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# Impact of Discussion Method On Performance and Retention in Biology Among Senior Secondary Students in Katsina Education Zone, Katsina State, Nigeria

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**ABSTRACT:** This study investigated the impact of discussion method on performance and retention in biology among senior secondary students in Katsina Education Zone, Katsina State, Nigeria. The targeted populations are all the 1,176 second year senior secondary biology students. The sample size is 214 SS II students selected from the population using simple random technique. The research design was quasi-experimental design involving pretest, posttest, experimental and control groups. The instrument used was; Biology Performance Test (BPT). The reliability coefficient of the instrument is 0.84. Three research questions (RQ) were raised to guide the study, one of which was "Is there any difference between the mean scores of students exposed to discussion method and those taught using lecture method?" Three hypotheses (Ho) were postulated to guide the study and tested at 0.05 level of significance. One of the hypotheses was: "there is no significant difference between the mean scores of students exposed to discussion method and those taught using lecture method" descriptive statistics of mean and standard deviation were used to answer research questions while Independent sampled t-test was used to test the hypotheses. The major findings showed that; significant difference exists between the academic performance of students taught biology using discussion method and that taught using lecture method. On the basis of these finding the following recommendation was made: Biology teachers should be trained on the use and importance of discussion method in teaching biology concepts.

## I. INTRODUCTION

Biology is a branch of science that studies living things. Biologists study animals, plants and microbes in many different ways. The study of Biology has undergone rapid changes and has a significant impact on human lives. Humans can now produce antibiotics and vaccines, grow disease-resistant crops, organs-transplant and genes manipulation (Augustine, 2018). The knowledge of Biology has help immensely in researching solutions to vital concerns such as increasing world food supply, controlling pest and diseases, environmental protection and studying the biology of certain microorganisms such viruses causing global pandemic such as the corona virus. Biology occupies a special position in the senior secondary school curriculum in Nigeria. Credit pass in any of the science subjects, is one of the criteria to gaining admission into any of the Nigeria Universities. Biology is mostly registered for, in the Senior Secondary Certificate Examination (SSCE) and the National Examination's commission (NECO), by science oriented and few social science oriented students. Studies (Alafiatayo, Anyanwu, & Salau, 2018; Augustine, 2018; Awodun, Adekunle & Femi-Adeoye, 2019) have shown poor performance of students in Biology at SSCE. Enohuean (2018), Jiya (2018) and Ifeyinwa (2019) stated that there had been a steady increase in failure rates of secondary school students in the sciences specifically Biology over the years. The poor performance in biology in the SSCE has been attributed to so many factors among which includes the teaching strategies used by biology teachers in teaching biology which is predominantly lecture method (Efe, 2017).

Uzoma and Amadi (2018) reported that when students find learning of a concept difficult in a subject, the students end up hating the subject. Ishaku (2019) stated that learners face many difficulties in learning science subjects particularly Biology in our schools. To overcome these barriers, teachers need to utilize learning strategies that will engage the learners in the learning processes. Abdulhamid (2016) reported that teaching strategies affects the responses of students' performance and determined whether they are involved in the teaching and learning processes. There are many teaching strategies that could be used to teach biology among which includes; discussion method, lecture method, laboratory method, discovery method, field-trip strategy to mention but a few. What constitutes a good teaching and learning of biology is the use of appropriate alternative means of imparting knowledge so as to ensure that all important concepts are passed on to the learner and not relegated to the background (Ogunkunle & Onwunedo, 2017).

Among these alternative techniques, is the use of discussion method in teaching biology. Discussion strategy is a technique in which a teacher leads or guides the students in groups towards expressing opinions and ideas with the view to identifying and solving problems collectively. The role of the teacher in this technique is that of a facilitator. The teacher presents the lesson topics to the learners and also creates enabling environment for them. According to Rahman, Khalil, Jumani, Muhammad, Malik and Sharif (2016), discussion method is a teaching method that includes questioning which is similar to testing. A teacher may ask a series of question to collect information of what students have learned and what needs to be taught. Testing is another application of questioning. A teacher tests the student on what was previously taught in order to identify if a student has learned in order to identify if a student has learned in the material. According to Ishaku (2019), there are different types of discussion methods this include;

