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The Effects of Demonstration and Discussion Methods of Teaching in the Enhancement of Retention Level of Students Gender in Senior School Biology in Yenagoa and Ogbia Local Government Areas of Bayelsa State

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Abstract: *This study, effects of demonstration and discussion teaching methods on retention of male and female students 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 there is no significant difference in the mean scores of male and female SS2 students taught with demonstration and discussion methods in retention level enhancement in Biology. These results may be due to unbiased nature of demonstration and discussion methods on gender. Recommendation made was that proper use of discussion and demonstration approaches of teaching should be employed by teachers. Also, training and retraining of teachers should be done regularly so as to improve on demonstration and discussion methods of teaching.*

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

Introduction

Science education is an aspect of education in Nigeria which comprise science-oriented subjects such as chemistry, biology, physics and agricultural science, among others. These subjects are basic requirements for studying science-oriented courses (medicine, nursing, bio-chemistry, pharmacy, laboratory technologist, among others) in the university and so, it is expected that students should credit these science subjects in order to secure admission in to the higher institutions. Education has been defined as instrument par excellence for national development (Federal Republic of Nigeria, 1979). This is to say that with education individuals or group of individuals can achieve excellence in all fields that enhance national development. It is the basis of progress in any individual or nation, Nigeria in particular. Education is transmission of knowledge, skills, attitude, and values, among others to learners in order to cause a change in behavior. The change in behavior is an indication that learning has taking place and one of its form is in academic achievement of the learner.

Studies have shown that there is poor academic achievement in science, biology in particular over the years (Enohuean, Jiya and Ifeyinwa in Ugwu, Jatau & Gwamna, 2020). In spite of the assumption that biology is the simplest among physics, chemistry and biology, it records highest failure among them (Aghaduino in Igbojinwaekwu, 2012b). Researchers have identified many factors contributing to poor academic achievement in science among which are teaching methods, fear of science, low self-esteem, lack of interest, lack of facilities for education of science, among others Olatoye (as cited in Olasehinde & Olatoye, 2014; Almasri, Hewapathirana, Ghaddar & Lee, 2021; Ahmad & Asghar, 2011;Ugwuadu, 2011; Opara, 2011; Aina, 2013; Oghenevwede, 2012; Ohba, 2009).

Demonstration teaching method is the practical way of teaching that involves doing and presentation the lesson Omwirhiren and Khalil in (Ehiwario, Aghamie & Azagbaekwue, 2019). It is a sequential process of presentation of lesson to the students. It is one of the methods that has bridged the gap between theory and practice. Arubayi in (Ehiwario, Aghamie & Azagbaekwue, 2019) opined that demonstration is a visible display of skills, attitude, ideas, process and other useful information to the students.

Discussion method of teaching is an oral exchange of ideas, views, opinions and thoughts between two or more persons engaging them in problem solving venture where they participate actively in considering the problem, discuss it, agree on the possible solution and draw a valid conclusion Special Teacher Upgrading Programme in (Omovie & Kpangban, (2023). In discussion method of teaching, students are actively involved in the lesson thereby improving their science skills, attitude, knowledge and values in terms of cognitive, affective and psychomotor capabilities.

Retention is the ability to store and recall information or knowledge acquired when demanded Olarewaju (as cited in Ugwu, Jatau and Gwamna, 2020). The ability to store, remember and continue to use ideas or information when duty demands is crucial to learners making steady progress successfully in life. The effect of inability to hold and remember what was learnt in science lesson is evident in achievement of students and it is a concern in education. Studies revealed that students' retention level at senior school

is poor and it has been traced to inappropriate methods of teaching in science Ajayi and Ogbeba in (Ajayi & Angura, 2017).

