Effects of Individual and Group Test Administration on Students' Achievement in Biology in Secondary Schools

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Abstract -The type of test administration used by teachers in assessing students in Biology in Nigerian secondary schools had been implicated. In view of the above problems, the present research work was designed to find out the effects of individual and group test administration on SS3 students' achievement in Biology. The researcher adopted a non-equivalent quasi-experimental design. A sample of 320 SS3 students was drawn from the four schools in Enugu south Local Government Area of Enugu State. In each school used, two intact classes were randomly drawn; one intact class was then randomly assigned to the experimental groups 1 and II. The two groups were assessed using individual and group test administrations respectively. A research question and hypothesis guided the study. Relevant data for the study were collected using individual and group tests on Biology Achievement Test (BAT). Research question was answered using mean and standard deviation while hypothesis was tested using Analysis of Covariance (ANCOVA). The results revealed that the use of individual test administration in assessing students in Biology in the secondary schools was found to achieve higher than group test administration. Some recommendations were made based on the findings of the study

Keywords: Achievement, Assessment, Biology, Intact classes, Test administration,

1 INTRODUCTION

Biology deals with facts and words associated with reasoning which is essential for technological growth. Biology is a subject that encroached into all aspects of human endeavors and it is described as the life wire in the studies of various sciences [1].

It is man's most basic tool without which it would be difficult for man and woman to live together, to think, to act, and share ideas together. Biology makes it possible for man to engage in scientific conversation, transfer of ideas, thoughts and feelings through science, and to develop scientific inquires.

The usefulness of Biology in every sector of human life is so glaring that there is no school curriculum or a national development planning without emphasis on the knowledge of Biology. In Nigeria for instance, the broad aims of secondary education in her national policy on education [2] are to prepare individual for useful living and higher education.

[3] defined individual tests as the type of test designed for administration to a given student at a time while group tests are designed in a way that they can be administered to more than one person at a time. The problem of low achievement in Biology at secondary school could be attributed to the teachers' failure to use appropriate administration methods. Sequel to the above, Biology teachers may have tried varieties of administration methods at their disposals. This underscores the need to explore the effects of individual and group test administration in enhanicing achievement in Biology at secondary schools.

Individual tests are designed for administration to be given to a student at a time. The advantage of an individual test over group test is that the tester can exert some positive influence and establish some degree of mutual confidence (called rapport) with the student being tested.

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This makes it possible for the tester to observe the individual regarding his/her mental ability, motivational level, physical constraint and emotional stability. Individual tests are more expensive in terms of time and expertise required for their proper administration and interpretation. They are more commonly employed in clinical situations such as language, verbal and sight problems where very fine discriminations must be made for very important discussions regarding the individual. For occupational skill acquisition in say electronics, heavy equipment operation, welding and truck driving, individual achievement tests will need to be administered.

Group tests are designed in such a way that they can be administered to more than one person at a time with large number of students in school situations. It is cheaper and simpler to use group tests even though the important advantages of individual tests that were indicated earlier become sacrificed. However a group test can be given to only one individual if it becomes necessary to do so

It seems that the Biology teachers neglect the use of vital methods of the administration of Biology such as individual and group test administrations. This has led to the students' poor achievement in Biology in senior secondary school certificate examinations in Nigeria. Furthermore, this unfortunate situation of not using individual and group test administration could have been attributed to the students dwindling achievement in Biology. Consider for instance, in 2011 out of 10,120 candidates who sat for senior secondary school certificate examinations in Biology in Enugu East Local Government Area of Enugu State only 19% passed at credit level [4]. It appeared that in Nigeria, teachers are more conversant in using group method test administration than individual test administration in evaluating Biology. A question that arises then is: is the use of group test administration, better than the use of individual test administration in achieving higher performance in Biology in secondary schools. Moreover, it is not certain which method of administration is associated with student's higher achievement in senior secondary school Biology with particular reference to the use of individual and group test administrations.

The purpose of the study was to find out the effects of individual and group test administrations on the mean achievement scores of students in biology in secondary schools.

Significance of the study is that the findings of this study will be beneficial to students, teachers, researchers, authors, and publishers, as well as curriculum planners, and supervisors. It will be useful to students because it enhances students' achievement in Biology due to the novelty of individual and group test administrations in our educational institutions.

The findings of this study will be useful to Biology teachers especially those in senior secondary schools. It will provide them with additional test administrative methods for assessing certain Biology topics for better assimilation which in turn will enhance students' achievement.

It will be useful to authors and publishers because it will serve as additional test administration methods/tool for presenting their Biology skills in Nigerian secondary school Biology text books.

This finding will be beneficial to curriculum planners in drawing up and restructuring Biology curriculum of senior secondary schools by making Biology teaching at this level more resource oriented. Lastly, the result of this study could be beneficial to researchers as a point of reference for further studies in other related disciplines.

This study was delimited to ascertain the effects of individual and group test administrations on students' achievement in secondary school two (SS3) in Enugu South Local Government Area of Enugu State. It will find out the level of difference in the mean achievement scores of students administered biology using individual and group test administrations.

