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Demonstration and Discussion Teaching Methods in the Enhancement of Academic Achievement of Students in Senior School Biology in Yenagoa and Ogbia Local Government Areas, Bayelsa State

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Abstract: *This study, Demonstration and Discussion Teaching Methods in the Enhancement of Academic Achievement of Students in Senior School Biology, was carried out in Bayelsa State using quasi-experimental research design. The population of the study was 6,988 Senior School Two students offering Biology as a subject in the Senior Secondary School in Bayelsa State. The sample consists of 323 Senior School Two students from 23 Senior Secondary Schools in Yenagoa and Ogbia 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 was used as a reliable instrument for data collection. The data were analyzed with percentage, mean, standard deviation and z-test statistics. The findings of the study were that students performed better when taught with discussion teaching method than when taught with demonstration teaching method. Also, students taught with lecture teaching method had high academic achievement. Recommendations made include; adequate consideration should be given to teaching methods in biology to enhance academic achievement of students, schools with high population of students should use discussion teaching method instead of demonstration teaching method because demonstration teaching method cannot be effectively carried out in a densely populated classroom, lecture teaching method should be used appropriately in order to maximize its benefits in teaching and learning.*

Keywords: *Demonstration, Discussion, Methods, Achievement, Biology, Education.*

Introduction

Education has been from the beginning of creation. Different generations had in one way or the other practice one or more forms of education such as informal, formal or non-formal. Education is the transmission of skills, knowledge, values, attitude, morals and culture from one generation to another. Obanya (2023) opined that education goes beyond inculcation of manipulative ability, numeracy and memorization but the inculcation of cognitive skills together with life coping skills and lifelong learning skills. Education has been defined as instrument par excellence for national development in the Federal Republic of Nigeria (1979). Adesehinwa, (2013), connote that is the bedrock of advancement in any nation, Nigeria in particular, but there is a challenge of falling standard of education. There are traces of shortfalls in people's attitude, skills, values, manners and disposition exhibited at home and workplaces. Agih *et al*, (2011), cited in Agih, Paulley and Offor (2018) reported that these deficiencies in skills, attitude and values abound in learners and make them unemployable, unproductive, inefficient and ineffective at workplaces. These practicable skills such as listening, creativity, communication, leadership, innovative, numeracy, literacy, manipulative ability among others are valuable skills acquired from science education. Hence, the relevance and functionality of science education.

Science education is dynamic, according to Ezeh cited in Mbachu (2018) posit that is the use of pedagogical preposition and knowledge content in science to communicate scientific concepts, ideas, facts, theories and laws. It is the education of science-related subjects such as physics, biology, chemistry, mathematics, computer science and so on. Science education frees the mind from biases, prejudice, superstition, myths, among others. It inculcates knowledge, skills, attitude, morals and culture.

Biology is one of the science subjects taught in senior schools today. It is the study of living things (plants and animals) and non-living things. The study of biology has contributed greatly to human existence. It has helped in improvement of drugs, medicine, genetics, agriculture, transportation, etc. It has also helped in environmental recovery (bioremediation), pest control, disease control, food supply, among others. Biology is one of the basic requirement for the enrolment of many science related courses in the high school. Aghaduino cited in Igbojinwaekwu (2012b) reported that students prefer to register biology to chemistry and physics in senior school certificate examination because they feel that biology is the simplest among the science subjects. Contrary to this, Awodun *et al*, (2016), and Augustine (2018) reported poor academic achievement of biology students in SSCE. Enohuean *et al*, cited in Ugwu, Jatau and Gwamna (2020) revealed that there is an increase in poor academic achievement of students in science, biology in particular over the years. Students perform worse in biology when their performance is compared with their performances in other science subjects. The poor achievement of students in SSCE biology has been traced with many factors such as anxiety, lack of interest, lack of confidence, inappropriate teaching methods, among others (Omwirhiren, 2015; Arokoyu & Chukwu, 2017). Some researchers Omwirhiren (2015), Abdi (2014), commend on the use of lecture teaching approach in contemporary time, while Abdulahi cited in Bature and Jibrin, (2015) opined that use of lecture teaching method is prevalent today and it is one of the causes of poor achievement in science and biology in particular. Difficulty in understanding biological concepts make students develop indifference and lack of interest (Uzoma & Amadi, 2018). This is in agreement with Ishaku (2019) who confirmed the struggle students go through in learning biology as a subject. Arokoyu and Chukwu (2017), posit that researchers like Ayeni and Ayodele cited in Bature and Jibrin (2015), are of the opinion that academic performance of biology students is as a result of methods of

