
**IMPACT OF DISCUSSION METHOD ON PERFORMANCE AND
ATTITUDE IN BIOLOGY AMONG SENIOR SECONDARY STUDENTS
IN ZONKWA, KADUNA STATE, NIGERIA**

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ABSTRACT

This study investigated the impact of the discussion method on performance and attitude in Biology among senior secondary students in Zonkwa, Kaduna State, Nigeria. The targeted populations are all the 1,169 second-year senior secondary biology students. The sample size is 220 SS II students selected from the population using a simple random technique. The research design was a quasi-experimental design involving pretest, posttest, experimental and control groups. The instruments used were; Biology Performance Test (BPT) and Students' Attitude Questionnaire (SATQ). The reliability coefficient of the BPT and SATQ were 0.72 and 0.74 respectively. 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 a 0.05 level of significance. One of the hypotheses was: "There is no significant difference between the mean scores of students exposed to the discussion method and those taught using the lecture method" descriptive statistics of mean and standard deviation were used to answer research questions while the 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 the discussion method and those taught using the lecture method. On the basis of these finding the following recommendation was made: Since gender difference was not significant in the study discussion method could be used to help eliminate the gender differences in science teaching and learning.

1.0 INTRODUCTION

Biology is a natural science that deals with the study of living organisms (plants and animals). Biology studies how living things came into existence, and how living organisms interact with one another and with the environment (Molla & Muche, 2018). Biology at the secondary school level is a pre-requisite subject for studying many fields of learning that contributes immensely to the technological growth of the nation at a higher institution (Musa, 2018). This includes agriculture, bacteriology, biochemistry, biotechnology, forestry, medicines, nursing, pharmacy, and virology to mention but a few (Yaduvanshi, 2019). Biology as the science of life is offered in all Senior Secondary Schools in Nigeria and has over the years been a core (compulsory) subject to both science-oriented and arts-based students. Because of its importance, more students enrolled for biology in the senior secondary school certificate examination (SSCE) than for physics and chemistry (WAEC, 2018). Biology is introduced to students at the senior secondary school level as a foundation for human development, where career abilities are groomed, and potentials and talents discovered and energized (National Policy on Education, 2013). In spite of the importance and popularity of biology among Nigerian students, performance at the senior secondary school level has been poor (Musa, 2018). The implication of this failure in education is that Nigeria may have shortages of manpower in science- and technology-related disciplines.

The teaching methods adopted by teachers at the senior secondary school level in Nigeria have been identified as one of the major factors contributing to the poor performance of students in biology (Ihejiamaizu & Ochui, 2016; Olarewaju, 2017; Enohuan, 2018; Musa, 2018). The conventional teaching method which is usually used by biology teachers gives an oral presentation of facts or principles to learners and the class usually being responsible for note-taking. Through the lecture method the advantage of presenting large amounts of information in a short time. However, it is teacher-centred. Students learn by listening not doing science, students are expected to listen to lectures and learn from them. The lecture method often encourages rote learning, where students depend on memorization without having a complete understanding of the subject. The persistent use of the lecture method makes students passive rather than active learners and does not promote insightful learning and a good attitude in biology. There are many teaching strategies that could be used to teach biology to encourage the active participation of students among which include; discussion method.

The discussion method is a variety of forums for the open-ended, collaborative exchange of ideas among a teacher and learners or among learners for the purpose of furthering learners' thinking, learning, problem-solving, understanding, or literary appreciation. Donche (2016) explained the discussion method as a democratic way of handling a class, where each learner is given an equal opportunity to interact and put forth views. A discussion taking place in a classroom can be either facilitated by a teacher or by a learner. It is a two-way interaction method in which to some extent learner-centred because of the active participation of the learners (Olawaju, 2017). The teacher in a discussion class acts as a moderator. Discussion method of teaching science increased curiosity about the subject; it enhances more positive perceptions of learners about the value of the subject. A good environment for interaction is the first step in encouraging learners to talk. Engaging learners in a discussion deepens learning and promotes a good scientific attitude by propelling the learners to develop views (Ugwu, Jatau & Gwamna, 2020).

