

## **AFRREV STECH**

*An International Journal of Science and Technology*

Bahir Dar, Ethiopia

Vol. 3 (2), S/No 7, May, 2014: 159-171

ISSN 2225-8612 (Print)

ISSN 2227-5444 (Online)

<http://dx.doi.org/10.4314/stech.v3i2.10>

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### **RELATIVE EFFECTIVENESS OF CONTEXT-BASED TEACHING STRATEGY ON SENIOR SECONDARY STUDENTS' ACHIEVEMENT IN INORGANIC CHEMISTRY IN RIVERS STATE**

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#### **Abstract**

*This study adopted the quasi experimental research design to examine the relative effectiveness of context-based teaching strategy on senior secondary school students' achievements in inorganic chemistry. The sample consists of 451 SSII chemistry students (224 males and 227*

females) drawn from four out of 46 secondary schools in Port Harcourt Zone in Rivers State of Nigeria. Three research questions were answered and three null hypotheses were formulated and tested at the 0.05 level of significance. Stratified random sampling techniques were used in selection and classification of the sample into the experiment and control groups. Inorganic Chemistry Achievement Test (ICAT) was employed in data collection. The instrument was validated and its reliability coefficient was 0.56. The ICAT instrument was administered on both the pre-test and post-test. The data obtained from the administration of the instrument was analyzed using mean, standard deviation and analyses of covariance (ANCOVA). The study found out that context-based teaching strategy was significantly better than the expository method in enhancing students' transfer of learning in inorganic chemistry. The result also showed that there was no significant difference in the mean achievement scores of male and female students taught inorganic chemistry using the same method. In the same vein, the rural students performed significantly better than their urban counterparts taught using the context-based teaching strategy. Based on the findings, recommendations were made among which were that context-based teaching strategy be adopted in teaching and learning of inorganic chemistry in the secondary and tertiary levels of the educational systems.

**Keywords:** Context-based, teaching strategy, students, achievement, inorganic chemistry

### Introduction

Chemistry is one of the basic science and the knowledge and skills acquired in chemistry contribute immensely to the development of any society. Chemistry has continued to play an increasingly important role in the lives of all mankind. All branches of science have important contributions to make in Nigeria's technological advancement; one of such subject is chemistry. The importance of chemistry in our everyday life cannot be overemphasized. For

instance, the knowledge acquired in chemistry provides theoretical bases for the synthesis of drugs which are used in medicine, manufacture of paints, cosmetic, textiles, shoes, plastics, soaps, and detergents. Aniodoh, (2001) observed that the importance of chemistry can be felt in almost all sphere of our national life.

In spite of the great importance of chemistry in our national development and the efforts being made by government researchers, Science Teachers Association of Nigeria (STAN) and other agencies, student's achievement has been poor and unsatisfactory year after year. The observed students' poor achievement seems to be more critical in inorganic chemistry. Ogbonna (1999) and Eze (2002) have independently shown that kinetic theory, radioactivity, and thermodynamics, all of which are aspects of inorganic chemistry are difficult for students to learn. Furthermore, Sozbilir (2004) confirmed that many teachers of inorganic chemistry believe that their students find this sub- discipline of chemistry to be difficult to learn.

One of the reasons adduced for student's conceptual difficulty and subsequent poor achievement in certain areas of the SSC inorganic chemistry is its method of teaching, which most of the student find uninteresting (Eze, 2002). Poor teaching method have been predominantly been in use for a long time in the teaching of chemistry (Ezeudu, 1995). Method, such as demonstration, guided inquiry, discovery method could be result oriented but have been reported to have made student fail to see the inter-dependent relationship that exist between academic content of chemistry courses offered while in school and their real life applications (Njoku, 2009), consequently, Nzewi (2011) proposed the need for a search of better instructional method for the attainment of improved learning outcomes. Notable among such innovative approaches is the Context-Based Teaching Strategy (CBTS). Context Bases Teaching Strategy (CBTS) involves the connection of the teaching of particular concepts with its context are still connecting the concept and context to student lives in their real world (Pearsal, 1999). Bennett (2003) also stated that context and applications of science are used as the starting point for the

development of scientific ideas; these contrasts with more traditional approaches that cover scientific ideas first before looking at applications.

Furthermore, evidence in related literature ( Egbo, 2005) shows that some factors have been shown to either single or in combination with instructional method influence students achievement in the subject. Specifically, some studies have been carried out to find out the influence of gender (Anidu, 2007), and location (Ogbu, 2005) on student achievement in science generally and on the student achievement in chemistry in particular. Unfortunately, the findings seem to be inconclusive. For example Ogbu (2005) revealed that there was no significant different in the achievement of male and female students in chemistry while Egbo (2005) observed significant difference in achievement due to gender. Also, influence of school location on students' achievement in science is equally contradictory (Daluba, 2011). According to Daluba (2011) urban students outperformed their rural counterparts in science achievement. This finding is contrary to the findings of Obinne (2007) who found out that students in rural schools performed better with respects to gender and location on science achievement, there is need to determine, how the effects of CBTS would affect student achievement in inorganic chemistry with respect to gender and location.