1. Round table discussion which involves small number of persons nearly three to eight. It needs a moderator to introduce the members of the discussion group, present the problem to be discussed and keep the discussion moving. The leader's role is one of guiding the group rather than one of dominating it. The responsibilities of a moderator included the introduction of the topic, keep the discussion moving, avoid having the group become sidetracked, avoid quibbling over irrelevancies, summarize and draw conclusions. While the responsibilities of members of the discussion group are to be well informed on the topic, speak informally while avoiding arguing and quibbling, stay with the topic under discussion, have sources of information available, back up statements with facts, and help the group summarize its conclusions.
2. Panel discussion: A panel discussion is similar to a round table discussion in many ways, but different to exist. The responsibilities of the moderator are the same as in round table discussion. The procedure is more formal than that of the round table. It begins with a short statement by each discussion member.

Rahman, Khalil, Jumani, Muhammad, Malik and Sharif (2016) explained that discussion works on the principles that the knowledge and idea of several people are more likely to find solution or answers to specific problem or topics. Discussion enhances learning by giving the learners room to develop their communicating skills, mental skills such as critical thinking, reflective thinking and evaluating diverse opinion (Efe, 2017). The role of the teacher is that of a facilitator. The teacher encourages the learner to discover things for themselves this could increase the retention ability of students towards certain concepts. Retention is the ability to store what has been learnt and recall what has been stored in the memory. According to Olarewaju (2017) retention is the ability to retain and later remember information or knowledge gained after learning in to memory. The nature of the materials to be coded contributes to the level of retention. Instructional strategies contribute to quality and level of retention in terms of meaningful, concreteness and image evolving characteristic (Wushishi, Danjuma & Usman, 2017). Retention could be explained as the process or ability to retain and remember things and experiences learned by an individual at a later time. Appropriate coding of incoming information provides the index that may be consulted so that retention takes place without an elaborate search in the memory lane. The level of retention is mostly determined by the teaching strategy used in teaching and learning concept in Biology. This study therefore investigates the impact of discussion method on performance and retention in biology among secondary schools students in Katsina Education Zone, Katsina State, Nigeria.

## II. THEORETICAL FRAMEWORK

The theoretical framework, on which this study is hinged on, is the constructivists' theory by Brunner (1966). The constructivist theory emphasizes the active participation of learners in the process of finding out information through organizing and reconstructing knowledge. Learning according to constructivism, places more emphasis on the learner rather than the teacher. Teachers are seen as facilitators or coaches assisting the learners to construct conceptualizations and find solutions to problems. Therefore, this study focuses on the use of discussion methods to ascertain the active participation of learners, in the teaching and learning process in biology concepts.

**Statement of the Problem:** Biology is a practical subject that requires to be taught in a manner that the students will be actively engaged in the teaching and learning processes. Despite the importance placed on biology, students' performance in the subject at both terminal school examination and external (WASSCE and NECO) examinations has been repeatedly poor or below average (Alafiatayo, Anyanwu & Salau, 2018; Augustine, 2018; Awodun, Adekunle, & Femi-Adeoye, 2019). The poor performance of students in biology becomes more evident, looking at the records of the West African Examination Council (WAEC) results over the years which reveals that biology has a high number of students' enrolment yearly in the Senior School Certificate Examination but records poor performances over the years.

The consistent poor or fluctuating performances have become a major concern to science parents, stake holders and researchers in science education. The West Africa Examination Council (WAEC, 2018) listed among others;

the teaching strategies adopted by biology teachers as the factor for the low performances in biology. The lecture method used in teaching biology concepts might have the advantage of presenting large amounts of information which can be used to cover the voluminous syllabus within a short time. However, the lecture method on the other hand, can hamper with the learning processes of the students, because learning is an active process not just listening to the teacher (Pool, Turner & Bottger, 2016). This study therefore investigates the impact of discussion method on performance and retention in biology among secondary schools students in Katsina Education Zone, Katsina State.

**Aim of the Study:** To ascertain the impact of discussion method on performance and retention in biology among secondary school's students in Katsina Education Zone, Katsina State, Nigeria.

