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EFFECT OF EXPEDITIONARY LEARNING APPROACH ON STUDENTS' ACHIEVEMENT IN CHEMISTRY

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ABSTRACT

This study investigated the effect of expeditionary learning approach on Students' achievement in Chemistry. The teaching and learning of chemistry have poised a lot of challenges to both teachers and students due to its abstract nature. Effort to tackle some of these challenges necessitated the purpose for this study. To find a solution to the gap created by public secondary school chemistry students in the discourse under investigation, two research questions and two hypotheses were formulated to guide this study. The researcher adopted quasi experimental research design for the study while the sample size of 80 chemistry students were used. A 35-item structured Chemistry Achievement Test (CAT) was used for data collection. The instrument was validated and also tested for reliability using Kuder-Richardson (K-R_{20}) reliability estimate. The reliability coefficient of 0.73 was obtained. Mean and Standard Deviation were used to answer the research question while ANCOVA was used to test the null hypothesis at 0.05 level of significance. The result of the study revealed that Students achieved more when taught halogens using expeditionary learning approach than when taught using lecture method. Based on this finding, it was recommended that Seminars and workshops should be sponsored by the Federal and state ministries of education, as well as Post Primary Schools Management Board (PPSMB) to enlighten teachers on the use of expeditionary learning approach.

Keywords*:* Expeditionary, students, Achievement, Chemistry, Gender, Education

Introduction

The swift evolution of science and technology has brought about far-reaching transformations, reshaping economies, societies and institutions in lasting ways. To cope with these changes, there comes the need to generate new models to deal with the challenges in question in the field of Education (Ezeano and Ugwu, 2020). Science which is the bedrock of any development needs careful attention and for this reason, the Federal government of Nigeria (FGN) initiated science subjects in both primary and secondary schools (Iyke-ugwueze and Ezeano, 2022).

Chemistry, which is one of the core major science subjects is a fundamental subject that underpins various aspects of our daily lives, from medicine and

technology to environmental science and industry (Taber, 2019). Chemistry is a branch of physical sciences that deals with the study of nature, composition and properties of matter (Asiyai and Tabeta, 2022). Despite its importance, many students struggle to grasp complex chemical concepts, leading to poor academic achievement in the subject (Egbo, Omeje and Eze, 2017).

Helmenstine (2020) opined that traditional teaching methods which often rely on lectures and rote memorization have been criticized for failing to engage students and promote deep learning. In response, educators have been exploring innovative approaches to teaching chemistry, including expeditionary learning.

Expeditionary learning, according to Udoewa (2022), is a project-based learning model whereby students answer real world questions and problems through interdisciplinary, in-depth studies involving community and field research, expert visits, community trips, and projects. Expeditionary learning approach can also be seen as an educational approach that has to do with hands-on activities, real world applications, creativity, problem solving, project-based learning and community engagement. It is imperative to note that students tend to enjoy teaching and learning when there is connection between what is taught and physical benefits that can help solve problems in the environment. Thorndike argued that the probability that a particular stimulus will repeatedly elicit a particular response depends on the perceived consequences of the response. Teaching and learning need to be fun and also be perceived as an interesting thing. This can be done by using hands on activities and using different teaching methods that are student-entered, rather than the regular method used in most schools. This implies that behaviours that are followed by a reward or reinforcement are more likely to be repeated in the future whereas behaviours followed by punishment are less likely to occur again. The implication of this theory in this study is that when students learn chemistry concepts by hands-on activities and also by gaining skills out of the topics treated, the students might always be looking forward to such teaching and learning and this can make the students develop passion for the subject and devote time for it since the students might understand the subject properly without striving so hard to memorize the concepts. The students will want to have a repetition of that particular subject at all times and thus encourages them to partake in the teaching and learning processes. By investigating the effect of expeditionary learning approach on students' achievement in chemistry, this study aims to contribute to the ongoing efforts to improve chemistry education and promote student success.