Over the years, the achievement of students in chemistry in Nigerian secondary schools has been very poor. This is because they fail to see the interdependent relationship that exists between the academic contents of chemistry subjects offered while in school and their real life application. As a result there is low transfer to what is learnt in the school to their real-world. Furthermore, the direction of the combined effects to each of the factors of gender and school locations in chemistry achievement hither have shown to be contradictory with the CBTS has not be explored. This is the main thrust of this study.

### **Purpose**

The general purpose of the study is to assess the relative effectiveness of context-Based Teaching Strategy on senior secondary students' achievement in inorganic chemistry. The study was specifically designed to:

- a. determine the difference in students' achievements when taught inorganic chemistry with Context-Based Teaching Strategy (CBTS) and Expository Method of Teaching (EMOT).
- b. determine the difference in achievements of male and female students taught inorganic chemistry with CBTS.
- c. determine the difference in achievements of students of urban and rural schools taught inorganic chemistry with CBTS.

### **Research questions**

The following research questions guided the study:

1. What are the achievement mean scores of SS2 students taught inorganic chemistry with Context-Based Teaching Strategy (CBTS) and those taught with Expository Method of Teaching as measured by Inorganic Chemistry Achievement Test (ICAT)?.
2. What is the difference in the achievement mean scores of male and female student taught inorganic chemistry with CBTS?
3. What is the difference in the achievement mean scores of urban and rural students taught inorganic chemistry with CBTS?

### **Hypotheses**

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

**H0<sub>1</sub>**: There is no significant difference in the achievement mean scores of student taught inorganic chemistry using context-based teaching strategy and those taught with expository method of teaching.

**H0<sub>2</sub>**: There is no significant difference between the achievement mean scores of male and female students when taught inorganic chemistry with CBTS.

**H0<sub>3</sub>**: There is no significant different between the achievement mean scores of urban and rural students when taught inorganic chemistry with CBTS.

### Methodology

A quasi- experimental (the non- equivalent pre-test post-test control group) design was adopted for the study. All the senior secondary two (SSII) chemistry students in Port Harcourt education Zone in Rivers State of Nigeria formed the population of the study. Stratified random sampling techniques across gender and school location were used to select four schools out of 46 schools in the education zone in Rivers State. Inorganic Chemistry Achievement Test (ICAT), was employed in the data collection. The instrument was face and content validated by three experts in curriculum studies and education technology university of Port Harcourt. The comments and suggestions of the experts were incorporated in building up the final draft of the instrument. The instrument was trial tested on 30 SSII students drawn from secondary schools that were not involved in the main study. The result was used to determine the reliability of the instrument using Kuder- Richardson formula 20 and the consistency index obtained for the ICAT was 0.56. The ICAT instrument was administered as both the pre-test and post-test by the regular chemistry teachers of the sample schools. The data obtained was analyzed using mean, standard deviation and analysis of covariance (ANCOVA).

## Result

The results were presented according to research questions in table 1, 2 and 3 while the test of the hypothesis was presented in table 4.

**Table 2:** Mean (X) and Standard deviation (SD) of students taught with CBTS and EMOT in ICAT.

Variable	(x)	SD
Experiment (CBTS)	18.56	4.448
Control (EMOT)	10.18	2.80

From table 1, it is observed that students taught inorganic chemistry with Context-Based Teaching Strategy (CBTS) have a mean score of 18.56 with a standard deviation of 4.45 whereas the student taught physical chemistry with Expository Method of Teaching (EMOT) has a mean score of 10.18 with a standard deviation of 2.80.

**Table 2:** Mean (X) and Standard deviation (SD) of male and female students in Inorganic Chemistry Achievement Test (ICAT).

Sex	Mean (x)	Standard Dev. SD
Male	14.48	6.04
Female	14.43	5.19

Table 2 shows that, the mean score of 14.48 was obtained by male students who participated in this study, whereas their female counterparts had a mean score of 14.45. The standard deviations of the male and female students were 6.04 and 5.19 respectively. The mean achievement score of the two groups (male and female students) seems to be similar.

**Table 3:** Mean (X) and Standard deviation (SD) of Urban and Rural students in the ICAT

		(x)	SD
School	urban	14.38	5.87
Location	Rural	14.55	5.28

Table 3 revealed that the mean score of urban students is 14.38 while that of the rural students is 14.55 comparing the achievement of urban and rural students, the result shows that the mean score of rural student is higher than the mean score of urban students.

