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The Effect of Linking Chemistry Consepts To-Day-To-Day Activities on Students' Achievement and Retention in Chemistry.

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Abstract: *The purpose of this study was to determine the effect of linking Chemistry concepts to-day-to-day activities on students' achievement and retention in chemistry. A total number of 164 Senior Secondary one (SS1) students which were randomly sampled from twenty governments owned secondary schools in Anambra State in Nigeria were involved in the study. The design adopted was quasi-experimental non-randomized control group. Selected topics in organic, inorganic and physical Chemistry (SS1) Syllabus were taught to all the students during normal classes. Additional treatment of exposure to linking chemistry concepts to-day-to-day activities were given to experimental groups who were made up to two male schools and two female schools. ANCOVA statistical tool was used to test the two null hypotheses at the probability level of 0.05. Results were analyzed and it was discovered that the experimental groups performed significantly better than the control group. Discussion and recommendation were made based on the findings.*

I. Introduction

Chemistry deals with the composition, properties and uses of matter. It probes into the principles governing the changes that matter undergoes (Ababio, 2004). This makes it very difficult or practically impossible to draw a demarcation between Chemistry and all occurring processes in nature, including all our day-to-day activities. In this view, Majekodumi (2007) holds that for chemistry to deliver or play an enduring role in natural development and growth, our knowledge and understanding of the subject must be built on a solid foundation and it must change from academic to the applied. An interesting thing about Chemistry is that it is human activity. Chemistry is contextually versed with concepts that have bearing with a lot of learners' day-to-day activities.

Consequently, there is little linkage between chemistry concepts taught and the learner's everyday activities. This is why Ausubel in Agbowuro (2008) proved that meaningful learning results when a learner consciously and explicitly relates new knowledge to relevant concepts or propositions which he already possesses.

Chemistry being one of the most important branches of science enables learners to understand what happens around them. Hence, Falnmy (2000) states that the most interesting aspect of chemistry is that which applies to our daily lives. Thus, functional chemistry can hardly be achieved in an atmosphere devoid of learner's everyday activities. Therefore, it becomes imperative that chemistry concepts must be suffix in a way of relating them to the learner's immediate environment and everyday life. Generally, researches have shows that there are a lot of chemistry concepts or topics which students found difficult [Udogu , 2009;Igdoegwu ,2010].

These difficulties arise from several sources, as revealed by work of scholars .One of the sources is that claimed by Taber [2002] as the abstract nature of chemistry concept. The list difficult concept ranges from organic through physical to inorganic chemistry .Udogu [2009] also noted that efforts has been made by many researchers to final ways of tackling these difficult concepts but there is one that has not attracted more attention .This is the ability of students to relate chemistry concepts and experiences already known to what their learn in the chemistry classes. This occurs because chemistry teachers have not been able to relate the local home chemistry experience in their chemistry institution [Olorutegbe and Ikpe ,2008] .This is why to some students, chemistry is simply a science subject involving chemical reactions which are only carried out in the laboratory by trained chemistry teachers or Scientifics called chemist. Students have not been exposed to first hand home activities and experiences through which they can acquire science concepts associated with such home activities. Olorundare[2006] in line with the above statement opined that the teacher having known these should teach the chemistry concept by linking it to the environment giving many examples from the environment . In this way the teacher is sure of his students active participation in the lesson, meaningfulness of the concept presented to the student. Hence productivity or usefulness of the concept to the student in solving their day - to – day related problem is ensured as chemistry becomes real and interesting to study.

Some of these chemistry concepts that can be linked to student day – to – day activities are;

- Application of cleansing properties in organic acids and base.

- Application of removing water from the mixture of salt and water, removing oil from a mixture of oil and so on using a separation technique.
- Application of freezing of water , boiling , melting and other processes as a change in states of matter
- Application of burning of fire wood and melting of candle wax as a chemical changes and physical changes
- Application of turning brown of food like egg , bread fruit ,avocado pear during preparation as oxidation processes
- Application of caustic potash in the wood ash used for the local black soap making as specification process
- Applications of food decay a fermentation process.
- Application of cassava , pineapple turning into alcoholic drinks when left for some days as fermentation process

This list is never exhaustible because almost every thing we do at home has a bearing in chemistry.