teaching used by teachers among other factors. Numerous teaching methods used in teaching and learning of biology include laboratory, field trip, lecture, demonstration, discussion methods, etc. Demonstration method is referred to as display, exhibition and dramatization of lesson (activity) by the teacher to the students in the laboratory for teaching and learning purposes. Demonstration method of teaching can be defined as a teaching technique in the laboratory that involves experimentation (Ugwuada, 2011). Also, Ngada cited in Ugwuada (2011) defined demonstration method of teaching as crucial in pointing out significant ideas in a lesson. According to studies by Eila *et al*, (2016) reported that many topics in biology require experiment, process-based skill and problem solving skills to help students understand inherent fundamentals in the topics. Addullahi cited in Obunadike and Omeye (2014) stated that demonstration method can be used as a method and a technique and it is not the same as experimentation. Demonstration is used to showcase a lesson while an experiment is done to validate a scientific opinion or used as a means of observing, classifying, measuring and interpreting data in the laboratory. However, demonstration method is one of the valuable methods of teaching, as it enhances understanding of lessons (Obunadike & Omeye, 2014).

Discussion method of teaching is an interactive session between the teacher and the learner and among learners. It is a strategy used when a teacher as a facilitator, groups the students in order to enhance exchange of ideas and opinions with the aim of identifying and solving problems together (Ugwu, Jatau & Gwamna, 2020). It is a method that encourage exchange of ideas, views and opinions. Rahman *et al*, cited in Ugwu *et al* (2020) view discussion method of teaching as a teaching method that involve questioning and testing. Albert, Osman and Yungungu (2014) opined that teachers should use teaching method that encourage positive attitude towards biology through the use of discussion groups, excursion, hands on activities, questioning, among others. Discussion method of teaching helps learners to acquire communication skills, critical thinking, creativity, reflective, leadership and social skills. In other words, these skills form life and lifelong learning skills which are helpful at the present and after school. The ability of learners to identify, develop and construct knowledge by themselves is essential to ensuring high academic achievement in science, biology in particular.

It's against these backdrop of rare research's on the discussion and demonstration methods in the teaching of biology as a subject to enhance the achievement of academic performance of senior secondary schools student in Yenagoa and Ogbia Local Government Areas of Bayelsa State, whilst these study exist to bridge that gap.

Statement of the Problem

Science has become a yardstick for measuring progress and achievement in any nation. For any nation to be relevant and make significant progress in economy, agriculture, health, education, among others, it citizens must be committed to teaching and learning of science. Teaching and learning of biology is crucial as it fosters acquisition of science skills, attitude, values, morals, knowledge and culture needed for day to day activities and solving societal problems. However, studies in (Omwirhiren, 2015; Edingyang, Ubi & Adalikwu, 2012; Ameh & Dantani, 2012) report that use of lecture method of teaching is prevalent in the schools today and this has contributed to poor academic achievement of students in biology. Some studies revealed that many factors including methods of teaching contribute to poor academic achievement of students in biology (Ohba, 2009; Ahmad & Asghar, 2011). It is on this background that the researcher investigate demonstration and discussion method of teaching in the enhancement of academic achievement of students in senior school biology in Yenagoa and Ogbia Local Government Areas, Bayelsa State.

Purpose of the Study

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

Research Question

What difference exist in the mean scores of SS2 students in public and private schools in academic achievement enhancement in Biology when taught with demonstration and discussion teaching methods?

Hypothesis

There is no significant difference in the mean scores of SS2 students in public and private schools, taught with demonstration and discussion methods, in academic achievement enhancement in Biology.

Method

The pretest-posttest control group quasi-experimental research design was adopted for the study. The population was 6,988, Senior school Two students offering 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 done. Purposive sampling technique was used to obtain a sample size of 323 biology students. One research question and one hypothesis were used. 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. One validated and reliable instrument namely Standardized Biology Achievement Test (SBAT) was used to collect data. 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 assistance. The data was analyzed using percentage, mean, standard deviation and z-test statistics.