Attitude is formed by people as a result of some kinds of a learning experience if the experience is favourable a positive attitude is found and vice versa (Alafiatayo, Anyanwu & Salau, 2018). The attitude people hold can frequently influence the way they act in person and in the larger situation. Attitude is an opinion or general feeling about something. Awodun, Adekunle and Femi-Adeoye (2019) defined attitude as cognitive, emotional, and action tendency to a particular behavioural intent. Awodun, Adekunle and Femi-Adeoye (2019) ascertained that attitude is an important factor that determined students' performance in the sciences. Ali and Mohsin (2016) stated that attitude is required through learning and can be changed through persuasion using a variety of techniques. Attitude, once established, helps to shape the experiences the individual has with an object, subject or person. Although attitude changes gradually, people constantly form new attitudes and modify old ones when they are exposed to new information and new experiences (Akey, 2019). Students' attitude towards science is more likely to influence performance. The development of positive attitudes towards learning science has always been a constituent of science education, which has increased, becomes a subject of concern. Akey (2019) recognized attitude as a major factor in the subject choice.

Awodun, Adekunle and Femi-Adeoye (2019) investigated students' attitude as correlates of students' academic performance in biology in a senior secondary school in Ekiti State, Nigeria. The findings showed that there is a significant relationship between the students' attitude to biology and students' academic performance in biology. Alafiatayo, Anyanwu and Salau (2018) examined students' attitude and academic performance in biology based on teachers' abilities among secondary schools in Sabon-Gari Local Government Area, Kaduna State, Nigeria. Findings indicated significant relationships between the teacher variables and students' academic performance in biology. The discussion method facilitates students' scientific attitude in approaching the topic to be discussed by sharing ideas with one another, arguing over points, suggesting solutions and alternative opinions, drawing conclusions or making generalizations (Efe, 2017). Therefore, this study investigated the impact of the discussion method on performance and attitude in biology among senior secondary students in Zonkwa Education Zone, Kaduna State, Nigeria.

2.0 THEORETICAL FRAMEWORK

The theoretical framework, on which this study is based on 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.

3.0 STATEMENT OF THE PROBLEM

The analysis of students' poor performance in the recent West Africa Examination Council (WAEC) result poses a great concern to the nation. The poor performance in biology at the Senior Secondary Certificate Examination (SSCE) could be attributed to so many factors

among which include poor teaching strategies in teaching biology concepts. Similarly, studies such as that of (Alafiatayo, Anyanwu & Salau, 2018; Awodun, Adekunle, & Femi-Adeoye, 2019) have shown that the failure rate in biology at senior certificate examinations is high resulting in secondary school students exhibiting poor attitude to Biology. The poor attitude of students in biology has also been traced to poor teaching strategies in teaching biology concepts. Teaching biology concepts cannot be effected through the use of the conventional method of teaching only because the biology curriculum is planned to enable the teacher use an activity-oriented, child-centred approach to teaching (Nzewi & Nwosu, 2017). The conventional method which is predominantly used by biology teachers in teaching has no mechanism to ensure that learners are intellectually engaged in the learning process. Information tends to be forgotten quickly when learners are passive. The lecture method presumes that all learners learn at the same pace and are at the same level of understanding. This leads to the poor attitude of learners towards biology which in turn leads to poor academic performance (Iwuanyanwu, 2017). Available literature shows that effective teaching and learning of biology can be achieved by the use of more interactive strategies. This study, therefore, investigated the impact of the discussion method on performance and attitude in biology among senior secondary students in Zonkwa Education Zone, Kaduna State.

4.0 AIM OF THE STUDY

To ascertain the impact of the discussion method on performance and attitude in biology among senior secondary students in Zonkwa Education Zone, Kaduna State, Nigeria.

5.0 OBJECTIVES OF THE STUDY

The objectives of this study are to:

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

6.0 RESEARCH QUESTIONS

The following research questions are formulated to guide the study:

1. Is there any difference between the mean scores of students taught biology using the discussion method and those taught using the lecture method?
2. What is the difference between the attitude of students taught biology concepts using the discussion method and those taught using the lecture method?
3. Is there any difference in the mean scores of male and female students taught biology using the discussion method?

6.1 Null Hypotheses

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

Ho1 There is no significant difference between the mean scores of students exposed to the discussion method and those taught using the lecture method

Ho2 There is no significant difference between the attitude of students taught biology concepts using the discussion method and those taught using lecture method

Ho3 There is no significant difference between the mean scores of male and female students taught biology using discussion method.

6.2 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 of how to organize biology lessons to ensure effective participation of learners.