II. Problem Of The Study

The major problem prompting this study is the poor performance of students in skills and cognitive achievement and performance in chemistry and the dwindling environment of students in science and science related careers. Research has shown that the young ones are turning away from sciences and chemistry is not left out. This is attributed to the fact that students have lost interest in sciences because they no longer see science as a real life experience, hence, poor performance.

Therefore, the researchers tried to find out if linking of chemistry concepts to-day-to-day activities could influence students' achievement and retention in chemistry.

Purpose of the Study.

The study was designed to investigate:

1. Experimentally, the efficacy of linking Chemistry concepts to-day-to-day activities in the Chemistry instruction in promoting and enhancement of students' Cognitive achievement when compared with Conventional method.
2. The extent to which linking chemistry concepts to-day-to-day activities could help in the enhancement and retention of knowledge gained.
3. Effect of gender on achievement and retention

Hypotheses: The following hypotheses were stated to guide the studies.

i. There is no significant difference in the mean achievement scores of the students' taught experimentally, that is, by linking the chemistry concepts with their day-to-day activities and those taught conventionally, that is, without linking the chemistry concepts to their day-to-day activities.
ii. There is no significant difference in the mean scores on knowledge retention test of student taught chemistry by using conventional method and those taught by linking Chemistry concepts to their day-to-day activities.

Research Method.

Design.

The research adopts quasi-experimental non-randomized pretest/post test, experimental and control group. Two classes of 81 and 83 students respectively were used for instruction as experimental and control groups.

Population

The study involved all the government owned Senior Secondary School Chemistry students of Anambra State in Nigeria.

Sample and Sampling Technique

164 Chemistry students from four randomly selected secondary schools in the study area formed the study sample. The four schools comprises of two male school and two female schools. Also simple random sampling was done to classify these four selected schools into experimental group and control group.

Table 1: Distribution of Subjects by Gender and Treatment.

Gender	Experiment Group	Control Group	Total
Male	E_1 = 43	C_1= 39	82
Female	E_2 = 38	C_2 =44	82
Total	81	83	164

Instrumentation.

The instruments used for data collection in this study were achievement test in chemistry (CAT) which consisted of 25 multiple choice items and knowledge retention test (KRT) which consisted of 10 questions. The Chemistry achievement test was divided into three sections which comprises of organic, physical and inorganic Chemistry. The CAT Consisted of 25 multiple choices item based on the three sections and were prepared as test I and II. The test I was designed as a pre-test. Test I1 served as an immediate post-test (achievement) measure. Test III was knowledge retention test (KRT), which was used to monitor knowledge retention after four weeks of teaching.

Validation of Instrument:

The Chemistry Achievement Test (CAT) and Knowledge Retention Test (KRT) were content validated by experts and colleagues in the field.

Reliability of the instrument

The pilot study test scores were used to characterize the instrument. Using split-half odd-even plot reliability technique and Pearson Product moment correlation formula, it reliability coefficient was fixed at 0.94 and 0.72 for (KRT)

Pre-test Session

Before the treatment commences, both the experimental and control groups were pre-tested to ascertain the equivalency of the group.

Treatment Session.

Each group was exposed to our three topics in physical, inorganic and organic Chemistry with duration of one week for each topic.

Experimental group.

This group received additional exposure to linking those chemistry concepts to their day-to-day activities as enumerated before or after the normal lessons.

Control Group.

This group received normal classroom lesson only from the teacher who used applicable method.

Administration of Test:

Finally all the groups were given the post-test to measure achievement. After four weeks, test III was administered to both groups to monitor knowledge retention.

Data Analysis.

The scores obtained from Post-test were processed and analyzed using ANCOVA with pre-test scores as a co-variant at a significant level of 0.05.

III. Presentation of Results.

Table 2: The means and standard deviation for Pre-test, Post-test and test after four weeks. N = 164

Types of Test	Experiment Gp male E_1	Experiment Gp Female E_2	Control Gp Male C_1	Control Gp Female C_2
Mean Pre-test	10.18	11.44	12.92	13.27
S.D				
Mean Post-test	3.14	3.25	2.36	3.26
S.D	27.38	27.79	18.59	10.36
Mean Post Ret				
after for weeks	5.23	5.27	4.31	3.22
S.D	13.87	15.01	4.12	7.37
	3.72	3.82	2.03	2.74

Table 2 above serves as descriptive information relevant for testing of hypothesis. The values obtained showed that the experimental groups performed better than the control groups but still have to be tested to ascertain the significance of the difference observed.

