



A Study of the Effects of Discussion and Inquiry Methods on Students' Scholarly Performance in Biology

OMOVIE, Akpevweoghene Anthony¹, Kpangban, Emperor (PhD)²

^{1,2} Department of Science Education, Delta State University, Abraka, Nigeria.

ABSTRACT

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This study examined the effects of discussion and inquiry methods on secondary school students' scholarly performance in Biology. The study adopted quasi-experimental pre-test, post-test, control group research design. Three hundred and eighty (380) secondary school one Biology students from nine schools through the simple random sampling technique were used as the research sample. The control group were instructed employing the lecture method, while the experimental group participated using the inquiry method. Both groups were instructed with same biological concepts in intact classroom for six weeks. Biology Achievement Test (BAT) was administered to collect data for pre-test and post-test. A reliability coefficient of 0.76 was obtained using kuder-Richardson Formula 21. The data collected were analysed using the statistics of mean to answer the research questions and t-test and analysis of variance (ANOVA) to test the hypotheses at 0.05 level of significance. The study's findings indicated a significant difference in the scholarly performance of male and female students instructed using discussion and inquiry methods, with the former yielding better results; and a significant difference in the scholarly performance of discussion- and inquiry-based instruction when it came to student gender. In conclusion, both discussion and inquiry methods of teaching help Biology students do better in high school, but the discussion method works better than the inquiry method. Based on these, recommendations were made.

KEYWORDS:

Discussion method, Inquiry method, Scholarly performance, Students scholarly performance.

1. INTRODUCTION

Biology is the scientific study of living things including their characteristics, classification, structure, functions and their relationship with their environment. Biology covers many areas of studies such as Zoology, Botany, Genetics, Ecology, Cell Biology, Microbiology, Medicine, physiology, Pharmacology, Pharmacy, Biotechnology, and Laboratory Technology etc. The inclusion of biology as a scientific discipline within the secondary school curriculum in Nigeria plays a significant role in fostering the scientific and technological advancement of the nation. The knowledge of Biology helps individual student to develop scientific skills and knowledge to build their lives and the nation. Biology

provides students the background knowledge required at to prepare students for career profession in diverse field of life. The subject or discipline promotes agriculture, health, environmental protection, disease control, human and animal reproduction, food preservation, conservation and management of natural resources, security of life through modern technology, production of drugs, chemicals etc and provision of finance to support human existence.

Over many years, review of performance of Biology students in Secondary School Certificate Examinations has shown the existence of persistent poor scholarly performance of students in Biology in internal and external examinations in Nigeria (Iroriteraye-Adjekpovu & Osilama, 2020). Repeated report of unsatisfactory scholarly performance of secondary school students in Biology is a concern to science educators in Nigeria, and therefore calls for better ways of teaching Biology to maximize learning (Ajaja & Kpangban, 2000). Inappropriate and ineffective teaching strategies which lack innovations have been identified by researchers as the predominant cause of poor scholarly performance of students in Biology.

Corresponding Author: OMOVIE, Akpevweoghene Anthony

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The current structure of education in Nigeria presents teachers as the sole possessors of absolute knowledge which they dispense to passive pupils; providing pupils with needed information without pupils been involved in teaching-learning process through the lecture method of talk- chalk (Iroriteraye-Adjekpovu & Osilama, 2020, Obro & Enayemo, 2022, Obro, 2023). The regular utilisation of the lecture mode of instruction in educational institutions has been identified as a contributing factor to the subpar academic performance of students in the field of Biology. The pedagogy of science disciplines, such as Biology, emphasises the importance of scientific inquiry and instructional tactics that involve active engagement. These approaches aim to foster the acquisition of scientific information, skills, and abilities in students, ultimately fostering their creative thinking talents.

Inquiry method involves hand-on activities, active participation and interaction which promote students' scholarly performance. According to Ibrahim et. al (2018), inquiry method of instruction is an instructional strategy where learners seek to discover and create answers to recognized problems through procedure of making a diligent search; it promotes self-direction, responsibility, social communication, creative skills, thinking skills, problem-solving skill, science process skills etc.

Also, discussion method of instruction or teaching encourages students' active participation in teaching-learning process. It is defined by Ugwu et al (2020) as the strategy in which a teacher leads or guides students in groups towards expressing opinions and ideas with the view to identifying and solving problems collectively. It helps students to listen, think, analyze and critically evaluate points made; provides students the opportunity to practice oral communication skills and give training to students with regard to respect of others' peoples view (Adeyemi, 2018). The scholarly performance of students is enhanced by activity-based instructional strategies which engage students actively in learning (Obro, 2021).

RQs:

1. Is there a difference in the scholarly performance of students instructed employing the discussion and inquiry methods?
2. Is there a difference in the scholarly performance of students instructed employing the discussion and inquiry methods based on gender?

Hypotheses

1. Students instructed utilising the discussion and inquiry methods will not differ significantly in their scholarly performance.
2. Students instructed utilising the discussion and inquiry methods will not differ significantly in their scholarly performance by gender.

II. METHODOLOGY

This study adopted a quasi-experimental pre-test, post-test, control group research design. Quasi-experimental design is a suitable alternative to experimental design when randomization is not applied (Borg & Gall, 2007). The design accommodates the utilisation of Biology Achievement Test (BAT) for collection of data from respondents. The experimental group was subjected to discussion and inquiry methods, whereas the control group was subjected to the lecture method. Both groups received instruction on biological concepts in intact classrooms for a duration of six weeks. Both groups underwent a pretest prior to receiving treatment, and a posttest following treatment, in order to assess the disparity in their scholarly performance results.

