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WHAT HAPPENS TO NIGERIAN ARTS AND SCIENCE STUDENTS ACHIEVEMENT IN LIFE SCIENCE WHEN ASSISTED WITH INDIVIDUALIZED AND DEMONSTRATION METHODS?

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ABSTRACT: *The study examined the effects of Demonstration and individualized methods on Nigerian Arts and Science students' achievement in life science (Biology). It adopted quasi-experimental design. Three instructional methods (demonstration, individualized and control) and moderator variable (subject specialization) at two levels (Arts and Sciences) were used.The study employed a multi stage sampling techniques. At the first stage, three schools were randomly selected out of the twenty-public secondary in Abeokuta South Local Government of the state. At the second stage, sample sizes of sixty students were randomly selected from the list of students provided by three schools to obtain a total number of one hundred and eighty students. To reflect the subject specialization of the student thirty out of the sixty students were selected from the Science and Arts class. Two instruments were developed for the measurement of the variable of this study, Biology Achievement Test (BAT) and Operational Guide for Instruction (OGI) stimulus instrument The result of the study obtained was analysed with spread sheet Microsoft excel, descriptive statistics and analysis of covariance.The result of the study was well discussed and recommendations were equally made.*

KEYWORDS: Science, Arts, Demonstration Method, Individualized Method, Achievement and Life Science

INTRODUCTION

Man is greatly dependent on science and technology (Uhumuavibi and Mamdu, 2009) while the impact of science, technology, engineering and mathematics education transcend every aspect of the society; this impact on human life is limitless (Alebiosu, 2017). It is in this direction that science is defined as the systematic study of natural phenomena that helps us to understand and relate better to nature and the universe at large. It refers to a classified body of knowledge, which includes Physics, Chemistry and Biology (Umeh, 1999). The focus of this paper is Biology, the most important school science subjects in Nigeria studies living matter, structure, function and behaviours of organism. It is concerned with evolution, distribution and taxonomy of life. A corner stone that cannot be over emphasized in terms of nations technology and industrial development (Bilesanmi – Awoderu, Afuwape, and Jolaosho, 2015). The role of Biology Education in nation building cannot be over-emphasized or ignored because of its crucial functions in health, agriculture, industry, environmental conservation to mention a few. It is central to many science related courses such as Medicine, Pharmacy, Agriculture, Biochemistry, and so on. In view of this status, it has been given very serious attention as a subject taught in the secondary section of educational institution in Nigeria and the broad goals shall be to prepare the individual for:

- Useful living within the society, and

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- Higher education (FRN, 2014)

Despite the above good note on this subject and its popularity among students in Nigeria, performance recorded had been poor and faced with many problems (Ahmed, 2008, Ejiwale, 2013 and Alebiosu,2017).

The poor performance could be attributed to techniques of teaching, as teaching focuses on students' understanding, the content matter for creative processes and solving tasks of life. Alonge (1995) opined that teaching method is far more important than the student-teacher ratio as submitted by Nwachukwu and Nwosu, (2007) while Bilesanmi - Awoderu, (2012) emphasized that the method of teaching is fundamental to student's learning outcome.

In line with the above, the curriculum planning of the subject and sequencing of the course content requires special approach. Teaching method should accommodate a variety of approaches to suit the concepts that is being taught. The methods are viewed as a process of developing the student cognitive, affective and psych motive domains irrespective of learners extension and community. Demonstration method involves the teacher showing learners how to do something. This method is one of the most effective teaching tools that can lead learners to desired behaviour (Uhumsuavbi and Mamudu, 2009). Duch (2002) described demonstration method as an instructional method that challenges students to "learn how to learn" working cooperatively in groups to seek solutions to real world problems while individualized method takes the form of self-directed learning or personalized instruction or independent study. It is a programmed instruction in which the learning programmes are essentially presented in careful structured steps and the pace or steps of learning depend on the individual student and the nature of the material to be learnt. The fundamental objectives of the individualized learning is, therefore; the progressive understanding of the individual monitored through his/ her performance.

The consideration for science and art students is another novel area in this study as affirmed by (Olatoye and Afuwape, 2004) that certain cultures restrict particular gender to certain professions like farming, engineering and trading. Studies carried out by Awam et al (2011) showed that students in developing countries appear to be more interested in science, however, Agha (1998) in Akpan (2010) alarmed the problem of students that they read science just the way they read ordinary literature and its obvious, methods in sciences are frequently used in arts and those that are not scientifically inclined cannot but always enjoy the products of science. In Nigeria, one science subject is a must for those that are not scientifically inclined and it is the duty of a good teacher to effectively impact on this set of learners which is the main stream path of this paper.

