control group were fewer than female students in discussion group. The control group had small class size to their advantage. Also, Lecture teaching method is examination oriented that enhances academic achievement. This is in agreement with Nwagbo and Ajaja (2008; 2009) as cited in (Oghenevwede, 2021). Another reason could be students' attitude to learning. This in agreement with Ahmad and Asghar (2011).

## **Recommendations**

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

- a) Schools with high population of students should use discussion teaching method instead of demonstration teaching method because demonstration method cannot be effectively carried out in a densely populated classroom.
- b) Demonstration method of teaching should be complimented with discussion method of teaching in order to improve academic achievement since both methods are gender friendly.

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