Hypothesis 1:

Comparison of the mean achievement scores of the respective groups with effect to gender.

Table 3: A summary of analysis to covariance examining effect of linkage on achievement using Pre-test and Post-test score as a co-variant.

Source	Dependent variable	Type III sum of squares	alf	Mean source	F	Sig
PRE-CAT	Post-CAT	10259.57	1	1465.652	6.747	.000
INTERCEPT	Post-Test (Achievement)	10316.30	1	10316.30	47.488	.000
PRE ACHIEVEMENT (COVERATE)	Post-Test (Achievement)	3076.282	1	3076.282	14.161	.000
METHOD	Post-Test (Achievement)	6184.753	2	3092.376	14.235	.000
GENDER	Post-Test (Achievement)	486.406	1	486.406	2.239	.136
METHOD & GENDER	Post-Test (Achievement)	367.259	2	183.630	.845	.431
ERROR	Post-Test (Achievement)	51703.14	160	217.240		
Total	Post-Test (Achievement)	592575.0	164			
Corrected Total	Post-Test (Achievement)	61962.70	163			

From the table above, a significant effect was observed for teaching method with respect to Post achievement F (2,160) = 14.24 < 0.000. Therefore the null hypothesis was rejected. This means that a significant ($P \leq 0.000$) difference exists between the experiment group and the control group. This shows that linking chemistry concepts with day-to-day activities was effective.

Hypothesis II: Comparison of the mean scores on knowledge retention test of respective groups with effect to gender.

Table 4: A summary of analysis of covariance of the Post-RET. Scores of (E and C) on knowledge retention.

Source	Dependent variable	Type III sum of squares	alf	Mean source	F	Sig
PRE-RETENTION	Post-RET	17397.20	1	2485.314	12.295	.000
INTERCEPT	Post-Test (RETENTION)	36668.89	1	36668.89	181.40	.000
METHOD	Post –Test (RETENTION)	12119.32	2	6059.658	29.977	.000
GENDER	Post – Test (RETENTION)	15.528	1	15.528	.077	.782
METHOD & GENDER	Post – Test (RETENTION)	390.731	2	195.365	.966	.382
Error	Post –Test (RETENTION)	48110.28	160	202.144		
Total	Post – Test (RETENTION)	1334587	164			
Corrected	Post – Test					
Total	Post-Test (RETENTION)	65507.48	163			

The table above revealed a significant main effect for teaching methods with respect to post knowledge retention F (1,160) = 9.98, $P \leq 0.000$. Therefore, the null hypothesis was rejected. This means that a significant ($P \leq .000$) difference exists between the experimental groups and control groups. This shows that linking chemistry concepts with students' day-to-day activities was effective.

IV. Discussion

The analysis of results shows that experimental groups performed significantly better than the control groups as indicated by the values in the above shown tables. Hence better performance of the experimental groups was enhanced adequately as a result of students' linking to their day-to-day activities during formal chemistry classes. This exposure has helped to bridge the gap between the abstract and theoretical concept and real life experiences. Thus, they now begin to relate their chemistry knowledge to their daily activities. And this helps to make learning concrete and meaningful. This is in line with what Yager (1990) revealed that when students are groomed under exposure to life realities of chemistry (Science), they become more curious and extend their hearing beyond the class periods and see science and technology as a way of dealing with problems

and not just an information to them. The findings also agreed with what Uduak and Inyang (2008) discovered in their studies that students learn more through direct experiences on concrete objects rather than mere verbal instruction.

V. Conclusion and Recommendation.

It can be concluded that with this approach, the wheels of change in Science education has been set in motion as learner will now understand the relevance of scientific discoveries rather than just concentrating on hearing the one scientific concepts and facts that seems distant from their realities.

In recommendation therefore,

- The existing science teachers should be encourage to employ it more in teaching of the subject.
- Science teachers should always from time to time organize exhibition, seminars, workshops, conferences and competitions on science experiences to acquaint themselves through training.
- Government on their own part should assist Science teachers in adopting this approach though provision of enough funds.

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