

**BRIDGING GENDER DISPARITY IN ACADEMIC ATTAINMENT USING
ACTIVITY BASED INSTRUCTION AND DEMONSTRATION METHOD IN BASIC
SCIENCE AMONG PUPILS IN KATSINA STATE, NIGERIA**

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ABSTRACT: *This study assessed the impact of Activity based and demonstration teaching strategies in bridging gender disparity in basic science among pupils in Katsina state, Nigeria. The study used quasi experimental design. Three groups' namely experimental group I, experimental group II and control group were involved. The sample of this study covered a total number of one hundred and forty primary six pupils from three selected primary schools in Kankia. This study used Basic Science Performance Assessment Tool (BSPAT) containing 50 multiple test items, the instrument was validated and with reliability coefficient of 0.82. Data collected were analysed using mean, standard deviation, t-test and Analysis of Covariance at 0.05 level of significance. Result of findings shows that there is significant difference between the academic performance of pupils in experimental and control groups; there is no significant difference between the academic performance of boys and girls pupils in experimental group as revealed in their mean scores. It was recommended that since the use of activity based method and Demonstration Method is efficacious in enhancing performance of boys and girls, curriculum planners like Nigerian Educational Research and Development Council (NERDC) should incorporate activities that involve the two methods in curriculum of primary school sciences.*

KEYWORDS: Basic Science, Activity Based Method, Demonstration Method

INTRODUCTION

Basic science is an amalgamation of the four core science subjects (Biology, Physics, Chemistry and mathematics) taught at senior secondary school level (FRN, 2013). The basic aim of introducing Basic Science in the primary school curriculum is to enable pupils observe and explore their environment using their senses (FRN, 2013). However, other reasons include but not limited to helping the pupils to explain events in nature; enable the pupils to think and reason in a logical manner; help pupils to develop the physical skills of science through proper handling of materials and equipment; help pupils to satisfy their natural curiosity through opportunities in carrying out scientific investigation National Policy on Education, (revised 2004 and 2013).

The need for effective teaching and learning of basic science in primary schools in order to achieve needed technological advancement cannot be over emphasized (Usman 2010). However, participation in science in order to make inventions is the main concern of many nations. This motive results in huge Investment in science and technology worldwide. According to Okeke in Ugwuadu and Obi (2009) when science is transformed into technology it makes tremendous impact in the society. In science, researchers recommended the use of hands-on strategies like demonstration, project, simulation, and activity based teaching

methods. The concerned of this study is activity based teaching method and demonstration method.

Activity method is a technique adopted by a teacher to emphasize his or her method of teaching through activity in which the students participate rigorously and bring about efficient learning experiences (American Association for the Advancement of Science, AAAS, 1993). It is a child-centered approach in which the child is actively involved in participating mentally and physically. Learning by doing is the main focus on this method. According to Arends, (2007) learning by doing is imperative in successful learning since it is well proved that the more the senses are stimulated, the more a person learns and the longer he/she retains. Pine (1989), and Choudhury, (2002) pointed out that in an activity based teaching, learners willingly with enthusiasm internalize and implement concepts relevant to their needs.

This type of teaching learning method generates an ideal situation for basic science teaching especially at Elementary level. In activity-based teaching methods, learners are involved actively in hands-on minds on experiences and acquire an opportunity to relate intangible concepts and theories with actual observations. It helps learners to understand the science concepts and also help the students to be actively involved in activities that will help them in applying what they have learnt in various real life situation (Shah & Rahat, 2014).

Demonstration method according to White (2001), involves displaying of things or materials for the pupils observation. It is also manipulation of equipment and materials in order to strengthen pupils' power of observation of certain scientific phenomena. Most of the practical works in the laboratory and even outside the laboratory are done by demonstration. Therefore, this method is sort of exhibition lesson that shows the parts of an organism or models or correct usage of a science equipment. It is merely done to show the student the procedure and caution. According to Tytler (2003), Arends (2007), and Sharma (2010), Demonstration method serves the following advantages: Economy of time is ensured; It is used to introduce lesson and conclude lesson; It protects the health and life of the students; It can be used to evaluate previous lesson.