Result

Research Question 1: What difference exist in the mean scores of SS2 students in public and private schools in academic achievement enhancement in Biology when taught with demonstration and discussion teaching methods?

Table 1: Summary of Mean Scores of Pretest and Posttest of SS2 Students in Public and Private Schools in Academic Achievement Enhancement taught with Demonstration, Discussion and Lecture Teaching Methods

Teaching Method	School Type	N	Pretest $\bar{x}$	Posttest $\bar{x}$
Demonstration	Public	96	45.16	42.54
	Private	25	64.64	65.52
Difference			19.48	22.98
Discussion	Public	51	47.90	52.17
	Private	64	62.64	58.43
Difference			14.74	6.26
Demonstration		96	45.16	42.54
	Public			
Lecture		48	46.52	47.47
Difference			1.36	4.93
Demonstration		25	64.64	65.52
	Private			
Lecture		39	52.58	66.15
Difference			12.06	0.63
Discussion		51	47.90	52.17
	Public			
Lecture		48	46.52	47.47
Difference			1.38	4.70
Discussion		64	62.64	58.43
	Private			
Lecture		39	52.58	66.15
Difference			10.06	7.72

Response to research question one as shown in Table 1 shows that public school students had academic achievement mean of 45.16 and private school students had academic achievement mean of 64.64 with a difference of 19.48 in favour of private school students at pretest. At posttest, after being taught with demonstration method, private school students had better academic attainment of 65.52 than public school students with academic achievement mean of 42.54 with a mean difference of 22.98.

Also, at pretest, public school students had academic achievement mean of 47.90 while private school students had academic achievement mean of 62.64. Private school students had higher academic attainment than their public counterparts with academic achievement mean of 58.43 against 52.17 when taught with discussion method at posttest. In the control group, at pretest, public school students had academic achievement mean of 46.52 while private school students had academic achievement mean of 52.58 with a difference of 6.06 in favour of private school students. At posttest, private school students achieved more than public school students with academic attainment mean of 66.15 against 47.47 mean of public school students with a difference of 18.68 when taught with lecture method. This shows that private school students had higher academic attainment mean than public school students when taught with lecture method. At pretest, private school students taught with demonstration teaching method had better academic achievement mean with a difference of 12.06 mean than private school students taught with lecture teaching method. Public school students taught with lecture teaching method had better academic achievement mean with a difference of 1.36 mean than public school students taught with demonstration teaching method. At posttest, public school students taught with lecture teaching method had better academic achievement mean with a difference of 4.93 mean than public school

students taught with demonstration teaching method. Also, private school students taught with lecture method had better academic achievement mean with a difference of 0.63 mean than private school students taught with demonstration teaching method. Private school students taught with discussion teaching method had better academic achievement mean with a difference of 10.06 mean than private school students taught with lecture teaching method. Also, public school students taught with discussion teaching method had better academic achievement mean with a difference of 1.38 mean than public school students taught with lecture teaching method. At posttest, public school students taught with discussion teaching method had better academic achievement mean with a difference of 4.70 mean public school students taught with lecture teaching method. Also, private school students taught with lecture method had better academic achievement mean with a difference of 7.72 mean than private school students taught with discussion teaching method.

Hypothesis 1: There is no significant difference in the mean scores of students in public and private schools taught with demonstration and discussion methods in academic achievement enhancement in Biology.

Table 2: Summary of z- test Analysis of Public and Private Students Achievement taught with Demonstration, Discussion and Lecture Teaching Methods

Teaching Method	Sch Type	N	Posttest $\bar{x}$	SD	df	z_{cal}	z_{crit}	Type of test	P
	Public	96	42.54	9.80					
Demonstration					119	5.74	1.96	2-tailed	<0.05
	Private	25	65.52	19.80					
	Public	51	52.17	15.42					
Discussion					113	2.52	1.96	2-tailed	<0.05
	Private	64	58.43	9.92					
Demonstration		96	42.54	9.80					
	Public				142	2.05	1.96	2-tailed	<0.05
Lecture		48	47.47	15.12					
Demonstration		25	65.52	19.80					
	Private				62	0.14	1.98	2-tailed	<0.05
Lecture		39	66.15	13.41					
Discussion		51	52.17	15.42					
	Public				97	1.53	1.98	2-tailed	<0.05
Lecture		48	47.47	15.12					
Discussion		64	58.43	9.92					
	Private				101	3.12	1.96	2-tailed	<0.05
Lecture		39	66.15	13.41					