Gender is a state of being a male or a female (Igbojinwaekwu, 2016). It is the characteristics of boys and girls that are socially defined. Arigbabu and Mji (as cited in Alordiah, Akpadaka & Oviogbodu, 2015) reported that gender discrimination is customary in Nigeria and Africa at large. This is in line with report from Nwona and Akogun (2015) that there is a misrepresentation and underrepresentation of females in Science, Technology and Mathematics due to gender issue. Adekunle (2017) reported that gender discrimination in teaching and learning of science is still a concern today in Nigeria. He stated that many report have related gender with students' academic achievement in science without conclusion. Fatokun and Idagboyi (2010) reported that female gender are discriminated against in science and this has become a challenge to enrollment and academic achievement in science.

Statement of the Problem

An appraisal of studies on academic achievement of students in senior school biology has been a concern to government, stakeholders, teachers, parents, among others over the years. In spite of efforts made by stakeholders in education, academic achievement of biology students have dwindled over the years (Albert *et al*, 2014; Enohuean, Jiya and Ifeyinwa in Ugwu, Jatau & Gwamna, 2020). Reports (Edingyang, Ubi & Adalikwu, 2012; Omwirhiren, 2015) opined that rote learning method of teaching is still practiced by some science teachers today. Some researchers (Aina, 2013; Ahmad & Asghar, 2011; Oghenevwede, 2012; Arokoyu and Chukwu, 2017) are of the opinion that prevalent factors abound among which are lack of interest, anxiety and methods of teaching that affect teaching and learning of science in senior school biology. It is on this note that the researcher investigate effects of demonstration and discussion methods of teaching on retention of male and female students in senior school Biology.

Purpose of the Study

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

Research Question

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

Hypothesis

There is no significant difference between the mean retention 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 utilized in the study. Three validated and reliable instructional guides namely Demonstration Teaching Method Guide (DTMG), Guide on Discussion Teaching Method Guide (GDTM) and Instructional Guide on Lecture Teaching Method (IGLTM) 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 aid of research assistants. After two weeks of teaching, the Students Retention Test (SRT) which was a rearrangement and re shuffled SBAT was administered to same students to test their retention level. Data was analyzed using percentage, mean, standard deviation and z-test statistics.

Result

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

Table 1: Summary of Mean Retention Scores of Retention Test and Retention Level of Male and Female SS2 Students taught Biology using Demonstration, Discussion and Lecture Methods

Teaching Method	Gender	N	Retention Test $\bar{x}$	Posttest $\bar{x}$	RL $\bar{x}$	Diff in RL $\bar{x}$
Demonstration	Male	85	56.58	46.44	10.14	1.16
	Female	36	59.91	48.61	11.30	
Difference			3.33	2.17		
Discussion	Male	39	66.12	55.56	10.56	3.46
	Female	76	69.73	55.71	14.02	
Difference			3.61	0.15		
Demonstration		85	56.58	46.44	10.14	2.70
	Male					
Lecture		59	60.23	52.79	7.44	
Difference			3.65	6.35		
Demonstration		36	59.91	48.61	11.30	0.33
	Female					
Lecture		28	74.82	63.85	10.97	
Difference			14.91	15.24		
Discussion		39	66.12	55.56	10.56	3.12
	Male					
Lecture		59	60.23	52.79	7.44	
Difference			5.89	2.77		
Discussion		76	69.73	55.71	14.02	3.05
	Female					
Lecture		28	74.82	63.85	10.97	
Difference			5.09	8.14		

Answer to research question one, Table 1 reveals male students' retention mean of 10.14 and female student's retention mean of 11.30 when taught with demonstration method, with a difference of 1.16 in favour female students. It also shows male students mean retention level of 7.44 and female students mean retention level of 10.97 when taught with lecture method. The difference in mean retention level of 3.53 was in favour of female students. This implies that female gender had better retention level than male gender. The Table discovers male students mean retention level of 10.56 and female students mean retention level of 14.02 when taught with discussion method. The difference of 3.46 mean retention level was in favour of female gender. It also shows male students mean retention level of 7.44 and female students mean retention level of 10.97 when taught with lecture method. The difference in mean retention level of 3.53 was in favour of female gender. This implies that female gender had better retention level than male gender. In addition, this table reveals that, male students schooled with demonstration method had higher retention level mean with a difference of 2.7 mean than male students schooled with lecture teaching method. Female students schooled with demonstration teaching method had better retention level mean with a difference of 0.33 mean than female students schooled with lecture teaching method. Also, male students taught with discussion teaching method had better retention level mean with a difference of 3.12 mean than male students schooled with lecture teaching method. Female students

schooled with discussion teaching method had better retention level mean with a difference of 3.05 mean than female students taught with lecture teaching method.

