The Effect of Home Related Science Activities on Students' Performance in Basic Science

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Abstract

Our study investigated the effect of utilizing home related science activities on student's performance in some basic science concepts. The concepts considered were heart energy, ecology and mixtures. The sample consisted of two hundred and forty (240) basic junior secondary two (BJSS11) students drawn from a population of five thousand and seventy six (5,076) students in two Local Government Areas of Bayelsa State. A quasi-experimental with a pretest posttest control group design was adopted. The data was analyzed using means, standard deviations, t-test and analysis of variance (ANOVA). The results showed that home related science activities enhanced students' performance in basic science concepts better than utilizing only school science or classroom activities. It was also revealed that gender and the interaction between gender and approach were not significant. It was recommended among others that teachers while teaching science should domesticate their teaching of science by citing relevant examples from the home background of the students to enhance performance.

Keywords: Basic science, Home science, Scientific activities, Mission oriented, Bedrock, Domestication

1. Introduction

Science remains the bedrock upon which technological development is built. Its importance cannot be overemphasized as it permeates all 'nooks' and crannies of our daily lives. According to Jegede (1983), the development of science and technology have so greatly affected the lives of every human being that to be ignorant of this basic knowledge is to live an empty, meaningless and probably an unrealistic life'.

In another vain, Simpson and Anderson (1981:p5) painted a picture of how science affects our lives by saying that:

> *Science affects every aspect of our lives, what we eat and what we wear, what we do as work and what we do as play; what we think and what we feel, even how we are born and how we die, few moments in our lives are untouched by the products of and processes of science.*

While Brown and Sarentiz (1991) in Akpan (2008) emphasized that those nations at the forefront of modern development, are those that have invested enormous resources over a considerable time in three major areas as follows:

1) Establishment and nurturing of a very stable and well supported science and technology system.

2) Promotion of mission oriented research in basic sciences, backed with a long term strategy for technology development.

3) Building institutions where well articulated programmes are in place for the education of a large scientifically and technologically literate workforce.

It is in recognition of this indispensable role of science to national development that the Federal Government of Nigeria in its 1999 constitution stated in clear terms that, government shall promote 'science and technology' in all its ramification.

Among other measures taken by government to promote science and technology include: the establishment of special schools of science across the country and a body to promote science and mathematics in secondary schools. In addition to this, most science education researchers according to Ahiakwo (2006) are also working tirelessly in finding ways of making science students' learn various science disciplines meaningfully. Similarly Inyang and Mkpanang (2004) in their study of science education trend in Nigeria reported that between the years 1982 and 2001, the focus of Science Teachers Association of Nigeria (STAN) journal articles and conference proceedings had been in the areas of science teaching and learning methods. All these were added impetus to government's effort at promoting the development of science and technology.

The constructivist principle provides a frame of learning in which the learner constructs meaning based on previous experiences. It is according to Okebukola (2002), a philosophy of learning founded on the premise that, by reflecting on our experiences, we construct our own understanding of the world we live in. Learning therefore is simply a process of adjusting our mental models to accommodate new experiences.

Incidentally, there are various practices which are carried out in the homes where children live and many of which have some scientific and technological implications that will fast track the teaching and learning of school science and technology. Ahiakwo (2006) called them home sciences which are students' construct which come from their homes and environmental experiences. Therefore science should not be presented as an abstraction but be made concrete between what is experienced at home and what is learned in the schools.

Obviously in Nigeria, there are as a matter of fact, profound indicators that performance of our country's students echo a dismal message of lack luster performance in scientific, technological, engineering and mathematical (STEM) disciplines, underscoring therefore, a tremendous lack of understanding and appreciation about the importance of strengthening scientific, technological, engineering and mathematical (STEM) concepts and skills by our policy makers.

Apparently, students' poor performances in the sciences have been attributed to the teaching method adopted by teachers. Studies have shown that majority of science teachers use the traditional lecture method (Shaibu and Usman 2004, Usman, 2000, Ali 1997). The traditional lecture method according to Ali (1997) involves the teacher telling his students what he thinks they need to know and the students listening and copying what they think the teacher needs them to know. Similarly Oyedeji (2010) had lamented that Nigeria remains an underdeveloped economy principally because of the unsatisfactory status of her science education especially in the primary and junior secondary school. He further asserts that relevant statistical details on primary science show that there is crisis in the area of science teaching. For instance Oloruntegbe and Ikpe (2008) found out that the poor performance of students in chemistry was due to the inability of students to relate chemistry concepts learnt in school to daily home activities and the inability of teachers to cite relevant home examples and illustration while teaching. Hence a gap exists between science lessons in the school and home activities. And so the pressing need for high-quality teaching and learning demands a vigorous response that would emphasize domestication of science curriculum content to learners environment.