When hypothesis 1, $H0_1$, was subjected to z-test analysis, it was observed that the calculated z-value is 5.74, while the z-critical is 1.96, (Table 2), when taught with demonstration method. The alternate hypothesis is accepted while the null hypothesis is rejected since the z- calculated value is bigger than the z-critical. This means that there is a substantial variance in the mean scores of students in public and private schools taught with demonstration method in academic achievement

enhancement method in Biology. It was also discovered from table 2 that the z-calculated value is 2.52 while the z-critical is 1.96 when taught with discussion method. The alternate hypothesis is accepted while the null hypothesis is rejected since the z-calculated value is bigger than the z-critical. This means that a substantial variance exists in the mean scores of students in private and public schools schooled with discussion method in academic achievement enhancement in Biology.

It was also discovered from Table 2 that the z-calculated value is 2.05 while the z-critical is 1.96 when taught with demonstration and lecture methods. The alternate hypothesis is accepted while the null hypothesis is rejected since the z-calculated value is bigger than the z-critical. This means that a substantial variance exists in the mean scores of students in public schools schooled with demonstration and lecture teaching methods in academic achievement enhancement in Biology. It was discovered that the z-calculated value is 0.14 and the z-critical is 1.98 when taught with demonstration and lecture 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 students in private schools taught with demonstration and lecture teaching methods in academic achievement enhancement in Biology.

It was also discovered that the z-calculated value is 1.53 and the z-critical is 1.98 when taught with discussion and lecture 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 students in public schools taught with discussion and lecture teaching methods in academic achievement enhancement in Biology. It was also discovered from Table 2 that the z-calculated value is 3.12 while the z-critical is 1.96 when taught with discussion and lecture methods. The alternate hypothesis is accepted while the null hypothesis is rejected since the z-calculated value is bigger than the z-critical. This means that a substantial variance exists in the mean scores of students in private schools schooled with discussion and lecture teaching methods in academic achievement enhancement in Biology.

Discussion

From research question one, private school students had better academic attainment than public school students when taught with demonstration and discussion teaching methods. The reason for private school students' attainment is probably because private school students were less distracted and more focused to learn than public school students. Public school students were more distracted and had divided attention due to low social and economic standing of their parents which make them engage in menial jobs at odd times for survival. This agrees with the finding of Akinsanyo *et al*, (2014) that canvass on the concept of distraction and divided attention in the academic achievement of students in schools. Also, private schools have better supervisory and monitoring system than public schools. This serves as a check on teachers to be on their duties always and it is to the advantage of private school students. When results of the research questions were subjected to z-test analysis, it was statistically significant. The study showed that there is a substantial variance in the mean scores of SS2 students in private and public schools taught with demonstration method in academic achievement enhancement in Biology. Private school students have higher academic achievement than public school students. This is probably due to low population of private school students which gave them an edge in performance above public schools with high population. Another reason might be that there is proper monitoring and supervision of classes and teachers by school proprietors in the private schools than in the public schools. The other reason is better coverage of scheme of work in the private schools. This finding