**Table 4:** Analysis of Covariance (ANCOVA) in the Achievement Mean Score of Students.

Source of variation	Sum of squares	Df	Mean square	F	Sig. of F.	Decisions
Covariates	593.223	1	593.223	50.724	.000	
PRE	593.223	1	593.223	50.724	.000	
Main effects	5136.185	3	1712.062	146.390	146.390	
Sex	31.801	1	31.801	2.719	.100	NS
Location	94.558	1	94.558	8.085	.005	S
Group	5122.521	1	5122.521	438.001	.000	
Explained	9060.745	7	1294.392	110.677	.000	
Residual	5180.980	443	11.695			
Total	14241.725	450	31.648			

Table 4 reveals significant main effect of context-based strategy on students' achievement in inorganic chemistry. An F-ratio of 438.00



with an associated level of significance (0.00) less than 0.05 was obtained. Hence, the null hypothesis  $H_{01}$ , which states that, there is no significant differences in the achievement mean scores of students taught inorganic chemistry using context-based teaching strategy and those taught with expository method of teaching was rejected. This implies that there was significant differences in the achievement mean scores of students taught inorganic chemistry using Context-Based Teaching Strategy and those taught with Expository Method of Teaching. The mean score CBTS was 18.56 while that of EMOT group was 10.18.

The data with respect to hypothesis 2 is presented in Table 4 with respect shows that an F-ratio of 2.72 with level (0.05), the null hypothesis was not rejected. Therefore, the null hypothesis which states that, there is no significant difference between the achievements mean score of male and female students in inorganic chemistry was upheld. Thus, the difference earlier observed in the achievement means score of male female students taught inorganic chemistry with context-based teaching strategy mean be due to chance. The data with respect to hypothesis 3 is also presented in Table 4. An F-ratio of 8.09 with associated level of significance 0.005 was obtained. Since the obtained level of significance (0.005) is less than 0.05, hypothesis 3 was not upheld. That is, there is a significant difference in the urban and rural schools in inorganic chemistry.

### **Discussion**

The finding of this study showed that Context-Based Teaching Strategy is significantly better than expository method of teaching. In other words, students achieved better when taught with the Experimental Method than the control method. This finding further buttressed the earlier findings of Ogbu (2005) and Obinne (2010). These researchers conclude from their investigations, that students taught using innovative teaching method as CBTS performed better than those taught using the Expository Method respectively in terms of achievement. The finding also showed that gender is not a

significant factor in students' achievement in inorganic chemistry. This finding appears to support the views of Ogbu (2005). For example Ogbu (2005) in her study of effect of guided-inquiry and expository instructional methods on students' achievement in chemistry found out that there is no significant difference in the transfer of learning between male and female students. However, the findings also differ from the findings of Nnadi (2002) who reported that female students performed better than their male counter parts and Okafor (2004) who reported that male students are better than female students. The result of this study further showed that location is a significant factor in students' achievement in inorganic chemistry. In other words, students in the rural areas achieved better than the students in the urban areas. The foregoing result is in agreement with the findings of Onunkwo (1995) and Ogbu (2005) who found a significant difference between urban and rural students in their achievement in science teaching and learning.

However, it disagrees with the findings of Ugwu (2009) who found no significant difference between urban and rural students' acquisition of chemistry process skills.

### **Recommendations**

Based on the findings of this study, the following recommendations were made:

- ❖ The government through the federal and state ministries of education should organize and sponsor chemistry workshops, exhibitions, quiz, seminars and conferences on a regular basis aimed at upgrading the knowledge of the teaches.
- ❖ Chemistry teachers should endeavour to use the Context-Based Teaching Strategy in teaching inorganic chemistry since this method enhances achievement and has the potentials of developing critical thinking and creative abilities in the students.

- ❖ Students should be serious, hardworking imitative and creative to enable them carryout independent or group work, such as assignments or project given to them by the chemistry teachers. These are necessary in CBTS teaching- learning processes

### **Conclusion**

Considering the great importance of chemistry in national development, which coincide with one of the objectives of the curriculum by the federal ministry of education to show chemistry and its link with industry, everyday life, benefits and hazards, and efforts being made by government, science teachers associations of Nigeria (STAN) and other agencies in promoting achievement in the subjects, it is understood that Context-Based Teaching Strategy will help in making the above laudable objective and those efforts feasible. One way of ensuring improved performance of students during the external examinations is by making them see the inter-dependent relationship that exist between academic contents of chemistry subjects offered while in school and their real-life application. If we are able to achieve the above, transfer of what is learnt in school to the real-world can be achieved hence improved achievement in external examinations irrespective of gender or school location.

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