



Effect of Discovery Method on Performance of Upper Basic II Students in Some Selected Basic Science Concepts in Giwa Education-Zone, Kaduna State, Nigeria

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Abstract

This study titled Effect of Discovery Method on Performance of Upper Basic Science II Students in Some Selected Basic Science Concepts in Giwa Education Zone, Kaduna State, Nigeria. The Design of the study was a Quasi-Experimental design. The population comprised of 1390 JSS2 Basic Science Students in Giwa. A Sample of 175 students from two randomly selected schools were used for the study. The Experimental Group was taught Basic Science Concepts using Discovery Method, while the Control Group was taught using Lecture Method. A validated Instrument called Basic Science Performance Test (BSPT) with a reliability coefficient of 0.83 was used for the data collection. Inferential statistic was used to test the null hypothesis at 0.05 alpha level. Finding revealed that there is a statistical significant difference between the groups in favour of the experimental group, its concluded that discovery method was found to be helpful in enhancing students' performance.

Keywords: Science Education, Basic Science, Discovery Method, and Performance

Introduction

Science education has always been seen as the most appropriate and fastest vehicle for the planned transformation of any society. Thus, in Nigeria, the contemporary national aims and objectives of education were geared towards the training of individual through child-centered learning for maximum self and societal development and fulfillment. Accordingly, education should aim at helping a child acquire appropriate skills, abilities, and competence - both mental and physical as equipment for the individual to live and contribute to the development of his society.

Basic Science is one of the subjects taught in Nigerian Junior Secondary Schools. It is a subject meant to provide a solid foundation for the Senior Secondary Science subjects like Biology, Chemistry and Physics (Gadzama, 2012). Basic science aims at providing an integrated approach to the teaching of science, stressing the fundamental unity of its branch disciplines. However, observations from the Basic science classrooms reveal that most teachers do not adopt instructional techniques and strategies that could stimulate students' interest and performance (Olorukooba & Lawal, 2010). Basic Science pedagogy like in any other science subject revolves around the practical, but the theoretical teaching and rhetoric learning within the contemporary Nigerian classrooms have become obstacles in the bid to transform the knowledge of Basic Science into achievements (Banfe, 2013). According to Bichi (2002), poor teaching

method is the genesis for students' poor academic performance in science subjects.

Academic performance as observed by Shaibu (2017) is the exhibition of knowledge attained or skills developed by students in a subject designed by test scores assigned by teachers. It is influenced by a number of factors such as instructional materials available, class size, qualification and experience of science teacher and teaching strategies employed to mention but a few. In the same dimension, the persistent use of teacher-centered method of teaching has been widely acknowledged as one of the several factors that causes poor performance. Several studies such as those of Banfe (2013) and Abdullahi (2021) among others, concluded that lecture method has taken precedence over the learner-centered or activity-based methods of instruction in teaching science in Nigerian schools. This is in conformity with Adamu, (2019), who revealed that teachers only lecture and give notes to learners in Basic Science lessons instead of using the prescribed methods. However, in order to handle the persistent poor performance in Basic science, there is need to identify a teaching strategy that will improve Basic science students' performance, such as Discovery method of teaching.

Discovery method is a method of teaching which offers learners the opportunity to discover scientific facts, concepts and principles for themselves rather than being told. According to Suryosubroto (2009), discovery method is a component of educational practice that



covers teaching methods that promote the way of active learning, process oriented, self-directed, self-seeking, and relative so that the learning which is done by self-finding, self-investigating, it will last long in students' memory. Discovery learning gives learners the opportunity to discover and learn science from their own participation. The teacher is not only the manager in the class, but moreover the teacher acts as a mentor and facilitator who direct the students in building their own knowledge by giving them problems to be solved through scientific steps. The success of this discovery learning method is in line with the success of discovery learning method implementation in the previous research findings. According to Yani (2012), the completeness of the student learning outcomes in class with the application of discovery gained satisfactory results. In addition, Supriyanto (2014), concluded that the application of discovery learning can improve the learning outcomes of students. It is against this background that this study seeks to find out the effect of the discovery method of teaching among male and female upper Basic science students in Giwa education zone, Kaduna state, Nigeria.