## III. OBJECTIVES OF THE STUDY

The objectives of this study are to:

1. determine the impact of discussion method on students' performance in biology
2. determine the impact of discussion method on students' retention in biology
3. determine the impact of discussion method on male and female students' performance in biology

## IV. RESEARCH QUESTIONS

The following research questions are formulated to guide the study:

1. Is there any difference between the mean scores of students exposed to discussion method and those taught using lecture method?

2. What is the difference between the retention levels of students taught biology concepts using discussion method and those taught using lecture method?

3. Is there any difference in the mean scores of male and female students taught biology using discussion method?

**Null Hypotheses:** The following null hypotheses were formulated based on the research questions and tested at 0.05 level of significance:

$Ho_1$ there is no significant difference between the mean scores of students exposed to discussion method and those taught using lecture methods

$Ho_2$ there is no significant difference between the retention levels of students taught biology concepts using discussion method and those taught using lecture methods

$Ho_3$ there is no significant difference between the mean scores of male and female students taught biology using discussion method.

**Significance of the Study:** The findings of this study would hopefully benefit the following:

**Students:** Encourage biology students to participate fully during biology lessons, expressing opinions or ideas and identifying and solving problems collectively to enhance performance.

**Teachers**: To have a wider knowledge on how to organize biology lessons to ensure effective participation of learners.

**Curriculum Planners:** To be knowledgeable about discussion method and design curriculum that will put in to consideration the instructional strategies that are student centered.

**Professional Bodies:** Help professional bodies such as Science Teachers Association of Nigeria (STAN), Mathematics Association of Nigeria (MAN), National Education Research and Development Council (NERDC) amongst others, to find the recommendations of this study useful, in publishing textbooks and educational articles that would lay emphasis on students' centered approach to learning.

## V. RESEARCH DESIGN

The research design for this study is quasi-experimental design involving pretest, posttest, experimental and control groups. In this design the subjects under study are not confined in one place throughout the study period. There are two groups of students all together; one Experimental Group (EG) and one Control Group (CG). In this design, the Experimental Group (EG) students were taught SS II biology concepts using discussion method while the students in the control group were taught same concepts using lecture method for a period of six weeks. At the end of the treatments, all the groups were subjected to a posttest to determine the effect of the treatment on students' Academic Performance (PM) and post posttest to determine students' Retention Level (RT).

**Population of the Study :** The population of this study consisted of all the nine (9) public co-education Senior Secondary Schools in Katsina Education Zone, Katsina State, Nigeria. The total number of the SS II students from the nine (9) schools was one thousand one hundred and seventy six (1,176), of which eight hundred and five (805) were males and three hundred and seventy one (371) were females.

**Sample and Sampling Techniques :** From the population of forty (40) co-educational schools, two schools were selected using simple random sampling technique. The first school selected was labeled Experimental Group (EG) while the second school selected was labeled Control Group (CG). The two schools selected had the total number of two hundred and fourteen (214) students who constituted the sample. The two schools selected were pretested, posttested and post-posttested using Biology Performance Test (BPT).

**Instrumentation and Validity of the Instruments :** The instrument used was; Biology Performance Test (BPT) which contained selected biology questions from the West African Examination Council (WAEC) past examination papers (2017; 2018). The BPT was administered during the pretest, posttest and post posttest to determine the performance and retention level of the senior secondary school students in biology when taught using discussion method. The BPT consisted of 50 structured multiple choice questions on biology concepts from Senior Secondary II biology with a maximum score of 100marks. The instrument was validated by three Senior lecturers from the Department of Science Education, Ahmadu Bello University, Zaria with a minimum qualification of Ph.D.

**Pilot Testing and Reliability of the Instruments:** The instrument was pilot tested in two of the schools which constituted the population but was not part of the study. The reliability coefficient of the instrument was 0.84.

**Data Collection Procedure:** Before administering the treatment, the two groups (EG and CG) were pretested using the BPT. The two groups (EG and CG) were taught biology concepts for the period of six weeks by the researcher using discussion method. After which the students were given a test from the BPT to ascertain the performance of the students and after two weeks the students were post posttested to ascertain the retention ability of the students.