The purpose of this study therefore, is to explore and utilize scientific activities in Nigerian homes in teaching some basic science concepts.

2. Research Questions

2.1 The following research questions were posed.

1) To what extent do home science activities influence students' performances on the concepts of heat, ecology and mixtures?

2) What difference exists between boys and girls in their performances on the concepts, heat, ecology and mixtures when home related science activities are utilized?

2.2 Hypotheses

The following hypotheses were tested at 0.05 level of significance.

H_{O1}: There is no significant effect of home related science activities on students' performance on the concepts heat energy, ecology and mixtures compared with those taught with school science activities.

H_{O2}: There is no significant difference in the performance of boys and girls taught the concepts of heat energy, ecology and mixture utilizing home related science activities and school science activities.

3. Research Design

The study was a quasi-experimental research with a pretest, posttest control group design.

3.1 Population of the Study

The population of this study comprised all the five thousand seventy six (5,076) Junior Secondary School Two (JSS11) students in two Local Government Areas in Bayelsa State. The two Local Government Areas Ogbia and Yenegoa are geographically contiguous.

3.2 Sample and Sampling Technique

The sample consisted of two hundred and forty (240) Junior Secondary Two (JSS 11) students from four intact classes drawn from four schools from the two local government areas selected for the study. A criterion sampling technique was adopted in selecting the four secondary schools from among the forty six (46) JSS in the study area, based on the conditions that the schools must be coeducational and must have at least two streams of not less than thirty students each. For the local government area that has more than one representative school random sampling by balloting was used to select the school. In each school, there was an experimental as well as a control group made through random assignment.

3.3 Instrumentation

The instrument for data collection was a Home Science Performance Test (HSPT) developed by the researchers. HSPT comprised of forty five items on the concepts heat energy, mixtures and ecology. The instrument contains three sections; A B and C with each section having ten multiple choice items and five essay questions. Lesson packages on each of the concepts consisting of procedural steps for teaching were also developed by the researchers.

The face and content validity of the instruments was done by experts in measurement and evaluation and Basic science teachers. A reliability coefficient of 0.70 was obtained through split half method and calculation with Spearman rank order correlation coefficient.

3.4 Research Procedure

Home science performance test was administered to both experimental and control groups as pretest. The regular Basic Science teachers in the schools were used as research assistants. They were trained on the uses of the lesson packages for duration of two weeks.

The experimental groups were exposed to the use of home science related activities while teaching the concepts. This was done through citing relevant examples from home and use of analogies relating home related science concepts to school science. The control group was also exposed to the same content. The teaching in this group involve the use of school science activities without the application of home related science activities that have direct bearing on the environment of the respondents. The teaching lasted for four weeks at which HSPT was reshuffled and administered as posttest to both groups.

3.5 Data Analysis

The research questions were analyzed using means and standard deviations while the hypotheses were tested at .05 level of significance using t-test and analysis of variance (ANOVA).

4. Results

The results of the data analysis are presented on Tables 1- 4

<Tables 1-4 about here>

Research Question: To what extent do home science activities influence students' performances on the concepts of heat, ecology and mixtures?

The result from Table 1shows that after treatments, there was improvement in performances for both the control and experimental groups. However, the experimental group had a higher mean of 58.37 and a gain score of 33.45 than the control group with a mean of 43.30 and gain score of 20.88 respectively.

Research question 2: What difference exists between boys and girls in their performances on the concepts of heat, ecology and mixtures when home related science activities are utilized?

Table 2 shows that girls in the experimental group had slightly higher mean scores than the boys. However the mean difference was very small, being (0.64). For the control group, the difference was the case as boys had higher mean scores than the girls with a mean score difference of 1.16 in their favour.

H_{O1}: There is no significant effect of home related science activities on students' performances on the concepts of heat, energy, mixtures and ecology compared with those taught with school science activities.