Academic performance is individual's inherent potentials in terms of intelligence combined with other sociological factors. Decco and Crawford (2001) submitted that academic performance is the process of measuring the pupils' auxiliary and terminal Performances during and at the end of instruction.

Gender as a variable in the present study has to do with sex of pupils. Halphen (2000), in his study found out that gender differences occur in specific sub-areas of spatial and verbal abilities, three dimensional mental rotation in favour of males while speech production favored females. Another research by Kuchii, (2012), showed a decline in the difference in performance in standardized test between gender in the past few decades suggesting that the more exposure that femals are getting to mathematics and science classes, the better their scores will be. Study by Ecctes, Lord Roeser, Barber, JozeFowez (1997) and Kachii (2012), found that gender differences on enrolment in advanced mathematics courses are in favor of males. It is against this background that this study were conducted to investigate the impacts of instructional materials on academic performance of boys and girls in basic science among pupils in Katsina state, Nigeria.

Statement of the Problem

Performance of pupils in basic science is not encouraging. This poor academic performance was attributed to so many factors including; inappropriate teaching strategy; parental influence i.e no encouragement towards learning science; lack of use of instructional materials by the science teachers and poor creative thought and habit on the side of the pupils. There is a need to utilize appropriate strategy that will promote students' performance in basic science. Thus, this study investigates the impact of activity based instruction and demonstration method on the academic performance of pupils in Basic Science in Katsina state.

Research Questions

This study sought to provide answers to the following research questions;

1. What is the difference between the mean academic performance scores of pupils taught basic science concepts using activity based method, Demonstration method and those taught the same concepts using lecture method?
2. What is the difference between the mean academic performance scores of Boys and Girls taught basic science concepts using activity based method and Demonstration method?

Research Hypotheses

H₀₁: There is no significant difference between the mean academic performance scores of pupils taught basic science concepts using activity based method, Demonstration method and those taught the same concepts using lecture method.

H₀₂: There is no significant difference between the mean academic performance scores of Boys and Girls taught basic science concepts using activity based method and Demonstration method.

METHODOLOGY

This study used quasi experimental design involving pre and post-test. In this study, three groups namely experimental group I (EG1), experimental group II (EG2) and control group were involved (CG). The three groups were pre-tested (O1) to ensure selection of respondents with similar academic performance. After which treatment and teaching period were observed for six weeks. Specifically, experimental group I were exposed to Activity based instruction (X1); experimental group II were exposed to demonstration method (X2) while control group were taught using lecture method (X0) which is the most predominant method often used by the teachers. Immediately after treatment and teaching period, the researcher tested students for the second time (Post-test, O2) to determine the pupils academic performance in the concepts taught using the same instrument in pre-test. This research design can be illustrated in figure 1:

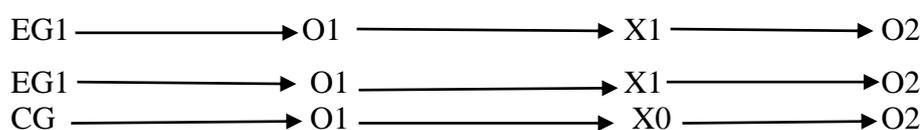


Figure 1: Research Design, Source: (Mamman, 2013)

The population of this study covered a total number of twenty three thousand seven hundred and eighty four primary six pupils (23784) in five Local Government Education Authorities that formed Kankia Education zone namely, Musawa, Kankia, Matazu, Kusada and Ingawa (SUBEB,2016). From this figure, 15218 are Boys and 8566 are Girls. Similarly, the Population covered pupils in both rural and urban locations. The sample of this study covered a total number of one hundred and forty primary six pupils from three selected primary schools in Kankia Education Zone. The justification for selecting 140 pupils is that the study is experimental research and Central limit theorem stated that were a researcher is conducting experimental research a minimum of 30 sample is viable and adequate enough to form a study sample. Similarly, Kerlinger (1971), Tuckman (1975) and Sambo (2008) supported the view that large sample size of at least 30 subjects is adequate enough to conduct experimental research. Therefore, in this study a total number of 140 pupils were used as sample in line with the above. In selecting sample size, systematic procedure was employed.

