

Effects Of Demonstration And Lecture Methods On Secondary School Students' Achievement And Retention In Biology In Delta North Senatorial District

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Abstract: *The study looked at the effects of demonstration and lecture methods on secondary school students' achievement and retention of Biology in Delta North Senatorial District. The study used a planned variation quasi-experimental approach. 6,453 SSII Biology students made up the study's population. The study used 246 SSII Biology students as its sample. Biology Achievement Test (BAT) was the tool utilised to collect data. Using KR-21, BAT had a reliability value of 0.88. Pre-test, post-test, and delayed tests with BAT were conducted. ANCOVA was used to examine the results. The findings revealed a substantial difference between students taught biology through lectures versus demonstrations in terms of mean accomplishment and retention scores, favouring the latter mode. The study concludes that demonstration method outperformed the lecture method in terms of raising student achievement and retention of biology. In order to teach biology at the secondary school level, it was recommended that teachers employ the demonstration technique.*

Keywords: Demonstration Method, Lecture Method, Academic Achievement, Retention

Introduction

In Nigeria, biology is one of the scientific subjects taught in secondary schools. A natural science known as biology studies the physical makeup, chemical reactions, molecular interactions, physiological activities, growth and evolution of living things. It is a crucial component of science that gives students training in fields like medicine, nursing, pharmacy, forestry, and fisheries access to relevant information. For science-related courses, a credit pass or higher in biology is required. Biology is the study of the environment and natural occurrences that comes from human curiosity. Another discipline of science whose curriculum has been designed to give students the scientific knowledge and abilities they need is biology. Nwagbo (2009) claims that biology education is widely recognised as a means of fostering economic growth, eradicating poverty and establishing social welfare. In all secondary schools in Nigeria, biology is taught as one of the fundamental science subjects. According to Nwagbo (2009), biology is intended to generate people as a science subject in the school curriculum, some of whom may or may not pursue science-related subjects in further education.

The study of Biology cultivates in students' specific qualities and characteristics such as curiosity, inventiveness, objectivity, the bravery to challenge, and aesthetic sensibility (FRN, 2013). The goals of biology instruction in Nigerian classrooms are to foster students' capacity for decision-making and problem-solving while also examining the relationships between biology and other facets of life, such as health, agriculture, and industry. Economic progress, poverty eradication, and social welfare are all aided by biology education. Despite the importance of Biology, students keep performing poorly in Biology based on the evidence gathered from WAEC Chief Examiner's report on the West African Senior Secondary Certificate Examination (WASSCE) results for students from 2015 to 2020 (See Appendix I). The government and other education stakeholders have taken note of this subpar performance in biology.

The federal and state governments have made efforts to improve biology teaching and learning in schools by creating scientific laboratories and providing science equipment to schools (Nnaji, 2017). Students' achievement in Biology, however, continues to fall short of what is expected. It's possible that biology teachers' teaching strategies are to blame for students' poor performance in the subject. According to my own observations, the lecture technique is the most often employed form of instruction in secondary schools in Nigeria. A form of instruction known as the lecture method involves the teacher presenting the subject matter to the class in its completed form. The students listen and take notes with little to no opportunity to ask questions. It is one of the earliest forms of instruction. The lecture method has a number of drawbacks, including the fact that it does not encourage students to think critically and creatively and that they only participate passively during instruction. Because students are just passive recipients of information during lectures, rote learning is encouraged. It also discourages students from actively interacting with the course materials. The demonstration method of instruction is one of the teaching strategies thought to encourage students' active engagement with the learning material as well as interaction among themselves.

Demonstration is a form of instruction that combines explanation with the handling or use of actual tools, materials, or items (Akinbobola & Ikitde, 2011). Demonstration method of teaching is efficient for retention of learnt concept in long term memory and improvement of students' study skills. According to Giridharam and Raju (2016), demonstrations naturally encourage more casual interactions between students and teachers. The authors went on to say that during demonstrations, students' spontaneous observations and active replies offer a great opportunity to engage with them and their uncensored thoughts. It is commonly accepted that active student participation during classroom demonstrations aids in students' understanding of science and piques their curiosity. Demonstrations provide a multimodal explanation of a subject, notion, or thing that could otherwise be difficult to comprehend through verbal description alone (Cabibihan, 2013).

