ARCN International Journal of Advanced and Educational Research
ISSN: 2360-9909. Volume 14, Issue 9, (September, 2023) pages 13 – 21
DOI: 272614522371492
arcnjournals@gmail.com
https://arcnjournals.org

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

Blessing C. CLEOPAS (PhD)
Department of Science Education
Faculty of Education, Federal University, Otuoke
Bayelsa State
chinyerecleopas@yahoo.com
+2348066399476
Patrick C. IGBOJINWAEKWU (Prof)
Department of Science Education
Faculty of Education, Niger Delta University
Bayelsa State
earimeka@gmail.com
+2348094636547

Abstract: *This study, effects of demonstration and discussion teaching methods on retention of 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 designate that private school students had a remarkable high retention level compare to their public counterparts when taught with discussion teaching method. Also, public school students had better retention when taught with demonstration teaching method than public school students taught with lecture teaching method. Recommendation made was that proper use of discussion method of teaching should be employed by teachers because it enhances retention level in Biology students.*

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

Introduction

The role of science and biology in particular cannot be over-emphasized. Science is everything and everything around man is science (Cleopas, 2023). Science is pivotal in growth and national development. Despite the importance of biology to man and national development, academic achievement has been poor. Perhaps, this is due to the fact that use of lecture method in teaching biology is prevalent today and inability of students to retain and recall information when called

upon (Edingyang, Ubi & Adalikwu, 2012). Abdi (2014) opined that use of lecture method of teaching does not provide avenue for independent thoughts and students' interactions. The inability of students to reflect on what they learn and transfer knowledge to other areas is a proof of lack of deep learning. Learning becomes meaningful when learners comprehend phenomena and concepts and can link it with previous knowledge (Ausubel, 2000). Omwirhiren (2015) reported that teachers are in haste to complete the scheme of work within stipulated time not minding students' retention level of the lesson.

Retention is the ability to store ideas or information. The ability to remember and continue to use ideas or information when duty demands is vital to learners achieving progressive success in life. The effect of inability to retain and recall what was learnt in science lesson is evident in achievement of students and it is a concern in education. Olarewaju (as cited in Ugwu, Jatau & Gwamna, 2020) defined retention as the ability to store and recall information or knowledge acquired when demanded. It is the process and ability to store and recall experiences learnt in future. The nature of information and teaching techniques used in teaching and learning contribute to quantity and quality of information retained and recalled by a learner. The inability to retain information or ideas due to lack of in-depth understanding is as a result of so many factors that have led to poor academic achievement. The issue of poor academic achievement in science cannot be over emphasized due to its importance to the age. Studies Adegoke *et al*, (as cited in Gambari, Yaki, Gana & Ughovwa, 2014; Macmillan, 2012; Moreno & Mayer, 2000) reported that a more innovating and stimulating method should be employed to aid students learning, understanding and retaining or remembering of biological principles and concepts in this digital age. Gambari *et al*, (2014) was of the opinion that an encouraging and appealing method should be used to assist students to learn more, comprehend, recollect biology concepts and promote their future involvement in science, in order, to enhance effective learning, arouse interest, encourage learning by doing and experiences among students.

The influence of demonstration and discussion of teaching procedures on retention of students is a path-breaking research in academic environ and needs extensive studies both in qualitative and quantitative stands to innate its purpose in schools. It's on these note the effects of demonstration and discussion of teaching procedures on retention of students in senior school biology in Yenagoa and Ogbia Local Government Areas of Bayelsa State emerged.

Statement of the Problem

Biology is the study of living things and non-living things in the environment. It is the science that deals with the how and what of living things and non-living things in the environment (Umar in Gambari *et al*, 2014). It is a major requirement for securing admission into higher learning to do science courses such as pharmacy, medicine, biochemistry, physics and science education among others. Despite its prominence and notion of its simplicity by students, as the simplest science subject among physics, chemistry and biology, academic achievement has been disturbing over the years Aghaduino (as cited in Igbojinwaekwu, 2012b). The concern of poor academic achievement in biology has been on the increase over the years (Enohuean, Jiya & Ifeyinwa in Ugwu, Jatau & Gwamna, 2020). The effects of poor academic achievement in biology cut across all areas because science is everything in life (Ahmad in Gambari *et al*, 2014). Several factors such as lack of interest, anxiety, teaching methods, among others have contributed greatly to poor academic achievement in biology (Arokoyu & Chukwu, 2017; Omwirhiren, 2015). Inappropriate teaching methods have been highlighted by many researchers to contribute to poor academic achievement in biology students (Ameh & Dantata. 2012; Ahmad & Asghar, 2011).

