



**AN INVESTIGATION INTO IMPACTS OF INNOVATIVE
TEACHING STRATEGIES WITH IMPROVED
ECOLOGICAL RESOURCES ON ACADEMIC
ACHIEVEMENT FOR SUSTAINABLE QUALITY EDUCATION
IN BICHI EDUCATIONAL ZONE, KANO STATE NIGERIA**

***ALAIRU AMINAT; & **MAMUDU SAMSON TOYOSI**

**Physical and Health Education Department, Federal College of Education
(T) Bichi P.M.B. 3473 Kano **Biology Education Department, Federal
College of Education (T) Bichi P.M.B. 3473 Kano.*

Abstract

The study investigated the impacts of innovative teaching strategy and improved ecological instructional materials for sustaining quality secondary Education in Bichi Educational Zone, Kano State, Nigeria. The study population consisted of twenty-five senior secondary schools, made up of two thousand, one hundred and twenty-eight (2,128) students' population of Bichi Education zone of Kano State, Nigeria. Two schools were randomly selected as sample for the experimental study with a student sample population of Eighty-five (85). The sample comprised of Fourty three (43) experimental group and fourty two (42) control group respectively. A quasi-experimental design of pre-test, post-test was employed in determining students' academic achievement, when the students were exposed innovative strategy with improved ecological instructional material (exp) and innovative strategy without ecological material (control) The instrument for data collection was Ecological Achievement Test (EAT) validated by three experts in science education department A.B.U.Zaria. Four Research questions and four null hypotheses guided the research exercise. The results were analyzed using mean, standard deviation and t-test: statistics. The result of the study revealed that students exposed to innovative teaching strategies with improved ecological instructional materials performed statistically better than those without improvised ecological instructional materials. Based on the findings of this study, it was recommended amongst others that for sustaining quality Ecological study in Nigeria, innovative teaching strategies and improvised ecological resource materials should be encouraged through seminars, workshops

and conferences.

Keywords: *Teaching Strategies, Improved, Ecological Resources, Academic Achievement, Sustainable Quality Education.*

Introduction

The task of improvement in the quality of education in Nigeria dates back to ancient history. The five main national objectives of Nigeria Education as stated in the Second National Development Plan as the necessary foundation for national policy on education are the building of: A free and democratic society. A trust and egalitarian society, A united, strong and self-reliant nation, A great and dynamic economic, A land of bright and full opportunities for all citizens F.M.E, 2012). In consequence, the quality of instruction and ecological resource materials utilization at all secondary education has to be reoriented toward inculcating the following values: Respect for dignity of individuals, Faith in man's ability, to make rational decisions, Moral and spiritual values in interpersonal and human relations, Shared responsibility for the common good of society, Respect for the dignity of labour and promotion of the emotional, physical and psychological health of all children.(Obeka, 2009). According to Nwana (2010)

Attempts have been made by successive governments towards sustaining quality education in Africa among which includes amongst others. Colonial government financing of education through grants in Aid of 1890, and payment by productivity 1910, grants to Acra - Ghana, Sierra- for Leone and some developing nations such as. Grants establishment of tertiary institutions and establishment of Regional Department of Education in Ibadan, Kaduna and Enugu: The introduction of Universal Primary Education (UPE) in Western region 1955 and in .Eastern Region 1957.Others: include the formulation of national philosophy of education in 1969 and national policy of education in 1973, the establishment of Data Collection and processing strategies by initiating research "in education through National Educational Research Council (NERC) in 1968 and-National Educational Research and Development Council (NERDC) in 1970 and Curriculum Development and Instructional Materials Centre (CUDIMAC)in 1980, "These Bodies were responsible for book development language development, curriculum development, educational planning, instructional materials, research and

statistical data. Other educational reforms embarked upon in Nigeria include: Situation and Policy Analysis (SAPA) 1980, Comprehensive Evaluation Assessment (CEA) 1990, UNESCO. UNDP, Educational Sector-Analysis, JAMB, NTI, NBTE and NECO ' 2006 and beyond are remarkable innovation toward sustaining quality education in Nigeria. (Ugo and Akpoghol, 2016),