Hypothesis 1: There is no significant difference between the mean retention 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 Retention Level taught using Demonstration, Discussion and Lecture Methods

Teaching Method	Gender	N	Retention Level $\bar{x}$	SD	df	z_{cal}	z_{crit}	Type of test	P
	Male	85	10.14	12.68					
Demonstration						119	0.05	1.96	2-tailed
<0.05									
	Female	36	11.30	11.13					
	Male	39	10.56	11.99					
Discussion						113	1.57	1.96	2-tailed
<0.05									
	Female	76	14.02	9.51					
Demonstration		85	10.14	12.68					
	Male					142	1.25	1.96	2-tailed
<0.05									
Lecture		59	7.44	12.82					
Demonstration		36	11.30	11.13					
	Female					62	0.09	1.98	2-tailed
<0.05									
Lecture		28	10.97	15.32					
Discussion		39	10.56	11.99					
	Male					96	1.22	1.98	2-tailed
<0.05									
Lecture		59	7.44	12.82					
Discussion		76	14.02	9.51					
	Female					102	0.98	1.96	2-tailed
<0.05									
Lecture		28	10.97	15.32					

When hypothesis 1, $H0_1$, was subjected to z-test examination in Table 2, it was discovered that the z-calculated value is 0.50 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 implies that there is no substantial variance in the mean scores of male and female students taught with demonstration method retention level enhancement in Biology. It was also discovered from Table 2, that the z-calculated value is 1.57 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 implies that there

is no substantial variance in the mean scores of male and female students taught with discussion method in retention level enhancement in Biology.

It was also discovered from Table 2, that the z-calculated value is 1.25 and the z-critical is 1.96 when taught with demonstration 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 taught with demonstration and lecture teaching methods in retention level enhancement in Biology. It was also discovered from Table 2, that the z-calculated value is 0.09 and the z-critical is 1.98 when taught with demonstration 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 female students taught with demonstration and lecture teaching methods in retention level enhancement in Biology.

It was also discovered from Table 2, that the z-calculated value is 1.22 and 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 taught with discussion and lecture teaching methods in retention level enhancement in Biology. It was also discovered from Table 2, that the z-calculated value is 0.98 and the z-critical is 1.96 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 female students taught with discussion and lecture teaching methods in retention level enhancement in Biology.

Discussion

From research question one, female students have higher retention level than the male students when taught with demonstration method, but the difference in mean was not substantial. Also, the variance in mean retention level of male and female students in favour of female students when taught with discussion method, when tested was not substantial. This study discovered that there is no significant difference in the mean scores of male and female SS2 students taught with demonstration and discussion methods in retention level enhancement in Biology. These results may be due to unbiased nature of demonstration and discussion methods on gender. This study disagrees with the study of Basila and Jajua (2019), who stated that there is a substantial variance in the mean grades of both gender taught with discussion method in retention level in biology.

Also, female students taught with lecture teaching method had better retention level than male and female students in the groups but when subjected to z-test analysis, result showed not substantial. High retention of level of female students is in agreement with Gambari *et al*, (2014) who opined that lecture teaching method yield higher retention level and Lawal (2009) as cited in Omwirhiren, (2015), reported that female gender achieved more than male gender which was as a result of high retention ability.

Recommendations

a) Science teachers should compliment demonstration method of teaching with discussion method of teaching in order to enhance retention level, thereby, enhancing academic achievement.

b) Both gender should participate in science classes so as to discourage gender discrimination in science classes.

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