Research Hypotheses

i. There is no significant difference in the academic achievement of science and arts students taught using the demonstration, individualized and control methods of teaching in life science.
ii. There is no significant difference in the academic achievement of science and arts students taught using the demonstration method.
iii. There is no significant difference in the academic achievement of science and arts students taught using the individualized method

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iv. There is no significant difference in the academic achievement of science and arts students taught using the control method

METHODOLOGY

The study adopts quasi-experimental research design with three Instructional methods at three levels (Demonstration, individualized and control) and moderator variable, subject specialization at two levels (science and arts).

Sample and sampling techniques

The study employed a multi stage sampling techniques. At the first stage, three schools were randomly selected out of the twenty public secondary in Abeokuta South Local Government of the state. At the second stage, sample sizes of sixty students were randomly selected from the list of students provided by three schools to obtain a total number of one hundred and eighty students. To reflect the subject specialization of the student thirty out of the sixty students were selected from the Science and Arts class.

Instrumentation

Two instruments were developed for the measurement of the variable of this study

- Biology Achievement Test (BAT) and
- Operational Guide for Instruction (OGI) stimulus instrument

Biology Achievement Test (BAT)

The biology achievement test items were selected from the past senior school certificate examination (SSCE) question papers. The test covered three selected topics treated in the study. The topics are:

- Alimentary canal and digestion of food in human,
- Vitamins required by humans
- Blood types, functions and clothing formation mechanism

The questions administered consist of 50-item- multiple- choice test with four options per item. The BAT was used for both pre-test and post –test exercise. However, in the post-test, the items were rearranged and the colour of the paper changed to present an impression that they are writing a different test from the earlier one presented.

Operational Guide for Instruction (OGI) stimulus instrument

This is a treatment package prepared for the experimental group. It is a package that promotes active learning, increasing retention and application, as well as promoting continuous and permanent learning. The OGI were developed on the three topics that were taught during the period of the study.

Validation and Reliability of the instrument

Biology Achievement Test was validated using test-retest method to determine the reliability of the instruments.

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The tests were administered on the same respondents twice, within two weeks compared using person product moment correlation coefficient

Test-retest reliability value is 0.74

RESULT AND DISCUSSION

The results of this study which were obtained using spreadsheet Microsoft excel, descriptive statistics and analysis of covariance.

Table 1: Main and Interaction Effect on Students' Achievement on Biology

Source of variation	Sum of squares	Df	Mean square	F	Sig.	Partial eta squared
Pretest (covariate)	20.697	1	20.697	5.917	.016*	0.34
Main Effect						
Gender	149.833	1	149.833	42.838	.000*	.204
Subject Specialization						
Treatment	1700.848	1	1700.848	486.287	.000*	.744
	632.293	2	316.146	90.389	.000*	.520
Two way interaction						
Gender *Subject Subject Specialization	16.923	1	16.923	4.838	.029*	.028
Treatment	44.523	1	22.262	6.365	.002*	.071
	380.291	2	190.145	54.364	.000*	.394
Three way Interaction	38.046	2	19.023	4.838	.005*	.394
ERROR						
TOTAL	584.103	167	3.498			
CORRECTION TOTAL	171078.000	180				
	4120.644	179				

Sources: field survey, 2014

R Squared= .858 (Adjusted R Squared-.848)

Hypothesis (H_{01}): There is no significant difference in the academic achievement of students taught using the demonstration, individualized and control methods of teaching in biology. The level test for the ANCOVA analysis to examine how the independent factors (Teaching methods and subject specialization accounted for variation in the dependent factor (post-test scores) revealed that there was no significant variation across the variances of the different groups. The adjusted R-Square of 84.4% also confirmed that the model specified was good, fit, and that 84.4% variation observed in the scores of the student were accounted for by the variation in the examined independent factors i.e. subject specialization and treatment (table4.1) The table also showed that there was a significant differences in the achievement scores among the three intervention groups after adjusting for pre-intervention scores (covariates)as shown by the significance of the F-values of the three factors examined at $p<0.05$

a. Subject specialization {F(1,127)=486.287 and partial Eta squared=0.744

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b. Treatment {F (2.167)=90.389 and Partial Eta Square = 0.520

There was however a weak relationship between the pre- intervention and post-intervention scores in Biology test as indicated by partial Eta Square value of 0.34

From table 1 and both the estimates and pair wise comparison result (appendix 1) it is obvious that there is a significant relationship among the three intervention groups (demonstration).

