



Effect of Ethnochemistry-Based Instructional Package on Students' Retention in Chemistry

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Abstract

The study, effect of Ethnochemistry-based instructional package on students' Retention in chemistry was investigated in Enugu State. The study adopted quasi experimental research design. A population of 3,909 senior secondary one chemistry students (SSI) from twenty-one co-educational schools. *96Four co-educational schools with a sample size of 208 students were selected by simple random sampling technique by balloting from Enugu Education zone of Enugu State. Out of four schools drawn, two were assigned to the treatment group while the remaining two schools were assigned to the control group. The treatment group were taught chemistry using ethnochemistry-based approach while the control group was taught chemistry using a conventional method. The same topics were taught to both the treatment and control groups. Four regular chemistry teachers from the four schools were used as research assistants. Before the onset of the experiment, topics in both treatment and control groups were given pre-tests. After the pre-test the regular chemistry started the experiments in their respective schools, adhering strictly to the lesson plan that was developed from the packages during the training conference. The experiment was conducted during the normal school period, following the timetable of the school. At the end of the experiment, that lasted for six weeks the teachers administered the post-tests to the subject to the two groups. The instrument for data collection was chemistry retention test (CRT), which was a reshuffled chemistry Achievement test (CAT), with reliability index of 0.70 using Kuder-Richardson (K-R20) approach. Two research questions and two null hypotheses guided the study. The research questions were answered using mean and standard deviation, while the hypotheses were tested at 0.05 level of significance using analysis of covariance (ANCOVA). The study revealed that students taught chemistry using ethnochemistry-based instruction had higher mean retention scores than those taught with a conventional method. The study further revealed that there is no interaction between methods and gender on students' mean retention scores in chemistry. It was recommended that science teachers Association of Nigeria (STAN) should encourage chemistry teachers on the use of the ethnochemistry strategy by producing textbooks on ethnochemistry-based instruction.

Keywords: Ethnochemistry, Retention, in Chemistry, Chemistry Students

Introduction

In Nigeria, science has become an important factor for national development and the skills of science Education is to train scientists with development. Science is made up of three main branches namely: Biology, chemistry and physics. Achimugu (2013) defined chemistry as a branch of science which deals with the study of matter, interaction between matter and the study of the interactions. The human environment is filled with matter, types and chemical composition of matter, the changes that matter undergo at different conditions and uses of matter in everyday life.

Chemistry as a branch of science is very essential and relevant in the economic and technological development of a nation. Achimugu (2016) pointed out that chemistry is concerned with identifying common materials around us that can be turned into more useful products and hence plays an important role in influencing the rate of economic and technological development. The knowledge of chemistry has aided in the establishment of chemical industries, improving agricultural processes and food safety (Odume, 2014). Nigeria is a developing nation require effective

chemistry education to train scientists that can help in the economic development but in Enugu Education zone, the end product is poor due to low retention in the knowledge of chemistry.

Retention simply means the ability to retain and remember things learned at a given time. Peni (2011) stressed that understanding and retention are products of meaningful learning, when teaching is effective to the students. This implies that students can understand and retain when teaching is effective. It goes further to explain that the teaching of chemistry is not effective when students cannot understand and retain as well. Studies have shown that poor retention in chemistry has delayed the realization of technological development. The introduction of chemistry using Eurocentric or foreign nature has led to students' inability to retain what is learnt in classroom. (Ajayi, Achor and Agogo, 2017). In this sense when the subject chemistry is being taught in a foreign cultural background, the subject appears to be difficult and abstract since it is not from their natural indigenous environment making it more retention and understanding low. Some authors described this method (conventional) as the teacher centered method of teaching.

In addition lecture method (conventional package) is used by teacher to cover the syllabus while students lack in-depth knowledge and understanding due to thereby making retention low. Ajayi et-al, (2017), stated that there have been ongoing endeavours to explore and implement several possible interventions to improve students' retention, and one of such interventions is to teach the students from what they know.

This brings about relating what the students already know from their cultural background to chemistry concepts, which is ethnochemistry, so as to improve retention. Ethnochemistry, according to Marasinghe (2016), is the study of chemistry practices of specific cultural groups in the course of dealing with their environmental problems and activities using their own ideologies. In addition, ethnochemistry teaching strategy is one adopted by the chemistry teacher as one of the best for teaching chemistry through the use of learners' culture which makes them to explain and manage situations and activities arising in their environment, (Ajayi et-al. 2017). The ethnochemistry strategy means making planning chemistry instruction based on diverse cultural origin and ideologies. In this case the teacher is expected to find out the cultural experiences and activities of the learners based on the

chemistry concepts to teach and he will relate them to their environmental usefulness.

