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## EFFECTS OF SCIENCE PROCESS SKILLS APPROACH AND LECTURE METHOD ON ACADEMIC ACHIEVEMENT OF PRE-SERVICE CHEMISTRY TEACHERS IN KADUNA STATE, NIGERIA

BY

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### ABSTRACT

*The study investigated the effects of Science Process skills Approach and Lecture method of Instruction on Students' Academic Achievement among pre-service chemistry teachers in Kaduna State. The study adopts the pretest-posttest quasi-experimental control group design. The population of the study comprises of 278 pre-service chemistry teachers. The same number was used as the sample for the study. The subjects were divided into two groups: Experimental and the Control group comprising of 134 and 144 students respectively. The subjects in the experimental group were exposed to science process skills approach while those in the control group were exposed to lecture method for a period of six weeks. The Science Process skills Test (SPST) was the instrument developed and validated for data collection with reliability coefficient of 0.80. The data collected were subjected to statistical analysis at 0.05 level of significance. The t-test statistics was used to test the hypothesis stated for the purpose of the study. The results obtained from the findings shows that; the subjects Exposed to science process skills approach, achieved significantly better than their counterparts exposed to lecture method of instruction. Based on the results, it was recommended that; chemistry teachers should be encourage to employ science process skills approach in teaching.*

**Key Words:** Science, Process skills, Practical, Chemistry, Academic-Achievement.

### INTRODUCTION

Science education occupies important position in the growth and development of a nation (Odunusi, 2001). Muhammad (2014) observed that the economic and political strength of a nation is always assessed in terms of its achievement in science and technology. The awareness of the importance of science and technology as the basic tools for industrialization and national development has made science educators to continually seek for avenues in making teaching and learning of science very effective, (Muhammad, 2014).

Chemistry is a branch of science which deals with the study of properties, composition and uses of matter (Ababio, 2007). It probes into the principles governing the changes matter undergoes, the complexity of the nature and changes that take place in the universe (Jegade, 2007). The teaching and learning of chemistry involves use of science process skills which are mental tools used in the discovery and acquisition of scientific knowledge. It involves conversion, procession production rebirth and transfiguration. It is an experimental science and its development and application demands a higher standard of experimental work.

Chemistry has been identified as one of the important science subjects and its importance in science and technological development of any nation has been widely reported (Adesoji, 2008). It was as a result of the recognition given to chemistry in the development of an individual and a nation, that it was made a core-subject among the natural sciences and it has been made a prerequisite subject for most of science and science related disciplines such as Medicine, Engineering, Pharmacy, Agricultural science among others in tertiary institutions. (Dara and Charles, 2011).

In spite of the importance of chemistry as enumerated observation of students' achievement in chemistry reveals that only a very negligible number of students performed very well in senior secondary school certificate examinations (Muhammad, 2014). The issue of poor academic achievement among students in Nigeria has been of much concern to all stakeholders; this problem is so much that it has led to the widely falling standard of education in Nigeria. A study conducted by Musa (2000) indicated that, the inability of teachers and students to adopt different methods of teaching and lack of exposure to scientific materials and resources for the learning processes are some of the challenges faced by chemistry teachers and students.

Science process skills have been described as mental and physical abilities which serve as tools needed for effective study of science and technology as well as the ways scientist conduct investigations to discover scientific knowledge which is explained as describing, predicting and explaining the natural phenomena, (Adeyemo, 2009).

The need for appropriate method of teaching chemistry cannot therefore be underrated. The teachers' methodology can promote learning if used appropriately or hinder learning if used otherwise. The science process skills are used to teach students in such a way that, the teaching-learning process is students centred and it is classified into fifteen skills according to Hofstein and Lunetta (2004). These are:-

Observing, Measuring, Classifying, Communicating, Predicting, Inferring, Using numbers, using space/time, Relationship, Questioning, Controlling variables, Hypothesizing, Operational definitions, Formulating models, Designing experiment and Interpreting data.

The lecture method of teaching has been dominating the chemistry classrooms for years. It is, therefore doubtful if lecture method of teaching is sufficient for use in inculcating the desired behavioural changes and chemistry skills in learners. The need for a more practical method is therefore necessary. It is against this background that, the study was carried out to investigate the effects of science process skills and lecture methods of instruction on the academic achievement among N.C.E. chemistry students.

In chemistry teaching, the importance of harmonizing practical skills with theoretical knowledge cannot be over emphasized. (Ikeobi, 2010) states that; pre-service chemistry teachers have difficulty in making connections between the practical skills and theoretical knowledge. If the academic achievement of students is to be enhanced, learners must have deep understanding of the science process skills they engaged in. This is because the observations and the experiments students' carried out are meant to confirm some theories and applications of concepts.