The Demonstration technique is now acknowledged as a teaching method that is becoming more and more common among scientific educators. Demonstration techniques greatly benefit students when they have the opportunity to engage in activities, interact with materials, and manipulate objects and equipment (Prpic & Hadgraft, 2009). The demonstration strategy, according to Ogwo and Oranu (2006), is a well-liked tool for teaching practical skills since it provides a verbal and correct illustration of a particular activity. The authors claimed that the strategy is especially successful since it promotes the student's active participation. The utilisation of demonstrations in the classroom has been shown to boost student achievement and retention (Adekoya & Olatoye, 2011; Ameh & Dantani, 2012; Auwal, 2013; Cyril, 2016; Giridharan & Raju, 2016).

Since demonstration method encourages active participation and social interaction among students as well as between students and teachers, it might boost students' academic performance and retention more than the lecture style. This study investigated the effect of demonstration and lecture approaches on students' achievement and retention of biology in order to determine the most effective mode of instruction.

According to Nwanze (2016), academic achievement is the extent to which a learner has reached specific goals that have been the focus of activities in educational contexts, particularly at school, college, and university. However, in this study, academic achievement is the measure of how successfully biology teaching objectives have been achieved at the end of learning. Retention on the other hand is the ability of students to remember learnt concepts over a period of time. Beer (2010) described retention as a means used by students to help them function efficiently and effectively in all aspects of life, particularly in school. Learners require this crucial means to maintain and retain knowledge in the mind for both short and long periods of time. Simply put, retention is the ability of students to remember learnt biology concepts after a given period of time. Research evidence has shown that teacher's teaching method affects students' achievement and retention (Ibrahim, Bashir, Buba & Thloma, 2020). In light of this, the goal of this study was to determine how students in the Delta North Senatorial District responded to demonstration and lecture approaches in terms of their academic achievement and retention.

Statement of the Problem

Several researchers have reported the downward trend in the achievement of Nigeria students in Biology in particular. Indices from WAEC have shown a consistent trend of students' poor achievement in Biology. Specifically, the WAEC Chief Examiner's report (2015-2020) confirmed this poor performance in Biology in the WASSCE. Poor teaching techniques, a shortage of competent and experienced teachers, and other factors could be to blame for the students' poor performance.

I have noticed that the majority of secondary school biology teachers still use the lecture method to impart information to their students. Students' active engagement and interaction during instruction is not guaranteed by the lecture technique. Biology instruction ought to be activity-based, which the lecture technique does not provide. In biology classes, many teaching strategies, like activity-based demonstrations, may be used. If students are exposed to this technique of instruction, the interaction impact between the method of instruction used, the teachers' training, and their experience may improve on students' biology achievement. Demonstration ensures that students participate in varieties of hands-on activities. Students are given the opportunity to demonstrate learnt concept through practical experimentation. This will no doubt prompt students to develop strong interest towards Biology that may metamorphosed into enhanced biology achievement. The problem of the study therefore, is: Will the use of demonstration and lecture methods enhance students' academic achievement and retention of Biology?

Purpose of the Study

The study examined the effects of demonstration and lecture methods on biology students' achievement and retention. The specific objective of the study was to determine the:

1. difference in the mean achievement scores between students who learned biology through demonstration and those who learned it through lecture;
2. difference in the mean retention scores between those who learned it through demonstration and those who learned it through lecture.

Hypotheses

Two hypotheses guided the study. They are:

1. There is no significant difference in the mean achievement scores between students taught Biology using demonstration and lecture methods.
2. There is no significant difference in the mean retention scores between students taught Biology using demonstration and lecture methods.

Method

The study employed planned variation quasi-experimental design. The study's population was 6,453 SSII Biology students. 246 SSII Biology students participated in the study. Biology Achievement Test (BAT) served as the data gathering tool. Three professionals evaluated the instrument's face validity comprising one experienced Biology teacher in Oza-Nogogo Comprehensive Secondary School, Ozanogogo, one expert in measurement and evaluation, and one of whom is a science educator in biology from Delta State University, Abraka. The Kuder Richardson formula 21 (KR-21) was used to determine the BAT's reliability. This was accomplished by giving the BAT to 45 SSII Biology students in a school that was not included in the study's sampling schools. The acquired data were put through KR-21. Analysis produced a reliability coefficient value of 0.88.

The study comprised two groups, demonstration and lecture groups. Treatment involved teaching the students in the demonstration group the selected Biology concepts using demonstration method, and the lecture group's students were instructed using the lecture method. Pre-tests were administered before the treatment and post-test after the six weeks treatment with BAT. BAT was also re-administered as delay test (retention) four weeks after the closure of treatment. t-test was used to assess the scores.

Result

1. There is no significant difference in the mean achievement scores between students taught Biology using demonstration and lecture methods.