1.1 Research question

This research question was posed to guide the study

1. What are the effects of individual and group test administrations on the mean achievement scores of students in Biology in secondary schools?

1.2 Research hypothesis

The null hypothesis (Ho) was tested at 0.05 level of significance.

1. There are no significant effects of individual and group test administrations on the mean achievement scores of students in Biology in secondary schools.

2 METHOD

The design for this stduy is quasi-experimental. The design is specifically a pretest post-test, non equivalent group design. The choice of this design agrees with [5] who observed that this design is often used in classroom experiments when experimental and non-control groups are naturally assembled groups, such as intact classes will be randomly assigned to experimental groups I, and II respectively.

TABLE 1
DIAGRAMMATIC REPRESENTATION OF PRE TEST – POST TEST CONTROL GROUP DESIGN

Group	Pre Test	Research Conditions	Post Test
E_1	O_A	X_1	O_B
E_2	O_A	X_2	O_B

Where

E_1 = Represent experimental treatment group on group test administration

E_2 = Represent experimental treatment group on individual test administration.

O_A = Represents pre test on achievements

O_B = Represents post test on achievements

X_1 = Represents treatment condition on group test administration.

X_2 = Represents treatment condition on individual test administration.

P_{PP}

The area covered by this study is Enugu South Local Government Area of Enugu State.

The population for this study comprised all the 3102 SS2 biology students in all the eleven secondary schools in Enugu south Local Government Area of Enugu state.

Simple random sampling technique was used to draw four schools from the eleven secondary schools in Enugu South Local Government Area. In each of the sampled schools, simple random sampling was used to pick two intact classes of SS3 in each school. Two intact classes were randomly assigned to the experimental group I and II. In all, a total of 320 students were used in the experimental groups. In each school, an intact class of 40 students was assigned to experimental group I and II respectively, making a total of 80 students.

Biology Achievement Test (BAT) developed by the researcher was used for data collection. The number of periods that essentially cover a particular unit and the objectives of the Biology contents guided the development of BAT. This implies that where more time was required to teach a unit, more items were drawn from such a unit. BAT consisted of 34 objective test items.

The choice of objective test items is to allow the researcher to cover more topic areas. Twenty objective test items were at the lower cognitive level (that is knowledge and comprehension) while 14 items were in higher thinking process (that is application and analysis). The instrument was used for pre test and post test but the serial numbers of the items were rearranged during post testing.

The instrument went through both face and content validations.

The items of BAT and experimental packages were subjected to face validity by two experts in Biology, one expert in measurement and evaluation. The instrument and experimental packages were reviewed in terms of clarity, appropriateness of the language used. Their critical appraisal and comments were useful in modifying the items of the tests, and experimental packages. The surviving items therefore possessed adequate face validity of the instruments for data collection.

Content validity is a measure of the extent to which the instrument is a representative of content and behaviour specified by the theoretical concept being measured. The table of specification was validated by the experts to determine how effective it is in selecting items considering the percentage allocation of the various levels of content. The items for the BAT were written to reflect the specification in a test blue print prepared. Thirty four questions survived out of 47 items after specification.

The reliability of BAT was determined using measure of stability (test re-test method). The choice is because it is most suitable and appropriate in determining the correlation between sets of scores from two administrations of the test. The BAT was administered to two intact classes of 40 students each at Model Secondary School, Olo in Ezeagu Local Government Area of Enugu State. The BAT was re-administered to the students and data collected. Then the two sets of scores from first and second administrations of BAT were correlated using the Pearson-product moment correlation Coefficient. A correlation co-efficient value of 0.88 was obtained.

2.1 Experimental Procedure

Two Biology teachers from each of the sampled schools received training for a period of one day from the researcher on the use of individual and group test administrations in evaluating Biology respectively. Prior to the treatment, the Biology teachers in the sampled schools who received training on how to use the research instrument, administered the BAT to their SS3 students using group test administration. At the end of the pretest, the question papers and the answer scripts were collected from each student who took the pre test. This is because the same test item is used for post test, except that the serial numbers of the items were rearranged in the post test. This made the items look different at first glance. After the pre test, the teachers administered the test to the two grouped by using individual and group test administrations.

2.2 Experimental Control

There are some extraneous or confounding variables that the researcher feel can constitute potential threats to the validity, reliability and generalization of the results of this study. Such variables include inter-group variables, teacher variables and Hawthorne effect. In seeking to achieve validity, the following measures were made to ensure that these confounding or intervening variables, which might introduce bias into the study, were either minimized or controlled.

Inter group variables: To remove the errors of non-equivalence arising from non randomization of the research subjects, analysis of covariance (ANCOVA) was used in data analysis. This is to correct the error of initial difference in the ability levels among the research subjects.