This will drive the concepts home, thereby improving retention of students in chemistry, because retention is not acquired by mere rote-memorization but by appropriate teaching method. In this case, the researcher found it necessary to find out if ethnochemistry package would improve retention in chemistry. Specifically this study sought to;

1. Find out the effect of ethnochemistry based instructional package on the mean retention scores of students in chemistry
2. Ascertain the interaction effect of methods and gender on students' mean retention scores in chemistry.

Research Questions

The following research questions were posed for the study

1. What is the effect of ethnochemistry-based instructional package on the mean retention scores of students in chemistry?
2. What is the interaction effect of method and gender on students' mean retention scores in chemistry?

Hypotheses

The following null hypotheses were tested at 0.05 level of significance.

- Ho₁:** There is no significant difference in the mean retention scores of students taught chemistry using ethnochemistry-based instruction and those taught chemistry using the conventional method.
- Ho₂:** The interaction effect of method and gender on students' mean retention scores in chemistry is not statistically significant.

Research Design and Procedure

The study used a pre-test, post-test non-equivalent quasi-experimental design. This was considered appropriate because intact classes were used. The area of study was Enugu Education zone of Enugu State.

The population of study comprised 3,909 SS1 Chemistry Students in 21 co-educational secondary schools. The sample consisted of 208 students randomly drawn from four co-educational schools. Out of the four schools, two were assigned to control groups while the other two were assigned to the treatment group. The treatment group was taught Chemistry using an ethnochemistry-based approach in line with the

lesson plan prepared by the researcher, while control group were taught using the traditional method. Four regular chemistry teachers from the 4 schools were used as research assistants, who were trained by researcher for one week before commencement. The instrument for data was a reshuffled chemistry achievement test called Chemistry Retention Test (CRT), which was validated. The content validity of the instrument (CRT) was ascertained using a test blueprint. The internal consistency of the instrument was determined using K-R20 approach, with an internal consistency index of 0.70. The instrument was used for both pretest and

posttest. After the pre-test, the chemistry teacher started the experiment during normal school period according to school timetable. At the end of the experiment that lasted for 6weeks, the teachers administered the post-test in the two groups. Data collected from pretest and post-test were kept separately for the two groups and were used to answer the research questions and test the hypothesis. The research questions were answered using mean and standard deviation while the hypothesis were tested at 0.05 level of significance using analysis of covariance.

Results

Research Question 1: What is the effect of ethnochemistry-based instructional package on the mean retention scores of students in chemistry.?

Table 1: Mean and standard deviation of retention scores of students taught chemistry using thnochemistry-based instructional package and those taught using the conventional method.

Methods	N	Mean	SD
Ethnochemistry-Based	108	28.689	2.4398
Conventional Method	100	12.880	1.8925

Table 1 revealed that students taught using ethnochemistry-based had mean retention score of 28.64 while those taught using conventional method had a mean retention score of 12.88. This implies that

students exposed to ethnochemistry-based had higher retention scores than those exposed to conventional method.

Research Question 2:

What is the interaction effect of methods and gender on students' mean retention scores in chemistry?

Table 2: Interaction effect of methods and gender on students' mean retention scores in chemistry

Methods	N	Mean	SD
Ethnochemistry-Based	108	28.93	28.46
Conventional Method	100	13.39	12.59

Table 2 showed that ethnochemistry-based instructional package yielded higher mean retention scores at the two levels of gender. This implies that there is no interaction

between methods and gender on students mean retention scores in chemistry.

Hypotheses

Hypothesis One: There is no significant difference between mean retention scores of students taught chemistry using ethnochemistry based instruction and those taught using conventional method.

Table 3: Analysis of co-variance for students overall chemistry retention scores by teaching strategies and interaction.

Source of variation	Sum of Squares	df	Mean Square	F	Sig. of F
Co-variates	12889.926	1	12889.926	4988.803	.000
Post test	12889.926	1	12889.926	4988.803	.000
Main effects	468.232	2	234.116	90.610	.000
Methods	467.792	1	467.792	181.050	.000
Gender	2.820	1	2.820	1.091	.297
2-way interactions	3.525	1	3.525	1.364	.244
Methods gender	3.525	1	3.525	1.364	.244
Explained	13361.682	4	3330.420	1292.847	.000
Residual	524.506	203	2.584		
Total	13886.188	207	67.083		

ANCOVA result on table 3 revealed that the alpha level (0.05) is greater than the significance of $f(0.000)$, $P < 0.05$. Thus null hypothesis was rejected. This implies that, there is significant difference between mean retention scores of students' taught using ethnochemistry and those taught using conventional method.