Curriculum Planners: To be knowledgeable about the discussion method and design curriculum that will put into consideration the instructional strategies that are student-centred.

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' centred approach to learning.

7.0 RESEARCH DESIGN

The research design for this study is a quasi-experimental design involving pretest, posttest, experimental and control groups. In this design, the subjects under study are not confined to 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 the discussion method while the students in the control group were taught the same concepts using the 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 Attitude (AT) to biology.

7.1 The population of the Study

The population of this study consisted of all the sixteen (16) public co-education Senior Secondary Schools in Zonkwa Education Zone, Kaduna State, Nigeria. The total number of

the SS-II students from the sixteen (16) schools was one thousand one hundred and sixty-nine (1,169), of which seven hundred and ninety-nine (799) were males and three hundred and seventy (370) were females.

7.2 Sample and Sampling Techniques

From the population of sixteen (16) co-educational schools, two schools were selected using a simple random sampling technique. The first school selected was labelled Experimental Group (EG) while the second school selected was labelled Control Group (CG). The two schools selected had a total number of two hundred and twenty (220) students who constituted the sample. The two schools selected were pretested and post-tested using Biology Performance Test (BPT).

7.3 Instrumentation and Validity of the Instruments

The instruments used were; Biology Performance Test (BPT) and Students' Attitude Questionnaire (SATQ). The BPT contained 50 multiple choice questions biology questions selected from the West African Examination Council (WAEC) past examination papers (2017; 2018). The BPT was administered during the pretest and posttest to determine the performance of senior secondary school students in biology when taught using the discussion method. The Students' Attitude Questionnaire (SATQ) was developed by the researchers using a four-point Likert scale format. The Students' Attitude Questionnaire contained 30 items. Four possible responses were given by the students which included Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD) by ticking the correct option. The instruments were validated by three Senior lecturers from the Department of Science Education, Ahmadu Bello University, Zaria with a minimum qualification of PhD.

7.4 Pilot Testing and Reliability of the Instruments

The instruments were pilot tested in two of the schools which constituted the population but were not part of the study. The reliability coefficient of the BPT and SATQ were 0.72 and 0.74 respectively.

7.5 Data Collection Procedure

Before administering the treatment, the two groups (EG and CG) were pretested using the BPT and SATQ. After the pretest, both groups were taught biology concepts for the period of six weeks by the researcher using the discussion method. After which the students were given a test from the BPT to ascertain the performance of the students and the SATQ to fill to determine the impact of the treatment on students' attitude towards biology.

7.8 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.

8.0 RESULT AND DISCUSSION

a. Answering Research Question

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

To answer Research Question 1, the 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 the Lecture Method

Variable	Groups	N	Mean	STD	Mean diff.	Remarks
Mean Scores	Discussion Group	100	56.5	9.2	19.0	Discussion group has higher mean scores than the lecture group
	Lecture Group	120	37.5	7.8		

Table 1 shows that a difference exists between the mean scores of students taught Biology concepts using the discussion method and those taught using the lecture method. The descriptive statistics showed that the computed mean performance values are 56.5 and 37.5 of students taught Biology using discussion method and lecture method respectively. The higher mean score obtained by the experimental group (discussion group) is a clear indication that the discussion method has a greater impact on students' performance in Biology concepts than the lecture method of teaching. However, the statistical validity of this statement is not ascertained until the related hypothesis of the study is tested.

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

To answer Research Question 2, mean ranking and sum of ranks were used. The summary of the posttest is presented in Table 2.

Table 2: Mean Ranking on the Differences in the Attitude of Students taught using Discussion Method Compared with lecture method

Ranks	Groups	N	Mean Rank	Sum of Ranks	Mean Rank Diffs
Attitude	Discussion Group	100	161.59	16158.5	93.66
	Lecture Group	120	67.93	8151.5	
	Total	220			

Table 2 shows differences in the mean rank attitude of students taught biology concepts using the discussion method and those taught using the lecture method. The mean rank attitudes are 161.6 and 67.9 by students taught biology using the discussion method and lecture method respectively, with a mean rank difference of 93.66. This shows that students taught biology concepts using the discussion method have a higher mean attitude than those taught using the lecture method. However, the statistical validity of this statement is left for the testing 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 the discussion method?