Table 1: Sample of the Study

SN	School	Boys	Girls	Total
1	Gyaza P.S	24	19	43
2	Hassan U.M.P.S	29	23	52
3	Kafinsoli P.S	27	18	45
	Total	80	60	140

The Basic Science Performance Test (BSPAT) was developed by the researcher and was validated by Subject Matter Expert (SME) in the Department of Science & Vocational Education, Usmanu Danfodio University, and Sokoto. After the experts validation, suggested was given for additional ten items to reflect Types of circulatory system and Composition of blood. Similarly, it was suggested that the options should be limited to four (A-D).

For the purpose of determining the reliability of BSPAT, Test-retest method with an interval of two weeks was conducted as reported in pilot testing. The results of the two tests were compared and correlated consequently, Reliability co-efficient of the instrument was determined using Pearson Product Moment Correlation Coefficient (PPMC) method. The reliability index of 0.8 was obtained.

Analysis of Covariance (ANCOVA) of pre and post test score of Boys and Girls in experimental group I and experimental group II was used in testing hypotheses.

RESULTS

H₀₁: There is no significant difference between the mean academic performance scores of pupils taught basic science concepts using activity based method, Demonstration method and those taught the same concepts using lecture method.

Table 2: ANCOVA of pre and post-test Performance score of experimental group I, experimental group II and control group.

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Squared	Eta
Corrected Model	5441.084 ^a	3	1813.695	75.072	.000	.623	
Intercept	90740.855	1	90740.855	3.756E3	.000	.965	
Pretest	41.874	1	41.874	1.733	.190	.013	
Group	5228.569	2	2614.285	108.210	.000	.614	
Error	3285.659	136	24.159				
Total	163572.000	140					
Corrected Total	8726.743	139					

a. R Squared = .623 (Adjusted R Squared = .615)

Table 2 presented the ANCOVA of significant difference in the performance scores of pupils taught basic science concepts using activity based method, Demonstration method and those taught the same concepts using lecture method. The f-value of 108.210 and p-value of 0.00 revealed significant difference among three methods with r squared value of 0.623 and adjusted r squared of 0.615. Therefore hypothesis one which stated that there is no significant difference between the mean academic performance scores of pupils taught basic science concepts using activity based method, Demonstration method and those taught the same concepts using lecture method is rejected. To determine the direction of disparity, the result was further subjected to post hock test and presented in Table 3

Table 3: Shaffer's' Post-hock test of Significant Differences among Groups

Pairwise Comparisons

Dependent Variable:posttest

(I) group	(J) group	Mean Difference (I-J)		Sig. ^a	95% Confidence Interval for Difference ^a	
			S E		Lower Bound	Upper Bound
activity based	demonstration method	-.661	1.013	1.000	-3.115	1.793
	lecture method	12.799*	1.044	.000	10.267	15.330
demonstration method	activity based	.661	1.013	1.000	-1.793	3.115
	lecture method	13.460*	1.012	.000	11.006	15.914
lecture method	activity based	-12.799*	1.044	.000	-15.330	-10.267
	demonstration method	-13.460*	1.012	.000	-15.914	-11.006

Based on estimated marginal means; a. Adjustment for multiple comparisons: Bonferroni; *. The mean difference is significant at the .05 level.

Table 3 presented the post-hock test of significant difference among activity based; demonstration and lecture method. Analysis indicated that significant difference exist in the performance of students exposed to activity and lecture method (P=0.1); Demonstration and lecture method (P=0.1); but not significant between activity and Demonstration methods (P=0.00).

Null Hypothesis 2: There is no significant difference between the mean academic performance scores of Boys and Girls taught basic science concepts using activity based method and Demonstration method.