Table 1

Independent Samples t-test Comparison of Mean Achievement Scores of Demonstrations and Lecture Methods Groups

Method	N	Pre-test		df	t_{cal}	sig.(2-tailed)	Remark
		\bar{x}	SD				
Demonstration	120	21.20	9.61	244	0.16	0.88	Not Rejected P>0.05
Lecture	126	21.38	8.48				
		Posttest					
Method	N	\bar{x}	SD	df	t_{cal}	sig.(2-tailed)	Remark
		Demonstration	120				
Lecture	126	54.13	10.35				

According to table 1 ($t = 0.16$, $P(0.88) > 0.05$), The pre-test mean achievement scores of students who were taught biology using lecture and demonstration did not differ statistically significantly. Additionally, table 1 demonstrates a statistically significant difference between students who learned biology through lectures and through demonstrations ($t = 10.17$, $P(0.00) < 0.05$) in their posttest mean achievement levels. H_{O1} is therefore disproved. As a result, students who were taught biology through demonstration rather than lecture showed a substantial difference in their mean achievement scores.

2. There is no significant difference in the mean retention scores between students taught Biology using demonstration and lecture methods.

Table 2

Independent Samples t-test Comparison of Mean Retention Scores of Demonstrations and Lecture Methods Groups

Method	N	Retention		df	t_{cal}	sig.(2-tailed)	Remark
		\bar{x}	SD				
Demonstration	120	56.93	8.13	244	8.76	0.00	Rejected P<0.05
Lecture	126	45.90	11.29				

Table 2 shows a substantial difference between students who were taught biology through lectures and demonstrations in terms of mean retention scores ($t = 8.76$, $P(0.00) < 0.05$). Thus, H_{O2} is rejected. As a result, there is a considerable difference between students who are taught biology through lectures and through demonstrations in terms of mean retention scores, favouring demonstration.

Discussion

The study indicated that students who acquired biology through lectures learned it significantly differently from those who learned it through demonstrations, favouring the demonstration method. The level of student involvement during instruction may be responsible for the observed superiority of the demonstration technique over the lecture method. The demonstration group's students participated fully during instruction. Specifically, students in the demonstration group were made to demonstrate the learnt concepts under the supervision of the teachers carrying out various experiments. However, the students in the lecture group merely listen to teachers' explanation on the selected Biology concepts. Due to this, students in the lecture group may have lower achievement results than their peers in the demonstration group. This study supports the claim made by Azubuike and Mumuni (2018) that there was a significant academic achievement gap between Biology students who were taught using demonstration-based and lecture-based techniques, with the demonstration method being more effective. This result is consistent with that reported by Basheer, Hugerat, Kortam, and Hofstein (2017), who noted that the demonstration method group's accomplishments and topic knowledge were statistically significantly higher than the lecture method group's achievement.

The study also found that students who learned biology by demonstration as opposed to lecture had considerably higher mean retention scores, favouring the demonstration method. This implies that compared to students who were taught through lectures, students who were taught through demonstrations retained more of the Biology concepts. Their improved retention scores compared to their counterparts in the lecture group, who were spoon-fed information, may have been due to the fact that students taught utilising the demonstration method examined learning materials and uncovered knowledge for themselves. In other words, the teachers in the lecture group passed knowledge to the students in the final form. There was minimal opportunity for the students in the lecture group to ask questions while the teachers were lecturing to them. This finding supports the claims made by Ibrahim,

Bashir, Buba, and Thlama (2020), who claimed that the demonstration approach significantly outperformed the lecture method in terms of students' accomplishment and retention scores.

Conclusion

The conclusions that were reached in light of the findings above were as follows: Both the lecture approach and the demonstration method have a big impact on how well students learn and remember biology. However, the demonstration method outperforms the lecture method in terms of how students learn and retain learnt biology concepts.

Recommendations

The study recommended the following:

1. When teaching biology in secondary schools, biology teachers should use the demonstration technique.
2. Lectures in biology should only be given when it is impossible to demonstrate.
3. To ensure equitable achievement and retention in biology, biology teachers should ensure equal participation of male and female students during classroom demonstrations.

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Appendix I

Students' Performance in WASSCE Biology

Year	Population of Students	Paper 2 (practical)		Paper 3 (Essay)	
		Raw Mean Score	SD	Raw Mean Score	SD
2015	1,182,083	25.00	11.87	21.00	10.34
2016	1,087,921	31.00	10.91	31.00	11.79
2017	1,087,921	31.00	11.92	24.00	9.22
2018	1,087,884	30.00	9.00	27.00	10.34

Source: <https://www.waeconline.org.ng/e-learning/Biology/Biomain.html>