The study population included all the Biology students in secondary schools in Delta Central Senatorial District. The sample size is three hundred and eighty secondary school one Biology students from nine sampled schools in Delta Central Senatorial District. The study simple comprised of 302 biology students' selected using the random sampling method. Biology Achievement Test (BAT) was utilised for collection of data. It consisted of fifty multiple questions selected from past WAEC questions on animal nutrition and dentition in mammals. The Biology Achievement Test (BAT) has a reliability coefficient of 0.76 obtained using Kuder-Richardson Formula 21. The experiment/treatment and control groups were assigned to sampled schools and Data collected were analyzed using the statistics of mean to answer the research questions and the t-test and analysis of variance (ANOVA) were employed to assess the hypotheses at a significance level of 0.05.

III. RESULTS

RQ1: Is there a difference in the scholarly performance of students instructed employing the discussion and inquiry methods?

Table 1: Descriptive Statistics of Mean Showing the Difference in the scholarly performance of students instructed utilising discussion and inquiry methods

Teaching methods	N	Mean	Mean diff
Discussion	145	61.04	7.75
Inquiry	158	53.29	

Table1, indicates that the discussion group had a mean score of 61.04, while the inquiry group had a mean score of 53.29. The mean score of the discussion group is higher than that of the inquiry group with a mean difference of 7.75.

RQ2: Is there a difference in the scholarly performance of students instructed employing the discussion and inquiry methods based on gender?

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Table 2: Descriptive Statistics of Mean Showing the Difference in the Scholarly Performance of Students Instructed utilising Discussion and Inquiry Methods based on Gender

Sex	N	Mean	SD
Males instructed with inquiry	75	54.00	12.4119
Females instructed with inquiry	83	52.64	14.9645
Males instructed with discussion	51	57.26	14.7076
Females instructed with discussion	63	63.09	14.5939

Table 2 indicates that the male students instructed with inquiry method had a mean score of 54.00, while the female students instructed with inquiry method had a mean score of 52.64. The male students instructed with discussion method had a mean score of 57.26, while the female students instructed with discussion method had a mean score of 63.09. It demonstrated that the female students instructed with discussion method had the highest mean score.

Hypotheses:

H₀₁: Students instructed utilising the discussion and inquiry methods will not differ significantly in their scholarly performance.

Table 3: Independent Sample t-test Statistics Showing the Difference in the Scholarly Performance of Students instructed using Discussion and Inquiry Methods

Teaching methods	N	Mean	Mean diff	SD	T	d	Sig (2-tail f)
Discussion	145	61.04	7.75	14.85	4.71	301	0.000
Inquiry	158	53.29		13.79			

Table 3 indicates that the observed difference is significant since the calculated sig value of 0.000 is less than the critical value of 0.005. Therefore, the null hypothesis H₀₁, which posits no significant disparity in the academic achievement of students instructed by discussion and inquiry approaches/methods, rejected.

H₀₂: Students instructed utilising the discussion and inquiry methods will not differ significantly in their scholarly performance based on gender.

Table 4: Analysis of Variance (ANOVA) Statistics Showing the Difference in the Performance of Male and Female Students Instructed with Discussion and Inquiry Methods.

Groups	Sum of squares	df	Mean square	F	Sig
Between group	5734.825	3	1912.608	9.471	0.000
Within group	60384.162	299	201.954		
Total	66121.997	302			

Result in Table 4 indicates a significant difference in the scholarly performance of male and female students instructed with discussion and inquiry methods because the calculated sig value of 0.000 is less than the critical sig value of 0.005. With this, H₀₂ which states no significant difference in the performance of male and female students instructed with discussion and inquiry methods is rejected.

IV. DISCUSSION OF FINDINGS

The findings of hypothesis one revealed a significant difference in the scholarly performance of students instructed with discussion and inquiry methods in favour of discussion method. This may be attributed to the fact that discussion method helps to maintain students' focus in learning in the classroom more than the inquiry method. This finding is in line with Adeyemi (2018) who reported significant effect of discussion strategy on students' scholarly performance.

The second finding showed significant difference in the scholarly performance of male and female students instructed with discussion and inquiry methods. This implies that the gender of students has an influence on the scholarly performance of students instructed with discussion and inquiry methods. This finding agreed with Sada-Alikinla and others (2016) report that the mean score of boys instructed with guided inquiry instructional technique was higher than the mean score of girls instructed with the same guided inquiry technique. The finding disagreed with the report of Okunade (2021), Rahman et al (2016) and Ibrahim et al (2018) that there was no significant difference in male and female students' scholarly performance exposed to discussion and inquiry.

V. CONCLUSION

It was concluded that discussion and inquiry methods of teaching enhance the scholarly performance of Biology students at the secondary school level but discussion method has more effect compared to inquiry method.

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Recommendations

1. Through workshops, seminars and conference, government should train and retrain science teachers including Biology teachers on the use of student-centred instructional strategies including discussion and inquiry methods to enhance scholarly performance of students at the secondary school level.
2. Biology teachers should employ the usage of discussion and inquiry methods of instruction to enhance the scholarly performance of students at the secondary school level.
3. Biology teachers should create opportunity for students to develop their interest and motivation in learning through activity- based instructional strategies.

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