Incorporating expeditionary learning approach in chemistry instructions may enable students to view chemistry as a familiar subject, and not one that is strange to the learners. It is worthy to note that some chemistry teachers tend

to skip some topics due to the difficulty in understanding and explanation. It is advocated that teaching through the use of expeditionary learning approach employs the use of certain examples and practices to enhance conceptual understanding (Issa & Ibrahim, 2021). This will further make both the teachers and the learners to understand that certain practices and activities that are performed in their environment may be used to understand Chemistry thereby increasing the retention, achievement and performance of the students. There are some topics that learners find very difficult to understand (Iyke-ugwueze, 2022). Such topics include and not limited to Halogens and many others but these may be taught by using expeditionary learning approach.

In the case of halogens, the practice of making bleach, making tooth pastes, producing the intermediates for making dyes and pigments for Chlorine, Fluorine, Bromine and others respectively can be used when teaching properties of halogens and uses of chlorine and many more.

Chemistry is a compulsory subject for science students who aspire to study science courses in higher institutions. Yet, it is often perceived as a difficult and uninteresting subject to some students and this can lead to poor academic achievement. The poor academic performance of students in chemistry has remained a major hindrance to the application of its knowledge to everyday life. The poor achievement of students in chemistry in external examinations like WASSCE / NECO is something that should be taken seriously, especially as it hinders the achievement of chemistry objectives. Findings from literature indicated that most Chemistry teachers in Nigerian secondary schools predominantly use the lecture method to teach. This could probably be due to poor knowledge and/or non exposure to other learner-centred and more effective methods, hence the poor achievement in Chemistry (Egolum, Okonkwo & Naomi, 2022).

According to Ejilibe (2020), a good teacher is one who can inspire the students to attain greater heights of achievement by guiding them to the full realization of their potentials. In this regard, there should be a shift from the common theoretical and subject-matter curriculum content delivery to a more flexible and progressive approach learning like the expeditionary learning approach. The problem of students' poor performance in secondary school chemistry examination in Nigeria has been a much-discussed educational problem (Bankole, 2024). In terms of academic achievement, many researchers attributed gender as a factor that should be considered.

Gender can be said to be the range of physical, biological, mental and behavioural characteristics pertaining to and differentiating between the feminine and masculine (female and male) population (Egbo, Omeje and Eze, 2017). In solving this issue however, many researchers have looked into it from several perspectives including the role of teachers, parents,

government and many others. Nevertheless, there seem to be agreement among most researchers to explain the failure from a perspective where the phenomenon is analyzed at several levels and where multiple variables are involved. While some researchers believe that teaching method has effect on the students, others believe that there is no significant effect on the academic performance of students in terms of gender. Hence, there is need to find out if gender has an effect on the academic achievement of students in chemistry.

It is imperative to note that teaching method might have an effect on the level of students' achievement in teaching chemistry. Hence, this research work tends to find out if expeditionary learning approach has an effect on the secondary school chemistry students' achievement in delivering chemistry lessons in Enugu Education Zone?

Purpose of the Study

The purpose of the study was to determine the effect of expeditionary learning approach on students' achievement by secondary school chemistry students in Enugu State. Specifically, this study sought to:

1. find out the mean achievement scores of chemistry students taught halogens using expeditionary learning approach and those taught with lecture method;
2. find out the mean achievement scores of male and female chemistry students taught halogens using expeditionary method.

Research Questions

The following research question was formulated to guide the study:

1. What are the mean achievement scores of chemistry students taught halogens using expeditionary learning approach and those taught with lecture method?
2. What are the mean achievement scores of male and female chemistry students taught halogens using expeditionary method?

Hypotheses

The following null hypothesis was tested at 0.05 level of significance;

H_{o1}: There is no significant difference between mean interest scores of chemistry students taught halogens using expeditionary learning approach and those taught with lecture method

H_{o5}: There is no significant difference between mean achievement scores of male and female chemistry students taught halogens using expeditionary learning approach and those taught with lecture method

Research Design

Quasi-experimental research design, specifically the pre-test, post-test non-equivalent control group design was adopted in this study. Quasi-experimental designs are research studies in which participants are drawn from different conditions of pre-existing groups. It deals with pretest and post-test control group.The need for conducting the pre-test, post- test assessment was to find out if any changes can be connected to the treatment. The aim of the approach was

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also to establish a cause-and-effect relationship. Quasi-experimental design was considered appropriate for the study because intact classes were used to avoid disruption of normal school class lessons.