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

Research Question
What difference exist between the mean retention scores of SS2 students in public and private schools taught Biology using demonstration and discussion methods?

Research Hypothesis
There is no significant difference between the mean retention scores of SS2 students in public and private schools, taught Biology using demonstration and discussion methods.

Methodology
The pretest-posttest control group quasi-experimental research design was adopted for the study. This was because complete randomization was not possible as intact classes were used.

Population
The population was 6,988, Senior school Two Biology students from 23 schools (14 public and 9 private) in two Local Government Areas, and random assignment to treatment and control group was done.

Sampling Technique
The standard behind the decision of the sample size is that it should be representative of the population, while the technique that was used in collecting data in this research involved the administration of a research questionnaire to the respondents in the senior schools. Purposive sampling technique was used to obtain a sample size of 323 biology students. One research question and one hypothesis were used.

Instructional guides
Three validated and reliable instructional guides namely instructional guide on Discussion Teaching Method Guide (DTMG), Demonstration teaching method (IGDTM) and Guide on Lecture Teaching Method (GLTM) were used in training teachers to use the methods of teaching.

Instrumentation
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 assistance.

Pretest session
Before administration of the treatment, the participants in the experimental groups and control group were given the SBAT based on the topics selected.

Instructional Procedure
Photosynthesis and excretion were the topics used in the study. The control group was taught using lecture method of teaching while the experimental groups were taught using demonstration and discussion methods of teaching which brought about participants interaction and involvement.

Data Analysis
Scores from both experimental and control groups formed the data used for the study. Data was analyzed using percentage, mean, standard deviation and z-test statistics at $P<0.05$.

Student Retention Test
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.

Research Question 1: What difference exist between the mean retention scores of SS2 students in public and private schools taught Biology using demonstration and discussion methods?

Results
Table 1: Summary of Mean Retention Scores of Retention Test and Retention Level of SS2 Students in Public and Private Schools taught Biology using Demonstration, Discussion and Lecture Methods

Teaching Method	Sch Type	N	Retention Test $\bar{x}$	Posttest $\bar{x}$	RL $\bar{x}$	Diff in RL $\bar{x}$
Demonstration	Public	96	53.00	42.54	10.46	0.82
	Private	25	75.16	65.52	9.64	
Difference			22.16	22.98		
Discussion	Public	51	62.27	52.17	10.10	4.95
	Private	64	73.48	58.43	15.05	
Difference			11.21	6.26		
Demonstration		96	53.00	42.54	10.46	4.18
	Public					
Lecture		48	53.75	47.47	6.28	
Difference			0.75	4.93		
Demonstration		25	75.16	65.52	9.64	2.90
	Private					
Lecture		39	78.69	66.15	12.54	
Difference			3.53	0.63		
Discussion		51	62.27	52.17	10.10	3.82
	Public					
Lecture		48	53.75	47.47	6.28	
Difference			8.52	4.70		
Discussion		64	73.48	58.43	15.05	2.51
	Private					
Lecture		39	78.69	66.15	12.54	
Difference			5.21	7.72		

N=Number of students, RL= Retention Level

Answer to research question one, Table.1 reveals that students in public schools had better retention level mean of 10.46 than their counterparts with retention level mean of 9.64 when taught with demonstration method. The variance in the mean retention level between public school students and private school students was 0.82. The Table shows that public school students had 10.10 mean retention level while private school students had 15.05 mean retention level when taught with discussion method. The difference between the two means was 4.95 in favour of private school students. This implies that private school students had higher retention than public school students when taught with discussion method. It also reveals that public school students in the control group had retention level mean of 6.28 and private school students had retention level mean of 12.54. The difference in mean retention level was 6.26 in favour of private school students. This implies that when taught with demonstration method, public school students had better retention than private school students but when taught with discussion and lecture methods, private school students had better retention level than their public counterparts. Also, public school students taught with demonstration teaching method had better retention level mean with a difference of 4.18 mean than public school students taught with lecture teaching method. Private school students taught with lecture teaching method had better retention level mean with a difference of 2.90 mean than private school students taught with demonstration teaching method. Public school students taught with discussion teaching method had better retention level mean with a difference of 3.82 mean than public school students taught with lecture teaching method. Also, private school students taught with discussion teaching method had better retention level mean with a difference of 2.51 mean than private school students taught with lecture teaching method.