Result from the table shows that the experimental group performed better than the control group as reflected in their mean scores with the experimental group having a mean score of 58.37 and the control group 43.30 respectively. The t-test value obtained 22.831 was found to be significant. Therefore the H_{O1} was rejected.

H_{O2}: There is no significant difference in the performance of boys and girls taught the concepts of heat energy; ecology and mixtures utilizing home related science activities and school science activities.

Result from Table 4 revealed that the performance of boys and girls did not differ significantly perform as the value of .088 was not significant. Therefore the null hypothesis was upheld. The interaction between group and concept was also not significant.

5. Discussion of Findings

Evidence from the findings of this study shows that teaching Basic Science through the use of home science related activities; a process referred to as "domestication" of science curriculum content enhanced students' performance better than teaching classroom science activities with no reference to students' local/domestic experiential background. It therefore supports Olomintegbe and Ikpe (2008) earlier findings that home activities can provide a veritable source of meaningful learning and teaching of science. It also laid credence to Ukwungu (2002) stance that western science is alien in nature, but the incorporation of ideas, objects and materials within the child's immediate environment into its instructional process and the use of such ideas in the clarification of scientific process will invariably boost interest in science. And accordingly, contradicts Adegbite, (1953), Levy-Bruhl and Clare, (1992) in Abonyi (2002) views that indigenous knowledge is primitive and therefore generates more conflict in learners when they are incorporated into science instruction.

The findings also revealed that the effect of gender on students' performance was not significant. Meaning that gender as a single factor did not produce large variation in the performances of students in agreement with Abonyi (2002, Ukwungu, 2002, Akinsola, 2002) findings. However, as indicated in Table 2 the girls had a slight higher performance than the boys in the experimental group, while the boys had a higher mean score than the girls in the control group in line with Spindler (1983) cited by Abonyi (2002) that females will benefit more from instruction that incorporates culture and totality of the environment.

Table 3 shows that there was no (13) significant interaction between gender and teaching approach on students' performances on the concepts. This gives an indication that teaching basic science concepts using home related science activities is superior to teaching through science classroom activities at the two levels of gender in enhancing students' performances. This also supports Abonyi (2002) findings. If home science related activities are utilized in science teaching both boys and girls will compete favourably.

6. Conclusion and Recommendation

Teaching basic science concepts using home related science activities improves performance for both boys and girls.

The findings of this study have far reaching implication for various stake holders in the education industry. It is therefore recommended that:

1) Parents should encourage their children to engage in domestic chores.

2) Teachers should teach science citing relevant examples from home experiences.

3) Indigenous authors should include in their texts, examples tailored to the home background of students.

4) Curriculum planners should select learning experiences directly from the home context of the learners in line with the principles of content domestication.

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Table 1. Pretest and posttest mean and standard deviation scores of experimental and control groups on the concepts.

Group	Test	N	Mean	SD	Gain score
Experimental	Pretest	120	24.92	13.300	33.45
	Posttest	120	58.37	11.946	
Control	Pretest	120	22.42	10.432	20.88
	Posttest	120	43.30	9.275	
Total		240			

Table 2. Comparison of the posttest mean scores of boys and girls on the concepts for the control and experimental groups.

Group	Gender	N	Mean	SD
Experimental	Boys	60	58.02	11.527
	Girls	60	58.71	12.374
	Total	120	58.37	11.946
Control	Boys	60	43.88	8.450
	Girls	60	42.72	10.022
	Total	120	43.30	9.275
Total	Male	120	50.95	12.328
	Female	120	50.72	13.803
	Total	240	50.83	13.078

Table 3. t-test comparison of achievement scores of students according to treatments

Group	N	Mean	SD	df	t	Sig.
Experimental	120	58.37	11.946	248	22.831	.000 *
Control	120	43.30	9.275			

Sig. at 0.05: - Significant; * = significant

Table 4. A-2 way analysis of variance on the effect of gender on achievement scores by treatments.

Source	Sum of squares	df	Mean square	F-ratio	Sig
Corrected model	41009.782	3	13669.927	119.427	.000
Intercept	1860601.668	1	1860601.668	16255.041	.000
Group	40845.735	1	40845.735	356.846	.000 *
Gender	10.035	1	10.035	.088	.767 ns
Group & Gender	154.013	1	154.013	1.346	.246 ns
Error	81955.550	716	114.463		
Total	1983567.000	720			
Corrected Total	1222965.332	719			

Significant at 0.05; NS-Not significant; * - Significant