**Procedure for Data Analysis :** Research questions were analysed using descriptive statistics of means scores, standard deviation. Null hypotheses were analysed using Independent sampled t-test statistics and non-parametric test of Mann-Whitney statistics.

## VI. RESULTS AND DISCUSSION

### a. Answering Research Question

Research Question 1: Is there any difference between the mean scores of students exposed to discussion method and those taught using lecture method?

To answer Research Question 1, mean and standard deviation was used. The summary of the posttest is presented in Table 1.

**Table 1: Mean and Standard Deviation of Posttest Scores of Students taught using Discussion Method Compared with Lecture Method**

| Variable | Groups | N | Mean | STD | Mean diff. | Remarks |
|---|---|---|---|---|---|---|
| Mean score | EG | 90 | 62.0 | 7.7 | 20.1 | EG had higher mean scores than CG |
| | CG | 124 | 42.0 | 8.1 | | |

*EG=Experimental Group (Discussion Method), CG= Control Group (Lecture Method)*

Table 1 shows that difference exists between the mean scores of students taught Biology concepts using discussion method and those taught using lecture methods. The descriptive statistics showed that the computed mean performance values are 62.01 and 42.0 of students taught Biology using discussion method and lecture method respectively. The higher mean score obtained by the Experimental Group is a clear indication that discussion method has greater impact on students' performance in Biology concepts than lecture method of teaching. However, the statistical validity of this statement is left for the test of the related hypothesis of the study.

Research Question 2: What is the difference between the retention levels of students taught biology concepts using discussion method and those taught using lecture method?

To answer Research Question 2, mean and standard deviation was used. The summary of the posttest is presented in Table 2.

**Table 2: Mean and Standard Deviation Statistics on Retention Levels of Students taught using Discussion Method Compared with lecture method**

| **Variable** | **Groups** | **N** | **Mean** | **STD** | **Mean diff.** | **Remarks** |
|---|---|---|---|---|---|---|
| Retention | Discussion Group | 90 | 55.9 | 7.7 | 19.9 | Discussion Group has higher retention level than Lecture Group |
| | Lecture Method | 124 | 36.0 | 8.1 | | |

Table 2 show differences in the mean retention of students taught biology concepts using discussion method and those taught using lecture methods. The mean retention levels are 55.9 and 36.0 by students exposed to discussion method and lecture method respectively, with a mean difference of 19.9. This shows that students taught biology concepts using discussion method have higher retention levels than those taught using lecture method. However, the statistical validity of this statement is left for the test of the related hypothesis of the study.

**Research Question 3:** Is there any difference between the mean scores of male and female students taught biology using discussion method?

To answer Research Question 3, mean and standard deviation was used. The summary of the posttest is presented in Table 3.

**Table 3: Mean Statistics on Differences between the Mean Scores of Male and Female Students taught using Discussion Method**

| Variable | Groups | N | Mean | STD | Mean diff. | Remarks |
|---|---|---|---|---|---|---|

| | | | | | | |
|---|---|---|---|---|---|---|
| Mean Scores | Male | 50 | 61.96 | 7.8 | 0.2 | There is no gender difference among the discussion |
| | Female | 40 | 62.08 | 7.7 | | |

Table 3 shows mean scores of 61.960 and 62.075 by male and female students exposed to discussion method respectively, with a mean difference of 0.2. This shows that the mean score of both male and female students taught biology using discussion method is the same, implying that it has the same effect on both male and female students. However, the statistical validity of this statement is left for the test of the related hypothesis of the study.

b. **Testing of Null Hypotheses**

**Null Hypothesis 1:** There is no significant difference among the mean scores of students taught biology using discussion method when compared with those taught using lecture methods

To test Null Hypothesis 1, independent sampled t-test statistics was used. The summary of the analysis is presented in Table 4.