Table 2: Descriptive statistic of the Post Academic Achievement Mean Scores and Standard Deviation according to Treatment

Dept	N	Mean	Std. Deviation	Std Error Mean
DPosttest .00	30	28.53	1.252	.229
1.00	30	38.90	3.951	.721
IPosttest .00	30	27.17	1.159	.212
1.00	30	32.10	2.657	.485
CPosttest .00	30	26.17	1.117	.204
1.00	30	30.00	1.875	.342

Source: Field survey, 2014.

Hypothesis 2

There is no significant difference in the academic achievement of science and arts students taught using the demonstration method.

The result demonstrated that the performance of the science students is significantly different from that arts students with a means score of 38.9 as shown in Table 2. Therefore the null hypothesis 2 rejected.

Table 3: t-test results of students posttest scores according to subject specialization of students.

	Levene's Test for Equality of Variances		t-test for Equality of Means	
	F	Sig.	T	Df
DPosttest Equal variance assumed	25.673	.000	-13.700	58
Equal Variance not assumed			-13.700	34.767
IPosttest Equal variance assumed	10.313	.002	-9.574	58
Equal Variance not assumed			9.574	39.655
CPosttest Equal variance assumed	2.925	0.93	-9.619	58
Equal Variance not assumed			-9.619	47.269

Source: Field survey, 2014

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Hypothesis 3

There is no significant difference in the academic achievement of science and arts students taught using the individualized method.

The same trend observed with demonstration was also noted when the score of the science students was compared with their counterparts in arts. Though, with a smaller means score of 32.1, the science students performed better than the arts students when individualized method was used. With reference to the two groups however, the demonstration method recorded a better performance. This clearly showed that with individualized method the difference between the performances of the science student is significantly different from that of the arts at 99% level of significance with a t-value of 9.57 as shown in table 3. Therefore the null hypothesis 3 is rejected.

Hypothesis 4

There is no significant difference in the academic achievement of science and arts students taught using the control method.

The conventional method recorded the least scores for the two groups when compared with both demonstration and individualized. Among the two treatment groups compared under the conventional method, the science students still performed better than their counterparts in arts with a mean score of 30 marks. The t-value of 9.62 confirmed that their performance is statistically different from that of the arts students at 99% level of significance. The achievement of the science students when taught using the conventional or traditional method was also better than the arts students as revealed in Table 3. Hence, the null hypothesis 4 was also rejected.

DISCUSSION

The effect of treatment (demonstration, individualized and control) on achievement in life science was significant at $P< 0.05$ with means score of 28.3; 29.6 and 33.4 for the convectional, individualized and demonstration respectively. The demonstration method produced a better achievement score among the arts and science students on the average compared with the control. The active participation of students cannot be unconnected with high performance in demonstration method. Alebiosu (2017) lead paper presentation at the 2017 Ogun State stan conference made case for hands-on- experiences as critical part of career exploration and skill building . Hence science teaching curriculum emphasizes practical hands-on- experiences for all science oriented subjects. It improves concentration and coordination, and builds critical problem solving strategies .learning is facilitated by explaining ideas through concrete, authentic experiences that engages the learners heads, hands, and hearts. Also, the result is in agreement with Adeleye (1987) and corroborated Afuwape (2002).

Result from table 2 and 3 showed that there were significant differences in the academic achievement of science and arts students taught using the demonstration, individual and control methods. Though researchers like Morgan, Farkas, Hillemeier and Maczuga (2009) affirmed performance from a result of different characters while Ogunjimi, Jalami & Oyedare (2015) identified family background variables but the result is consistent with Oduro-Mensah (1987) in Nwachukwu and Nwosu (2007). It is also in line with Afuwape (2002) Knight and Michelle

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(2010) Illingworth and Burke Da Silva (2012) who concluded non majors do not always achieve as high a level of understanding as majors. They laid emphasis on attitude, study time and study techniques for high performance.

CONCLUSION

This study could be useful to different agencies in education on and reasons to focus more on demonstration method during science lesson more importantly life science (Biology) because of its motivational power over individualized and control methods. This method will assist student level of understanding, retention, processing, manipulations, creativity and innovation.

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