agrees with the study of Ajaja (2009) in his study "Evaluation of Science Teaching in Senior Schools in Delta State". Irrespective of the fact that we have more qualified and competent teachers in the public schools, public school students have poor academic achievement in Biology. This could be as a result of large population in science classes in most public schools. It will be difficult for teachers to demonstrate, display materials and capture attention of students effectively at the extreme of highly populated classes. This also agrees with Ajaja (2009), Mukhwana *et al*, (2013) and Mudasiru and Adedeji (2010). Another reason is that the densely populated science classes have few science teachers to cater for them. Imagine a biology teacher catering for one hundred and four biology students or in a situation whereby a biology teacher is responsible for teaching senior school students 1, 2 and 3 biology, and quality delivery will be compromised. In the absence of a qualified teacher, an NCE Certificated teacher or a corp member maybe drafted to teach students preparing for internal and external examinations as against the National Policy on Education which stated that a degree holder should teach the senior school students. This is in agreement with the study of Olasehinde and Olatoye (2014). Another reason may be due to lack of sufficient resources to cater for large class size in the public schools. Many public schools have insufficient classrooms, those that have enough classrooms have insufficient chairs and desks for students and some laboratories are dilapidated and not functional. This agrees with the study of Ajaja (2009) in his study, "Evaluation of Science Teaching in Senior Schools in Delta State". Another major reason for poor academic achievement of public school students could be socio-economic standing of their parents. Most public schools' students are from poor background where their parents cannot take adequate care of them and their school requirements. This is in line with the study of Akinsanya, Ajayi and Salomi *(*2014) in their finding. They are of the opinion that students from good background have access to resources that will enhance their academic attainment. This is in contrast to the finding of Osuafor and Okonkwo (2013). They reported that social and economic standings of parents do not affect academic attainment of students. Absenteeism is another challenge facing the public schools students as a result of social and economic status of their parents. Due to the fact that most of them take care of themselves, they absent from school regularly in search of business and money. Compulsory offering of biology in many public schools could contribute to poor academic achievement in the public schools. Many of the students offering biology in the public schools are forced to offer it or do not like it and do not need it in their career. This is in line with National Policy on Education which stated that biology should be an optional subject in the senior school. These reasons make them unserious and nonchalant towards biology. This is supported by Ogunleye and Fasakin (2011). They reported that students' attitude has a vital role to play when taking a subject and it influences academic achievement of students as stated by Ali *et al*, (2014) and Samikwo (2013). No doubt the aftermath of COVID-19 Pandemic is still with us. Many teachers lamented about the effects of long stay away from school which have a downturn on learning gains on the students. Probably, COVID-19 had caused so much setback in academic achievement and retention level of the students as school year is reduced which heightened ability to cover biology syllabus. The learning attitude of the students has also declined compare to pre- COVID-19 era. This is in line with UNESCO 2021. Teachers are struggling to bridge the wide gap created by the pandemic especially in the public schools unlike students in the private schools, whose parents can afford home lesson by private teachers in order to bridge the gap created by the pandemic. According to Olatoye (as cited in Olasehinde & Olatoye, 2014), factors such as study habit, self-concept, motivation for examination and examination anxiety could also have significant effects on academic achievement in science students.

This study also revealed that there is a significant difference in the mean scores of SS2 students in the public and private schools taught with discussion method in academic achievement enhancement in biology. It was observed that private school students did better than their public schools' counterparts. Factors that could be responsible for this include small class size, conducive learning environment and diligence to work by teachers as a result of proper monitoring and supervision by the proprietors. This agrees with the finding of Olasehinde and Olatoye (2014). It is vital to note that both public and private school students had mean scores above average unlike in demonstration method where the public schools students had a mean score below average. This is to say that discussion method has greater influence on academic achievement of students than demonstration method in both public and private schools. It also enhances socialization among students which leads to active participation in contribution to ideas that enhance learning and academic achievement. This agrees with the study of Ugwu, Jatau and Gwamna (2020), as well that of Okoye and Onwuachu (2018).

Also, private students taught with lecture teaching method achieved more than private and public students in demonstration and discussion teaching methods. This is probably because population size in the control group is smaller than population size in the experimental groups. This is in agreement with Ajaja (2009). In addition, when lecture method is used for lesson presentation by a competent teacher, results are inevitable (Veselinovska, 2011). Results also show that private school students taught with lecture teaching method did better than private school students taught with demonstration teaching method but when it was subjected to z-test analysis, it was statistically insignificant. Also, public school students taught with discussion teaching method did better than public school students taught with lecture teaching method but when it was subjected to z-test analysis, it was statistically insignificant.

Recommendations

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

a) Adequate consideration should be given to teaching methods in biology to enhance academic achievement of students.
b) Schools with high population of students should use discussion teaching method instead of demonstration teaching method because demonstration teaching method cannot be effectively carried out in a densely populated classroom.
c) Lecture teaching method should be used appropriately in order to maximize its benefits in teaching and learning.

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