The area of this study was Enugu Education Zone of Enugu State. The population of the study was 80 Chemistry students. The population for the study comprised 2,252 SS 2 Chemistry students in the 31 public senior secondary schools in the three Local Government Areas that made up Enugu Education Zone. The sample for this study was 80 chemistry students drawn from 2 intact classes of SS 2 students, from 2 sampled schools. Multi-stage sampling procedure involving purposive sampling technique was used to sample Enugu Education Zone out of the six Education zones in the state. This was to make for effective monitoring of the activities of the research assistants by the researcher.

The instrument used for data collection in this study was Chemistry Achievement Test (CAT). The 35-item CAT was modified from standardized chemistry previous questions from the Senior Secondary Certificate Examination (SSCE). This was done by picking questions on halogens from the WAEC sample past questions. The CAT has five response options lettered A-E. Each correct answer was scored one mark (1mark), giving a total of 35 marks for the entire instrument. A marking guide prepared the research was used to score the test.

The instrument was validated by the three specialists to ascertain the content validation, clarity of the questions asked, suitability of the items and for general test format scrutiny. Two specialists from department of science education and one expert from mathematics and computer Education. Data collected were analyzed using Kuder-Richardson coefficient (K-R_{20}) and the overall reliability coefficient was 0.81 was obtained and this showed that the instrument was reliable for the study. Mean and Standard deviation were used to answer the research question while ANCOVA was used to test the hypothesis.

Data analysis and results

Research Question 1: What is the mean achievement and standard deviation scores of Chemistry students taught halogen using expeditionary learning strategy and those taught using lecture method?

Table 1: Mean achievement and standard deviation scores of Chemistry students taught halogen using expeditionary learning strategy and those taught using lecture method

Teaching strategy	Pretest			Posttest			
	n	Mean	SD	N	Mean	SD	Mean Gain
Expeditionary learning	43	11.73	2.00	43	26.80	2.71	15.07
Lecture method	37	11.73	2.00	37	19.43	1.89	7.70

Table 1 demonstrates that students taught chemistry utilizing the expeditionary learning approach had mean accomplishment scores of 11.73

and 26.80 on the pretest and posttest respectively, with a mean score increase of 15.07. In the contrast, their lecture-based counterparts had mean scores of 11.73, 19.43 and 7.70 for the pre-test, post-test and gain respectively.
This demonstrates that the students wh o were taught using the expeditionary l earning technique had a 7.37 increase i n mean scores compared to the other g roup.
Additionally, the results demonstrate a notable disparity in mean gain scores b etween students who were taught chem istry utilizing an expeditionary learnin g approach.
Compared to students who were taught through lectures, these students obtain ed
higher post-mean achievement scores.

Research Question 2: What is the mean achievement and standard deviation scores of male and female Chemistry students taught halogen using expeditionary learning strategy?

Table 2: Mean and Standard deviation of achievement scores of male and female students taught halogen using expeditionary learning strategy

Gender	Pre-test			Post-test			
	N	Mean	SD	n	Mean	SD	Mean Gain
Male	19	12.25	2.82	19	26.88	2.60	14.63
Female	24	11.38	1.13	24	26.75	2.83	15.37

Table 2 shows the pre-test and post-test mean achievement scores of male students (12.25 and 26.88) and their female counterpart (11.38 and 26.75) taught halogen using expeditionary learning strategy. The gain in mean score for male students was 14.63 while that of the female counterpart was 15.37. This indicates a mean difference of 0.74 in support of the female pupils.

Hypothesis 2: There is no significant difference in the mean achievement scores of Chemistry students taught halogen using expeditionary learning strategy and those taught with lecture method.