Statement of the Problem

The poor performance in Basic science has endured in spite of the various reforms and interventions by the government and the situation has remained a source of concern to science educators and educational experts. This poor academic performance in Basic science according to Adamu (2021), has assumed alarming proportions and has been a source of concern for some time now. In the same dimension, students' performance in Basic science is rapidly increasing as reported by the Junior Secondary School Certificate Examination (JSSCE) chief examiner (2022). Several factors have been identified as the contributing factors that cause poor academic performance in Basic science. Such factors according to Olorukooba and Lawal, (2010), and Gadzama, (2012), include gross inadequacy or lack of instructional materials, poor utilization of instructional materials in classroom instruction and the teachers' method of teaching among others. Consequently, from the foregoing, if students are left unchecked and the same poor result continues to refuse, the Nigeria's dream of technological buoyancy and subsequent development would be a mirage. It's in the light of the above situational problems that this study seeks to see if the discovery method of teaching will improve male and female Basic science students'

performance in Giwa education zone, Kaduna State, Nigeria.

Objectives of the Study

The objective of this study is to:

1. Ascertain the effect of the discovery method on students' performance when taught Basic science concepts.

Research Question

The study sought to give answer to the following question:

1. What is the difference between the mean performance scores of upper Basic science students taught Basic science concepts using discovery method and those taught the same concept using lecture method?

Hypothesis

The null hypothesis is set to be tested at 0.05 alpha level

1. There is no significant difference between the mean performance scores of upper Basic science students taught Basic science concepts using the discovery method and those taught the same concept using the lecture method.

Significance of the Study

This study will hopefully give an insight on the effect of discovery method on academic performance of upper Basic II students' in Giwa education zone, Kaduna state, Nigeria. The study also revealed how discovery method benefits; Basic science Teachers, Basic science Students, Parents, Curriculum Planners, Educational Administrators, and Non-Governmental Organizations (NGOs) among others in teaching and learning of science subjects at all level of education, the challenges encountered, the progresses and how to improve the teaching and learning in science education.

Methods

This study adopted pretest, posttest quasi experimental control group design as proposed by Kerlinger (1973). The subjects were pretested to determine the academic equivalence of the two groups in their ability level. The experimental group was taught using discovery method (xi) while the control group was taught using lecture method (xo). After treatment, Posttest was administered to the participants in the two groups to determine the effect discovery and lecture methods employed in the teaching of Basic science concepts. The design of the study is illustrated in Figure1.



Figure 1: Research Design

Keys:

EG: Experimental Group CG: Control Group X₁: Treatment

X₀: No treatment O₁: Pretest O₂: Posttest

The population of the study comprised all public secondary school students offering Basic science as a subject in Giwa Educational Zone Kaduna State Nigeria. There are fourteen (14) public secondary schools in Giwa Education Zone with a total population of; 1390 students in which 640 are male and 750 female students. Out of which 12 schools are co-educational and 2 are single sex secondary schools.

Purposive and Simple Random Sampling Techniques were used in the study. Coeducational schools were purposely selected from the population due to gender involvement in the study. Four schools were randomly selected in the zone for participation. A general Basic Science Performance Test (BSPT) was administered to JSS II Basic science students in each of the four schools selected from the zone to determine their equivalence in

terms of academic performance. This was achieved by subjecting the students' scores to Analysis of Variance (ANOVA) and Scheffes post hoc test. ANOVA was used to determine the existence of any significant difference in the selected schools while the Scheffes Post Hoc test was used to separate the schools and determine which schools were significantly or not significantly different. Two schools were found to be relatively similar statistically. The status of the schools was then determined by simple coin tossing. As a result of this exercise, one school became the experimental school and the other one became the control school. The total number of the male and female students from the two coeducational sampled schools chosen were 175 and this is in line with Usman (2010) who suggested that the sample of 175 is in line with the Central Limit Theorem (CLT) which recommended a minimum of 30 subjects as adequate sample size. The experimental group were also labeled "School X" while the control school was labeled "School Y" respectively. Because of the large number of students in the sample schools, one Arm was randomly selected and used from each of the selected school respectively. Table 1 represent the sample for the study.

Table 1: Sample of the Study

S/n	School Name	Groups	Number of Students		Total
			Male	Female	
1	X	Experimental	48	39	87
2	Y	Control	52	36	88
Total			100	75	175

For the purpose of this study, one instrument namely Basic Science Performance Test (BSPT) was used for data collection.

Basic Science Performance Test (BSPT)

BSPT Consist of 40 multiple choice items with four options (A-D). Three among them are distracters while the other one is the correct option, it was adopted by the researcher to determine the Academic Performance of Students in Basic Science. The instrument was developed by the researchers which consists of six topics of Basic Science. That is; Soil Erosion, Deforestation, Desertification, Bush burning, Flooding, and Depletion of Ozone Layer.