Hypothesis 1: There is no significant difference between the mean retention scores of SS2 students in public and private schools, taught Biology using demonstration and discussion methods.

Table 2: Summary of z- test Analysis of Public and Private SS2 Students Retention Level taught Using Demonstration and Discussion Methods

Teaching Method	Sch Type	N	Retention Level $\bar{x}$	SD	df	z_{crit}	z_{crit}	Type of test	P
	Public	96	10.46	12.56					
Demonstration					119	0.32	1.96	2-tailed	<0.05
	Private	25	9.64	11.01					
	Public	51	10.10	11.80					
Discussion					113	2.50	1.96	2-tailed	<0.05
	Private	64	15.05	8.83					
Demonstration		96	10.46	12.56					
	Public				142	2.00	1.96	2-tailed	<0.05
Lecture		48	6.28	11.40					
Demonstration		25	9.64	11.01					
	Private				62	1.05	1.98	2-tailed	<0.05
Lecture		39	12.54	10.22					
Discussion		51	10.10	11.80					
	Public				97	1.63	1.98	2-tailed	<0.05
Lecture		48	6.28	11.40					
Discussion		64	15.05	8.83					
	Private				101	1.28	1.96	2-tailed	<0.05
Lecture		39	12.54	10.22					

N=Number of students, SD=Standard Deviation, df =Degree of Freedom

When hypothesis 1, $H0_1$, was subjected to z-test analysis, in Table 2, it was discovered that the z-calculated value is 0.32 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 students in public and private schools taught with demonstration teaching method in retention level enhancement in Biology. It was also discovered in Table 2 that the z-calculated value is 2.50 and 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 implies that a substantial variance exists in the mean scores of students in private and public schools schooled with discussion teaching method in retention level enhancement in Biology.

It was also discovered in Table 2 that the z-calculated value is 2.00 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 students in public schools schooled with demonstration and lecture teaching methods in retention level enhancement in Biology. It was discovered that the z-calculated value is 1.05 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 was no substantial variance in the mean scores of students in private schools taught with demonstration and lecture teaching methods in retention level enhancement in Biology.

It was also discovered that the z-calculated value is 1.63 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 students in public schools taught with discussion and lecture teaching methods in retention level enhancement in Biology. It was discovered that the z-calculated value is 1.28 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 students in private schools taught with discussion and lecture teaching methods in retention level enhancement in Biology.

Discussion

From research question one, public school students taught with demonstration teaching method had a slight increase in retention level than private school students taught with demonstration teaching method but when subjected to z-test analysis, result showed statistically insignificant. There is no significant difference in the mean scores of SS2 students in the public and private schools taught with demonstration method in retention level enhancement in Biology. The mean difference of 0.82 in favour of public schools is not substantial. This agrees with the findings of Basila and Jajua (2019) in their study.

From research question one, private school students taught with discussion teaching method had better retention level than public school students taught with discussion teaching method and when result was subjected to z-test analysis, it showed significant. The reason is probably because private schools have better supervision and monitoring of teachers and students than public schools. This is in agreement with the study of Olasehinde and Olatoye (2014). There is a significant difference in the mean scores of SS2 students in public and private schools taught with discussion method in retention level enhancement in Biology. Private school students had a remarkable high retention

level compare to their public counterparts. The high mean score in retention level is probably an indication that discussion method makes better impact on students' retention level. Discussion method enables students to develop science skills and attitude such as communication, listening, questioning, critical thinking and mental skills among others. This is in line with Ugwu, Jatau and Gwamna (2020).

From research question one, public school students had better retention when taught with demonstration teaching method than public school students taught with lecture teaching method and when it was subjected to z-test analysis, it showed significant. High retention level of public school students taught with demonstration teaching method is probably because in demonstration teaching method, teaching and learning is not in abstract, so, students can retain and recall what was learnt unlike in lecture teaching method where learning is done by rote learning. This agrees with Ameh and Dantani (2012), and Oghenevwede (2012). This is in disagreement with the study of Gambari *et.al*, (2014).

From research question one, private school students taught with lecture teaching method had better retention level than private school students taught with demonstration teaching method but when result was subjected to z-test analysis, it was statistically not significant. Public school students taught with discussion teaching method had higher retention level than public school students taught with lecture teaching method but when subjected to z-test analysis, result showed statistically not significant. Private school students taught with discussion teaching method had better retention level than private school students taught with lecture teaching method but when subjected to z-test analysis, result showed not statistically significant.