Table 2: Summary of Analysis of Covariance of effect of expeditionary learning strategy on students' achievement in chemistry by Treatment and Gender

Tests of Between-Subjects Effects

Dependent Variable: PostTest

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	1101.29[a]	4	275.32	50.04	.00	.73
Intercept	1351.50	1	1351.50	245.61	.00	.77
PreTest	12.26	1	12.26	2.23	.14	.03
Strategy	1038.41	1	1038.41	188.71	.00**	.72
Gender	3.03	1	3.03	.55	.46	.01
Strategy * Gender	.208	1	.21	.04	.85	.00
Error	412.70	75	5.50			
Total	44249.00	80				
Corrected Total	1513.99	79				

a. R Squared = .727 (Adjusted R Squared = .713)

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Table 2 shows that at .05 level of significance, there was a significant main effect of the teaching strategy on students' academic achievement in halogens, *F (1, 75) = 188.712, P (.000) <.05.*
The null hypothesis was thus rejected.
As a result, students who were taught Halogens using an expeditionary learni ng
strategy
and those who were taught Halogen us ing a lecture method had significantly different mea n achievement scores. Partial eta squared showed significant contribution of 71.6% achievement in the chemistry concept of halogen resulting from expeditionary learning strategy.

Hypothesis 2: There is no significant difference in the mean achievement scores of male and female Chemistry students taught halogen using expeditionary learning strategy.

Table 2: Summary of Analysis of Covariance of effect of expeditionary learning strategy on students' achievement in chemistry by Treatment and Gender

Tests of Between-Subjects Effects

Dependent Variable: PostTest

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	1101.292[a]	4	275.323	50.035	.000	.727
Intercept	1351.501	1	1351.501	245.611	.000	.766
PreTest	12.263	1	12.263	2.229	.140	.029
Strategy	1038.408	1	1038.408	188.712	.000**	.716
Gender	3.029	1	3.029	.550	.460	.007
Strategy * Gender	.208	1	.208	.038	.846	.001
Error	412.695	75	5.503			
Total	44249.000	80				
Corrected Total	1513.987	79				

a. R Squared = .727 (Adjusted R Squared = .713)

Table 2 revealed, at the .05 level of significance, gender and the teaching strategy had no noticeable main effects on students' chemistry achievement (F (1, 75) =.550, P (.460) >.05.
As a result, the null hypothesis was not rejected.
Therefore, the mean achievement score s of male and female students who wer e taught Halogen using the expeditiona ry learning strategy and those who wer e taught using the lecture method did n ot differ significantly. Partial eta squared showed insignificant contribution of 0.7% achievement scores in the chemistry concept of halogen resulting from expeditionary learning strategy when moderating gender.

Discussion of Findings

The result showed in research question 1 noted that students taught with expeditionary learning approach showed higher mean achievement scores than the ones taught using lecture method. After the test on hypotheses, expeditionary learning approach has a

significant influence in chemistry students' achievement in chemistry.
This finding agrees with Umoetuk (2022), who showed that learning strategies were found to have a significant impact on students' chemistry achievement. The findings are also aligned with the findings of Izekor (2022) who discovered that there was a significant difference in the mean achievement scores of students taught relevance of agriculture in biology using practical teaching method and that of those taught with lecture method in favour of the experimental group. The result implies that teaching strategies have positive effect on students' academic achievement.

The result on research question 2 revealed that the female chemistry students mean achievement scores wer e higher than their male counterparts. However, after the test on hypothesis, gender was found to have no significant influence on students' achievement in chemistry. This disagrees with Umoetuk (2022) who found out that gender was found to have a significant effect on students' academic achievement. This study also disagrees with Wrigley-Asante et al (2023) studies which stated that males' academic performance was superior at the senior high school level.

Conclusion

This study proved that the integration of expeditionary learning approach is effective for improving students' achievement in chemistry. It is evident from the study that expeditionary learning approach is a very effective instructional delivery approach and that it is highly effective for teaching chemistry. Furthermore, female chemistry students had greater mean achievement than the male students taught with expeditionary learning approach. It is evident from the study that there was significant effect between the mean achievement scores taught chemistry using expeditionary learning approach, in favor of the expeditionary learning approach.