**Table 4: Independent-Sampled t-test on Differences between the Mean Scores of Students exposed to Discussion Method and Lecture Method**

| Variable | Groups | N | Mean | STD | Mean diff. | df | p-value | Remark |
|---|---|---|---|---|---|---|---|---|
| Mean Scores | Discussion Group | 90 | 62.0 | 7.74 | 20.1 | 212 | 0.004 | Significant |
| | Lecture Group | 124 | 42.0 | 8.14 | | | | |

Table 4 shows a significant difference between the mean scores of students taught biology using discussion method and those taught using lecture methods. Reasons being that the calculated p value of 0.004 is below the 0.05 alpha level of significance. This shows that students exposed to discussion method have significantly higher scores than their counterparts taught using lecture method. Therefore, the null hypothesis which states that there is no significant difference between the mean scores of students exposed to discussion method and those taught using lecture method, is hereby rejected

**Null Hypothesis 2:** There is no significant difference between the retention levels of students taught biology concepts using discussion method and those taught using lecture methods.

To test Null Hypothesis 2, independent sampled t-test statistics was used. The summary of the analysis is presented in Table 5.

**Table 5: Independent t-test statistics on the Retention Levels of Students taught Biology Concepts using Discussion Method and those taught using Lecture Method**

| Variable | Groups | N | Mean | STD | Mean diff. | df | p-value |
|---|---|---|---|---|---|---|---|
| Retention | Discussion Group | 90 | 55.9 | 7.7 | 19.9 | 212 | 0.011 |
| | Lecture Group | 124 | 36.0 | 8.1 | | | |

Table 5 shows a significant difference between the retention levels of students exposed to discussion method and those taught using lecture methods. Reasons being that the calculated p-value of 0.011 is below the 0.05 alpha level of significance. This shows that students exposed to discussion method have significantly higher retention levels than their counterparts taught using lecture method. Therefore, the null hypothesis which state that there is no significant difference between the retention levels of students exposed to discussion method and those taught using lecture method, is hereby rejected.

**Null Hypothesis 3:** There is no significant difference between the mean scores of male and female students taught biology using discussion method.

To test Null Hypothesis 3, independent sampled t-test statistics was used. The summary of the analysis is presented in Table 6.

**Table 6: Independent t-test Statistics on Difference between the Mean Scores of Male and Female Students taught Biology using Discussion Method.**

| Variable | Groups | N | Mean | STD | Mean diffs. | df | p |
|---|---|---|---|---|---|---|---|
| Mean Scores | Male | 50 | 61.96 | 7.82 | 0.1 | 88 | 0.95 |
| | Female | 40 | 62.07 | 7.72 | | | |

Table 6 shows a no significant difference between the mean scores of male and female students taught biology using discussion method. Reasons being that the p-value of 0.95 is greater than the 0.05 alpha level of significance. This shows that the mean scores of both male and female students taught biology using discussion method is the same, thereby, implying that discussion method has the same effect on both male and female students. Therefore, the null hypothesis which state that there is no significant difference between the mean scores of male and female students taught biology using discussion method, is hereby accepted and retained.

## VII. DISCUSSION OF FINDINGS

**The findings of the study are discussed as follows:** The significant difference that exist between the mean scores of students taught biology using discussion and lecture methods in favor of discussion method, signifies a greater effectiveness of discussion method over lecture method of instruction. This could be because in discussion method of instruction enhances learning by giving the learners room to develop their communicating skills, mental skills such as critical thinking, reflective thinking and evaluating diverse opinion. This is in line with the findings of Efe (2017).

The significant difference between the retention levels of students exposed to discussion and lecture method in favors of discussion method is a clear indication of the greater impact discussion method had on students' retention abilities. This could be attributed to the fact that discussion method of instruction encourages the active participation of learners, in the teaching and learning process thereby enhancing retention ability. This is in line with the finding of Abdul Hamid (2016).

A no significant difference between the mean scores of male and female students taught biology using discussion method indicates equal chances of performance between males and female counter parts. In other words, discussion method is gender friendly. This is similar to the findings of Ishaku (2019).

## RECOMMENDATIONS:

1. The use of lecture method in teaching biology concepts should be minimized and be used only when the topic to be treated calls for that.
2. Biology teachers should be trained on the use and importance of discussion method in teaching biology concepts. This training should be done through organizing seminars, workshops, conferences, in-service training, annual teacher's vacation course and refresher courses.

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