### ***Research Question***

The research question formulated for the study was:

1. What is the difference in the academic achievement among pre-service teachers taught chemistry practical concepts using the science process skills approach and those taught using the Lecture method of instruction?

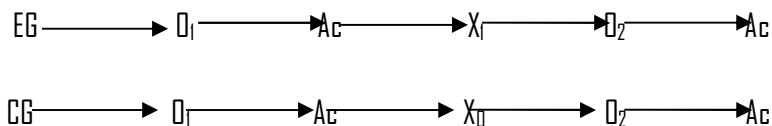
### ***Hypothesis***

H<sub>01</sub> There is no significant difference in academic achievement among pre-service teachers taught chemistry concepts using the science process skills

approach and those taught using lecture method of instruction.

## METHODOLOGY

### *Research Design*



Where:

EG = Experimental group

CG = Control group

O<sub>1</sub> = Pretest

O<sub>2</sub> = Posttest

X<sub>0</sub> = Lecture Method

X<sub>1</sub> = Science Process Skills

Ac = Academic Achievement

A pretest-posttest quasi experimental, control group design was used for the purpose of the study. The study comprises of two groups: The experimental and the control groups. The population of the study comprises of all N.C.E II chemistry students in colleges of education in Kaduna state Nigeria. A total of 278 students made up the population of the study consisting of 179 males and 99 females' students. Purposive sampling techniques was used due to the fact that the population was small therefore the entire population was used. The instrument for the data collection was the Science Process Skills Test (SPST) which is made up of 30 multiple choice question items. The SPST was validated by experts; a chief lecturer in the department of chemistry, Federal College of Education, Zaria and a PhD holder in Science Education from Ahmadu Bello University, Zaria to determine its content as well as its face-validity.

The reliability co-efficient of the instrument was found to be 0.80 using test and re-test method and Pearson Product Moment correlation coefficient.

The subjects in both the experimental and control groups were pre-tested to find out whether they do not differ significantly before the commencement of the treatment using the SPST.

The subjects in the experimental group were then exposed to the treatment i.e taught the practical chemistry concepts (volumetric analysis) using the science process skills test while those in the control group were taught using lecture method of teaching for the periods of six weeks. At the end of the treatment period, a posttest was administered to the subjects in the two groups in order to evaluate the effectiveness or otherwise of the treatment for enhancing the learning of chemistry practical concepts among pre-service teachers. The scores was collected and subjected for data analysis.

### DATA ANALYSIS, RESULTS AND DISCUSSION

The results obtained from the data analysis is presented in Tables 1.1&1.2

**Table 1.2:** Summary of mean Scores of the subjects in the Experimental and Control Groups

Variables	N	mean	S.D	S.E	df	mean difference
Experimental Group	134	26.17	2.61	0.22	276	13.16
Control group	144	13.01	3.60	0.29		

The subjects in the experimental groups have higher mean scores of 26.17 than those in the control group

with a mean score of 13.01. Therefore the mean difference is 13.16 which is very high.

**Table 1.2:** Summary of *t*-test Analysis of the mean scores of subjects in the Experimental and Control Groups

Variables	N	mean	S.D	S.E	df	<i>t</i> -cal.	P	Remarks
Experimental group	134	26.17	2.61	0.22	276	1.96	0.01	Significant
Control group	144	13.01	3.60	0.29				

Significant at  $p \geq 0.05$

The subjects in the experimental group were taught using science process approach which has a mean score of 26.17 which is higher than that of the control group taught using the conventional lecture method which is 13.01. Therefore, the group taught using the science process skill achieved better with the *t*-test analysis employed to test the hypothesis, a *P* value of 0.01 was obtained which is less than 0.05 which was set as the probability level. This implies that there is a significant difference in the academic achievement of the subjects in the experimental group taught using the science process skills strategy compared to the subjects in the control group taught using the lecture method.

The null hypothesis of no significant difference is thus rejected. The result shows that the science process skills strategy is better at improving students' academic achievement in practical chemistry concepts. The results of the findings is in line with that of Danladi (2003) and Muhammad (2014)

that discovered a significant difference in performance between subjects in the experimental group taught using process approach and those taught using the convectional lecture method.

## CONCLUSION

Based on the findings of this study it was concluded that science process skills approach enhances pre-service chemistry teachers' practical performance at colleges of education in Kaduna state. Therefore science process skills approach is viable and has potential to enhance practical achievement in chemistry and promote acquisition of practical skills among students.

## RECOMMENDATIONS

On the basis of the findings and conclusion reached, the followings recommendations were made:

1. The use of science process skills approach by chemistry teachers should be encouraged in all colleges of education in Nigeria by the government.
2. Colleges of education, Universities and all other educational institutions should incorporate science process skills approach in their curriculum at all levels.
3. Professional bodies like Science Teachers Association of Nigeria (STAN), Chemical Society of Nigeria (CSN) should incorporate science process approach in their activities.

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