Recommendations

Based on the findings of the study, the following recommendations were made;

1. Teachers should be made to attend in-course training regularly to broaden their knowledge on the use of expeditionary learning approach, as teachers cannot give what they don't have.
2. Seminars and workshops should be sponsored by the Federal and state ministries of education, as well as Post Primary Schools Management Board (PPSMB) to enlighten teachers on the use of expeditionary learning approach.
3. Curriculum developers and planners should place emphasis on the use of expeditionary learning approach and create more time for the teaching of chemistry since the allotted time is inadequate for the effective use of expeditionary learning approach.

REFERENCES

Asiyai, A. A (2021)- Assessment of pedagogical knowledge of chemistry teachers for effective teaching of the subject: The case of Bayelsa State, Nigeria. *ABSU Journal of Educational Studies, 8 (3), 71, 2021*

Bankole, G.O (2024): Influence of Family Size and Parental Socio-Economic Status on Academic Performance of Secondary School Students in Business Studies, Kwara State University (Nigeria)

Egbo, J.J, Omeje, C.O & Eze, C.U (2017): Effect of Learning Activity Package Instructional Strategy on Senior Secondary Students' Achievement in Chemistry.https://www.researchgate.net/publication/361728585_EFFECT_OF_LEARNING_ACTIVITY_PACKAGE_INSTRUCTIONAL_STRATEGY_ON_SENIOR_SECONDARY_SCHOOL_STUDENTS'_ACHIEVEMENT_IN_CHEMISTRY

Egolum, E.O., Okonkwo, G.I and Naomi, N.C.S (2022): Enhancing students' interest in chemistry through inculcation of problem Solving Skills. *International Journal of Global Energy Issues vol 4 (2705-2001): 2*

Ejilibe, O. C. (2020): Entrepreneurship in Biology Education as a means for Employment. *Global academic group.com. Knowledge Review 26 (3), 96-100, 2012*

Ezeano, C.A., & Ugwu, I.M. (2020): The Effect of Laboratory Teaching Method on Senior Secondary School Students' Academic Achievement in Inorganic Chemistry. *IMT International Journal of the Arts and Sciences Vol 3, Issue 5, pp 14-26*

Helmenstine, A.M. (2020): "What is the importance of Chemistry". Thoughtco. Com/What–is– the importance-of- chemistry- 604143.

Iyke-Ugwueze, K.A. & Ezeano, C.A (2022): Awareness and Utilization of Ethno- based Practice in teaching Chemistry in Enugu Education Zone, Enugu State. *A Publication of OWSD Southeast Zone Nigeria. Page 130-139*

Izekor, E.S. (2022): Effects of Two Teaching Methods in Students' Achievement, Interest and Entrepreneurial Skill Acquisition in Teaching Biology in Enugu State. *An Unpublished Research work. Enugu State University of Science &Technology, ESUT.*

Taber, K.S. (2019): The Nature of the Chemical Concept: Reconstructing Chemical Knowledge in Teaching and Learning. Royal Society of chemistry vol 3.

Udeowa, V. (2022): Hybrid Expeditionary Service-Learning Model. International Journal for Service Learning in Engineering: Humanitarian Engineering and Social Entrepreneurship Vol.17, NO.1,

PP 20-36, Spring 2022 ISSN 1555-9033.

Umoetuk, L.A. (2017): Effects of Analogy, Advance Organiser and Elaborative Interrogation on Achievement and Attitude to Chemistry Among Students in Abia State, Nigeria, University of Lagos. A thesis Submitted to University of Lagos School of Postgraduate Studues PhD Thesis, 287p. http://ir.unilag.edu.ng8080/xmlui/handle/123456789/3235.

Wrigley-Asante, C.W, Ackah, C.G, Frimpong, L.K (2023): Gender differences in Academic Performance of Students Studying Science, Technology Engineering and Mathematics (STEM) subjects at the University of Ghana.2023.*doi: 10. 1007/s43545- 023- 00608-8PMCID:PMC9838398 /PMID: 36686568.*