Hypothesis Two: The interaction effect of methods and gender on students mean retention scores in chemistry will not be statistically significant.

For test of interaction result on Table 3 showed that the alpha level (0.05) is less than F significance of $F(0.244)$, $P > 0.05$. The null hypothesis was upheld and concludes that the interaction effect of methods and gender on students' mean retention scores in chemistry is not statistically significant.

Discussion

The findings of the study showed that the students taught chemistry using ethnochemistry based instruction had higher retention scores than those taught with conventional method. Further analysis showed that there is significant difference in the mean retention scores of students taught chemistry using ethnochemistry based instruction and those taught with conventional method. This finding is in agreement with that of Peni (2011) who found that the use of ethnoscience enriched instruction enhanced students' retention of basic science concepts than the use of conventional method. This is because the ethnoscience enriched instruction involved the practices and activities very familiar to the students which were

carried out often, thus providing them with long lasting experience.

The findings of the study showed that there is no interaction between methods and gender on students mean retention scores in Chemistry. Further analysis revealed that the interaction effect of methods and gender on students mean retention scores in chemistry is: not statistically significant. This implied that the mean retention scores of students in either experiment or control group did not depend on gender, rather on the appropriate method.

The essence of learning is to bring about long lasting experience, since if a student learns and forgets easily such learning is not worthwhile. A student can learn and retain the knowledge when the method involved in the process is accompanied with activities and practices connected to their cultural background, hence the use of ethnochemistry based instructional package.

Conclusion

Ethnochemistry based instructional package was found to be more significantly effective in generating retentive memory of long lasting experiences as a result of connecting chemistry concepts to indigenous knowledge and practices in the students environment. Based on the findings it is recommended among others that Science Teachers Association of Nigeria (STAN) should encourage teachers on the adoption of ethnochemistry based instruction through production of comprehensive textbooks on ethnochemistry.



References

- Achimugu .L. (2013) Instructional modes of teaching and learning chemistry in senior secondary schools under MDGs, Needs and Educations Reform Agenda. Science Teachers Association of Nigeria (STAN) 54th Annual Conference proceedings. 2248-249.
- Achimugu,L. (2016) Implementation of senior secondary education chemistry curriculum in Kogi State, Nigeria. *International journal of scientific and research publications*. <https://www.semanticscholar.org>.
- Ajayi, O. A., Achor E. E. and Agogo, P. O. (2017). Use of Ethnochemistry Teaching Approach and Achievement and Retention of Senior Secondary Students in Standard Mixture Separation Techniques. *ICSHER Journal*,3(1) 21 – 23
- Hornby, A.S. (2006). *Oxford Advanced Learners Dictionary*. 7th Edition Oxford University Press.
- Mohammad. S. A (2011). *Effects of Inquiry Teaching Method on Academic Performance, Retention and Attitudes towards Chemistry among Diploma Students of Kano State Polytechnic*. (Unpublished M.Ed Project), Department of Education. Ahmadu Bello University Zaria, Nigeria.
- Odume .C.O. (2014). Readability of recommended senior secondary school chemistry textbooks in Enugu State. Unpublished M.Ed Thesis, University of Nigeria, Nsukka.
- Ogenyi. D. S. (2015). Impact of process Approach on Questioning preference, Academic Performance and Retention Span Among Chemistry Students in Zaria Metropolis, Nigeria. Unpublished Ph.D thesis. Department of Science Education, Ahmadu Bello University, Zaria.
- Omwirhiren and Lawal (2016). Investigation into Effects of Laboratory, Guided-Inquired Discovery (Inquiry) and Lecture-Demonstration Teaching Methods on Senior Secondary Students Achievement in Acid-Base Titration Practical Test in selected Secondary Schools in Giwa L.G.A of Kaduna State Nigeria *Journal of Research and Methods in Education* 6(3) 20-26.
- Peni, H. Y (2011). Impact of Ethnoscience – Enriched Instruction on Attitude and retention in Basic Science Among Rural and Urban Students in Kano State. Nig. Unpublished Ph.D Thesis, Ahmadubello University Zaria.
- Ugwu, A.N (2014) creating change through interaction of indigenous knowledge and practices into chemistry for sustainable living. Chemistry education, science education department, University of Uyo, Akwa- Ibom State, Nigeria.