Table 4: ANCOVA of pre and post test score of pupils Performance of Boys and Girls in experimental group I and II

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	214.046 ^a	4	53.511	1.717	.153	.071
Intercept	11993.030	1	11993.030	384.716	.000	.810
PRETESTEXP	2.091	1	2.091	.067	.796	.001
GENDEMETHODS	204.125	3	68.042	2.183	.096	.068
Error	2805.639	90	31.174			
Total	136801.000	95				
Corrected Total	3019.684	94				

a. R Squared = .071 (Adjusted R Squared = .030)

Table 4.10 presented the ANCOVA of significant difference in the performance scores of boys and girls taught basic science concepts using activity based method and Demonstration method. The f-value of 2.183 and p-value of .068 revealed no significant gender difference between pre and post-test using the two methods with r squared value of 0.71 and adjusted r squared of 0.30. Therefore hypothesis two which stated that there is no significant difference between the mean academic performance scores of boys and girls pupils taught basic science concepts using activity based method and Demonstration method is retained.

DISCUSSIONS

Hypothesis number one which stated that there is no significant difference between the mean academic performance scores of pupils taught basic science concepts using activity based method, Demonstration method and those taught the same concepts using lecture method is rejected. Analysis indicated that significant difference exist in the performance of students exposed to activity and lecture method (P=0.1); Demonstration and lecture method (P=0.1); but not significant between activity and Demonstration methods (P=0.00). The finding supported that of Awotunde & Chukwunyere, (2002), Lawal (2010), Mamman, (2013), Isah, (2000), Muhammed, (2010) and Shaibu, (2013).

Finding number two shows that that the mean and standard deviation of boys in experimental group I is 35.29 and 5.22, whereas girls in the same group have a mean of 39.68 and standard deviation of 6.61 with a mean difference of 4.39. This implies that boys and girls taught basic science concepts using Activity Based method in the group slightly differ with a mean difference of 4.39 in favour of Girls. However, in experimental group II, the case is different because a mean and standard deviation of boys is 37.86 and 5.25, whereas girls in the same group have a mean of 37.65 and standard deviation of 5.30 with a mean difference of 0.21. This implies that boys and girls taught basic science concepts using demonstration method in the group slightly differ with a mean difference of 0.21 in favour of Boys. In the final analysis, there is no significant difference between the mean academic performance scores of boys and girls pupils taught basic science concepts using activity based method and Demonstration method and the hypothesis is retained. This finding is supported by Saka, Sam and Yusuf (2002), Decco and Crawford (2001), Fujita (2006), Abdullahi (2009) who in their study revealed that the use of instructional materials, playing sports, watching television and participating in community service improve academic Performance of students.

Summary of the Major Findings

1. There is significant difference between the mean academic performance scores of pupils taught basic science concepts using activity based method, Demonstration method and those taught the same concepts using lecture method.
2. There is no significant difference between the mean academic performance scores of boys and girls pupils taught basic science concepts using activity based method and Demonstration method.

CONCLUSIONS

Pupils taught basic science concepts using Demonstration method performed better than those taught using activity based instruction and lecture method; Boys and girls taught basic science concepts using Activity Based method in the group slightly differ. Therefore, the use of activity-based method and demonstration method in teaching is effective in improving pupils' performance in basic science concept irrespective of gender.

RECOMMENDATIONS

On the bases of the findings of this research, the researcher recommends that:

1. Federal and State Ministries of Education should adequately trained primary school teachers on using activity-based method and demonstration methods in teaching basic science through periodic seminar, conference, workshop and in-service training.
2. There is a need for Katsina state Universal Basic Education Board and State Ministries of Education to make adequate provision of facilities to be used in activity-based method and demonstration methods.
3. Since the use of activity based method and Demonstration Method is efficacious in enhancing performance of boys and girls, curriculum planners like Nigerian

Educational Research and Development Council should incorporate activities that involves the two methods in curriculum of primary school sciences.

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