Teacher variables: To minimize the error which may arose due to teacher difference, the researcher gave Biology Achievement Test (BAT) constructed by the researcher to all the Biology teachers who were used for the study. The Biology Achievement Test (BAT) and procedure for presentation of the BAT were to large extent discussed with the teachers. Each teacher administered the equivalent of students at Community Secondary School Olo in Ezeagu L.G.A. during the trial administration with the BAT. After, the trial, administration, discussion was held on the teachers' presentation of the Biology Achievement Test (BAT).

Hawthorne effects: This is a situation in which the research subjects' behaviour is affected not by treatment per se but by their knowledge of participation in the study. This was avoided by the use of regular Biology teachers in the school in administering the Biology Achievement Test (treatments). The researcher was not directly involved in the treatment in order to avoid sensitizing the students being used for the research.

2.3 Method of Data Collections

BAT was administered respectively as pretests on the first week of treatment by research assistants using individual test administration. Scores of the students on the pretests were recorded and kept for use after the experiment. The posttest data were also generated after the re-administration of BAT using individual and group test administrations to the students on the last week of treatment. For each of the groups, data for pretests and post tests were recorded separately. The test items on BAT were scored and two marks were allocated to each number to give a maximum mark of sixty eight.

Mean (x) and standard deviation were used in analyzing the research question. Mean was used because it is the most appropriate statistical tool to use for such data and as such takes all measurement (observations) into consideration. Analysis of covariance was used to test the hypothesis.

Analysis of covariance (ANCOVA) is used because intact classes were used and as such corrects the error of initial differences in the ability levels among the students involved in the study. Reject the null hypothesis (Ho) if the significance of t (value of the test t – calculated is greater than the t – table at 0.05 then fail to reject the null hypotheses at 0.05 if the t-calculated is less than t – table at 0.05.

3 RESULTS

What are the effects of individual and group test administrations on the mean achievement scores of students in Biology in secondary schools?

TABLE 2
MEAN ACHIEVEMENT SCORES AND STANDARD DEVIATION OF STUDENTS ASSESSED IN BIOLOGY USING INDIVIDUAL AND GROUP TEST ADMINISTRATIONS.

	Mean (X)		Standard Deviation		N
Groups	Pretest	individual test)Posttest	Pretest	Posttest	
Experimental Group I	(individual test) 18.08	54.07	5.06	2.38	160
Experimental Group 2	(individual test) 20.34	(group test) 19.71	5.06	5.13	160
Total					320

Table 2 above indicated that the experimental group 1 assessed using individual test administration obtained 18.08 in pretest and 54.07 in posttest. The group also had standard deviation of 5.06 and 2.38 in pretest and posttest respectively. The table 2 showed that the experimental group 2 assessed using group test administration assignment obtained mean achievement scores of 20.34 and 19.71 in pretest and posttest respectively. The group too had a standard deviation of 5.06 in pretest and 5.13 in posttest.

The result in table 2 above revealed that the experimental Group one assessed in Biology using individual test administration achieved higher than those assessed in Biology using group test administration. Similarly, it is in agreement with [6] who observed that the quality and method of test administration affects the students' performance in Geography.

TABLE 3
ANALYSIS OF COVARIANCE OF STUDENTS OVERALL MEAN ACHIEVEMENT THROUGH THE USE OF INDIVIDUAL AND GROUP TEST ADMINISTRATIONS IN ASSESSING BIOLOGY.

Source of variation	Sum of square	Df	Mean square	F-Cal	Significance	Decision
Covariance variation	8163.867	1	7163.867	117.629	000	
Main effect	16830.990	3	8415.496	242.867	000	
Teaching methods	2798.077	2	2698.077	46.531	000	Significance
Error	20102.931	287	65.561			
Residual	10126.312	4	2531.578	38.034		
Total	65922.18	303	20875.578			

S = Significance at P<.05

From the result of Analysis of covariance in table 3 above, it was observed that <F (46.531) = 0.000; P< 0.05>. This means that the F calculated, F (46.531) is greater than the F critical. Thus, the null hypothesis of no significant difference in the mean achievement scores of SS3 students assessed using individual and group test administrations in assessing Biology was rejected at 0.05 levels of significance. This implies that the use of test administrations in assessing Biology influence significantly students' achievement in Biology. The researcher therefore found out that there was significant difference in the mean achievement scores of students assessed with individual and group test administrations in favour of individual test administration. The result of the study is in agreement with the findings of [7] where homework was found to be more efficacious than the use of project in assessing 200 SS2 students Biology in Ezeagu Local Government Area of Enugu State.

4. CONCLUSIONS

The result of the findings showed that experimental group I assessed in biology using individual test administration achieved higher mean than those assessed biology using group test administration.

Furthermore, the researcher found out that there was significance difference in the mean achievement scores of students assessed with individual and group test administrations in favour of individual test administration followed by group test administration.

5. RECOMMENDATIONS

Based on the findings of the study, the following recommendations were made

1. The serving teachers of Biology in secondary schools should adopt the use of individual test administration in assessing Biology than group test administration.
2. In-service programmes should be made to emphasize the need to assess the subject (Biology) using individual and group test administrations among other things.

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