The instrument was validated by 3 panel of experts from science educations to: Check the clarity of the statement, Check whether the time allocated to the instrument was sufficient, Check the content of the test item if it's appropriate to the objectives of the study,

Verify if the language used is at the same level with the ability level of the participants of the study. Their comments, correction, suggestion and recommendation regarding the face and content validity of the test item were noted and helped in producing the final version of the Instrument.

The Instrument was pilot-tested in one of the schools that is part of the population but not among the sample of the study to determine its reliability, PPMC statistical tool was used to find the reliability and the reliability was found to be 0.83 which is fit for the study based on the recommendation of Olayiwola (2010), who recommended that the closer the reliability is to 1 the more reliable it is and the closer the reliability is to 0 the more unreliable its.

Administration of the treatment

The experimental group was taught using the following steps:

Step One: Questioning: the students ask questions at this step about concepts or topic of discussion after the teachers introduction of the lesson.

Step Two: Investigation: At this step the students collect information about the concepts/topics. They make observations about what they discovered from there investigations, and make an experiment to find out the accurate solution to the observed problem.

Step Three: Creating: At this step the students synthesize, make links and write a report based on their discovery about the concepts/topics

Step Four: Discussion: this the step were students share ideas and confront ideas of themselves based on their discovery about the concepts/topics.

Step Five: Reflection: this the point at which the students examine the results of their discovery and also at the questions again to further adjustment if needed

Teaching of the control group

The control group was taught using the conventional lecture method. The lesson was initiated by the teacher with little participation of the students/subjects.

Accordingly posttest was administered after treatment and the data collected were recorded for analysis

Results

Table 2: Mean and Standard Deviation of the Performance Scores of Students in the Experimental and Control Groups.

Factor	Groups	N	Mean	Std. D	M. df
Mean Performance	Experimental	87	36.5	2.22	5.9
	Control	88	30.6	2.64	

From the descriptive statistics in Table 2, among the Experimental group the mean performance score for students in the Experimental group was 36.5 and a standard deviation of 2.22. While the mean performance score for the control group was 30.6 and a standard deviation of 2.64 with the mean difference of

5.9 respectively. This indicates that there is a difference in the mean performance scores of the experimental group and the control group when taught using discovery method and those taught using lecture method in favor of the experimental group respectively.

Table 3: Summary of t-test on the difference between the Mean Performance Scores for Experimental and Control Groups.

Factor	Groups	N	Mean	Std	M.d	D.f	T-val	P-val	Remark	Decision
Mean Score	Experimental	87	36.5	2.22	5.9	173	15.9	0.01	Sig.	Reject
	Control	88	30.6	2.64						

Significant @ $P \leq 0.05$ level of significance.

Results of the independent t-test statistics in Table 3 shows that there is a significant difference between the mean Academic Performance scores of the experimental and control group in favour of the experimental group. Reasons being that the calculated p-value of 0.01 is lower than the 0.05 alpha level of significance at degree of freedom (df) 173. This confirmed that the significant difference is in favour of the experimental group. This is as a result of the treatment discovery method on students in the experimental group. Therefore, the null hypothesis that stated; there is no significant difference between the mean performance scores of upper Basic science students taught Basic science concepts using discovery

method and those taught the same concept using lecture method, is hereby rejected.

Discussion

The results in Table 3 showed that statistically significant difference exist between the mean performance of the experimental and control group in favour of the experimental group. The rejection of the null hypothesis indicate that significant difference exists in the mean academic performance scores of upper basic science students taught using the discovery method and those taught the same concepts using Lecture method. This is due to the fact that discovery method enables the students to discover solution to a given problem themselves. Unlike the Lecture method



which is teachers centered. Student's active engagement in learning leads to a more concrete learning which translates to better academic performance. This finding is in support of the findings of Effiong, (2014), and Anwar (2019), who concluded from their findings that the discovery method improved the performance of students significantly when compared to the lecture method.

Conclusion

Conclusion was made based on the study:
Academic performance of upper Basic II students in Basic science concepts can be improved by the use of discovery method.

Recommendations

Based on the finding of the study, the following recommendation was made;
Basic science teachers should use the discovery method when teaching Basic science concepts which plays greater role in student's academic performance. This is due to the fact that the discovery method enables the students to find out a solution to a given problem themselves.

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