Conclusion

The findings in the study show that a substantial variance exists in the mean scores of students in private and public schools schooled with discussion teaching method in retention level enhancement in Biology. There was no substantial variance in the mean scores of students in private schools taught with demonstration and lecture teaching methods in retention level enhancement in Biology. Also, there was no substantial variance in the mean scores of students in private schools taught with discussion and lecture teaching methods in retention level enhancement in Biology.

Recommendations

There are several observations obtain from the qualitative and quantitative pathway on the cause of the study, based on these findings, it was recommended that teachers should endeavor to make proper use of discussion method of teaching because it enhances retention level in Biology students. Teachers should also encourage learners' active participation and interaction in the classroom as it is not just a teaching nomenclature but complex interplay of factor in the retention level and enhancement of senior school pupils in biology and other subjects.

References

Abdi, A. (2014). The effect of inqussiry-based learning method on students' academic achievement in science course. *Universal Journal of Educational Research*, 2(1), 37-41.

Ahmad, R. N. & Asghar S. K. (2011). Attitude towards biology and its effects on students' achievement. *International Journal of Biology*, 3(4), 100-104.

Ameh, P. O. & Dantani, Y. S. (2012). Effects of lecture and demonstration methods on the academic achievement of students in chemistry in Nasarawa Local Government Area in Kano State. *International Journal of Modern Social Sciences*, 1(1), 29-37.

Arokoyu, A. A. & Chukwu, J. C. (2017). Biology teachers' methods of teaching and academic performance of secondary school students in Abia state. *Journal of Emerging Trends in Educational Research and Policy Studies*, 8(4), 228-231.

Ausubel, D. P. (2000). The acquisition and retention of knowledge: a cognitive view. Kluwer Academic Publishers.

Basila, D. & Jajua, M. A. (2019). Effects of demonstration and discussion strategies on secondary school students' achievement and retention in biology in Mubi educational zone, Adamawa state. *International Journal of Research and Scientific Innovation,* 6(12), 234-246.

Cleopas, B. C. (2023). Inclusiveness in science education: prospects and challenges. *Rivers State University Journal of Science and Mathematics Education*, 1(1), 21-33.

Edinyang, S. D., Ubi, I. E., & Adalikwu, R. A. (2012). Relative effectiveness of inquiry and expository methods of teaching social studies on academic performance of secondary students in Akwa Ibom State, Nigeria. *British Journal of Arts and Social Sciences*, 3(15),132-135.

Gambari, A. I., Yaki, A. A., Gana, E. S., & Ughovwa, Q. E. (2014). Improving secondary school student s' achievement and retention in biology through video-based multimedia instruction. *Journal of Scholarly Teaching*, 9, 78-91.

Igbojinwaekwu, P. C. (2012b). Prior knowledge of study questions and students' biology academic achievement at senior secondary level. *A Multidisplinary Journal,* 23 (1), 9-15.

Macmillian, M. J. (2012). School location versus academic achievement in physics: Does computer – assisted instruction (CIA) has any effect. *Journal of Education and Social Research*, 2(8), 162-168. http://doi:10.5901.

Moreno, R & Mayer, R. E. (2000). A coherence effect in multimedia learning. The case of minimizing irrelevant sounds in the design of multimedia instructional messages. *Journal of Educational Psychology*, 97, 117-125.

Oghenevwede, O. E. (2012). Enhancing the retention level of biology students through the guided discovery instructional method. *Nigerian Journal of Curriculum and Instruction,* 19(1), 7-12.

Olasehinde, K. J. & Olatoye, R. A. (2014). A comparative study of public and private senior secondary school students' science achievement in Katsina state, Nigeria. *Journal of Education and Social Research,* 4(3), 203-207.

Omwirhiren, E. M. (2015). Enhancing academic achievement and retention in senior secondary school chemistry through discussion and lecture methods: A case study of some selected secondary schools in Gboko, Benue state, Nigeria. *Journal of Education and Practice*, 6(21), 155-161.

Ugwu, L., Jatau, A. & Gwamna, S. K. (2020). Impact of discussion method on performance and retention in biology among senior secondary school students in Katsina education zone, Katsina state, Nigeria. *International Journal of Multidisciplinary and Current Educational Research*, 2(6), 76-83.