To answer Research Question 3, the 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	Gender	N	Mean	STD	Mean diff.
Mean Scores	Male	62	56.2	9.68	0.69
	Female	38	56.9	8.29	

Table 3 shows the mean scores of 56.2 and 56.9 by male and female students exposed to the discussion method respectively, with a mean difference of 0.69. This shows that the mean score of both male and female students taught biology using discussion method is the same, implying that the discussion method 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 the discussion method when compared with those taught using the lecture method

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	Remarks
Mean	Discussion	100	56.47	9.14	19.02	218	0.01	Significant

Scores			
Lecture	120	37.45	7.76

Table 4 shows a significant difference between the mean scores of students taught Biology using the discussion method of instruction and those taught using the lecture method. The reason is that the calculated p-value of 0.004 is less than the 0.05 alpha level of significance.

This shows that students exposed to the discussion method have significantly higher scores than students taught using the lecture method. Therefore the null hypothesis which states that there is no significant difference between the mean scores of students exposed to the discussion method and those taught using the lecture method is hereby rejected

Null Hypothesis 2: There is no significant difference between the attitude of students taught biology concepts using the discussion method and those taught using the lecture method

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

Table 5: Mann-Whitney Test on Differences between the Attitude of Students taught using Discussion and Lecture Methods

Ranks	Groups	N	Mean Rank	Sum of Ranks	Mann-Whitney U	p-value	Remarks
Attitude	Discussion	100	161.6	16158.5	891.5	0.000	Significant
	Lecture	120	67.9	8151.5			
	Total	220					

The Mann-Whitney test presented in Table 5 shows a significant difference between the attitudes of students taught Biology concepts using the discussion method and those taught using the lecture method. This is because the p-value of 0.000 is less than the 0.05 alpha level of significance. This shows that students in the discussion group have significantly higher attitude than those in the control group. Consequently, the Null Hypothesis which states that there is no significant difference between the attitude of students taught biology concepts using the discussion method and those taught using the 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 the 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 the Difference between the Mean Scores of Male and Female Students taught Biology using Discussion Method.

Variable	Gender	N	Mean	STD	Mean diff.	df	p	Remarks
Mean Scores	Male	62	56.2	9.68	0.7	98	0.72	Not Sig.
	Female	38	56.9	8.3				

A no significant difference between the mean scores of male and female students taught biology concepts' using the discussion method was presented in Table 6. The reasons being that the p-value of 0.72 is greater than the 0.05 alpha level of significance. This shows that the mean scores of both male and female students taught Biology concepts using discussion method of instruction is the same, thereby, implying that discussion method has the same effect on both male and female students. Therefore, the null hypothesis which states that there is no significant difference between the mean scores of male and female students taught biology using the discussion method is hereby accepted and retained.

9.0 DISCUSSION OF FINDINGS

The significant difference between the mean scores of students taught biology using discussion and lecture methods signifies a greater efficiency of the discussion method over the lecture method of instruction in teaching Biology concepts. This could be hinged on some features of the discussion method of instruction which includes laying more emphasis on learning than teaching and encouraging students' participation. This helps to improve students' academic performance. This is similar to the findings of Ugwu, Jatau and Gwamna (2020) who stated that engaging learners in a discussion deepen learning.

The significant difference between the attitudes of students in favour of discussion method strategy suggests a greater efficiency of discussion method over the lecture method of instruction in developing a positive attitude of students towards Biology. This could be hinged to the discussion method being an instructional strategy that encourages democratic thinking, enhances reflective thinking, helps improve self-expression and nurtures the spirit of tolerance. This study is in line with the findings of Iwuanyanwu (2017).

A no significant difference between the mean scores of male and female students taught Biology using the discussion method signifies that there are equal chances between males and female counterparts in relation to performance. Therefore, the discussion method can be said to be gender friendly. These findings is similar to that of Ugwu, Jatau and Gwamna (2020) who reported no significant difference between the mean scores of male and female students taught Biology using the discussion method in Katsina State, Nigeria.

10.0 CONCLUSIONS:

The study can be concluded that the discussion method has a positive effect on attitude and performance in Biology among senior secondary students, Zonkwa, Kaduna State, Nigeria. The strategy is gender-friendly and recommended for the teaching of science in all senior secondary schools.

11.0 RECOMMENDATIONS:

1. Adequate time should be allotted to Biology lessons on the time table to encourage teachers to use more interactive strategies such as discussion method in teaching the students.
2. Since gender difference was not significant in the study, the discussion method could be used to help eliminate the gender differences in science teaching and learning.

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