Introduction of 6,3,3,4, system of education, 9,3,4., takeover of management of primary, secondary colleges of education, polytechnic and university education from private sector and state government are laudable achievements toward enhancing quality education establishment of UBEC commission 1999, re-establishment of National Open University of Nigeria (NOUN) 2003 and closure of unapproved institutions are tremendous achievement toward standardization of quality education in Nigeria (Stake & Mares, 2011). Curriculum innovation and innovative teaching strategies are further steps toward access and quality education in Nigeria. According to Anthony (2004), every school curriculum must be learner-centered and learner friendly. In the process of developing the course content of a learner centered curriculum, special consideration must be paid to course contents, pupil activities, method of evaluation, pupils abilities aptitudes, interest and motivation levels. Therefore any meaningful curriculum innovation or strategy that is planned and implemented must address the following issues in Nigeria contest: The underlying philosophy and goals, work plans, new and relevant topics, teaching methods and inclusion of psychological, mental and socio-technical background. Others are: Budgetary consideration for curriculum and innovative teaching methods and instructional resources, source of contents/topics that the curriculum and innovative strategy is meant and expert validation advice. (Ahmad, 2011; Achor, Wude and Duguryil, 2014)

Production "of instructional resource materials according to Onasanya & Omasewa, (2010), has problems such as problems of raw materials, tools for use in production efforts and low production skills by teachers in the area of improvised instructional materials and innovative teaching techniques, quantity, quality, storage, and maintenance problems are others of note. However, it should be noted that, improvised materials should not be as a permanent and valid alternative to using the standard commercially produced ones, since they are temporary and exploratory, (Unesco, 2014). Innovation varies in scope, time for completion organizational and societal impact.

Classification of any kind usually involve areas of duplication where the lines between one category and another overlap (Ibrahim, 2012). Other simplified classifications of innovation using novelty of results as basis of classification, we have the following types: incremental, radical and breakthrough innovations, when source of innovation is used as basis of categorization, we have research and development and non-research and Development innovation; when firm's innovation strategy is consider we have open and close innovation; and when innovation approach is used as basis of classification we have: top-down and bottom-up innovation. As identified by Yunus (1998) in Wabuke (2013) for a change to be classifies as an innovation it should possess the following or most of these features:

- a. **Realistic/Achievable objective:** objective that are realistic and achievable that are not mere dream/imagination or copying from another already existing setting, which are fantasy should be the forms of the innovation processes. The innovation procedures must take the social, political and economic atmosphere and available resources (indigenous technology) into consideration.
- b. **Presence of new elements:** the essence of innovation/change is to introduce something new which should have an improvement over the existing situation and which is capable of bringing some form of progress.
- c. **Flexibility:** innovation must be flexible to allow for adjustments to the changing needs and conditions of society where it is operational.
- d. **Must have been tested:** an innovation should first be experimented over a smaller group so that its worthiness and workability can be determined on a larger society
- e. **Acceptability:** innovation should reflect the needs of the society such that they become acceptable. Every purposeful change should reflect the aspiration problems and societal values so that it can be seen and embraced by the society.
- f. **Official support:** the support of leaders/administration of every section of the society upon which of the innovation(s) would be implements is very vital it is the leader/administrator that determine policies and how they are implement
- g. **Involvement of all participants:** it is more than necessary to involve

every group of people that would participate in new innovation/invention, say for example parents, teacher, organization employers, sponsors e.t.c so as to ensure that innovation exert the required impact

Hence, this study is to determine the effects of innovative teaching strategy of ECOPOCOWI and instructional materials (improvised model, chart and real ecological instruments) on academic achievement for sustaining quality education in Bichi Educational Zone, Kano State Nigeria. ECOPOCOWI; used in this study is an acronym of Ecosystem "E", Competition "CO" Population "PO", Conservation of Natural Resources "CO" and Wild life Management "WI". (Adapted from Obeka, 2009),

Statement of the Problem

Sustaining quality education in Africa, especially Nigeria has continued to pose serious problems ranging from fallen standard of education due to poor instructional techniques, inadequate instructional materials (Ecological instrument and Improvised model, charts), lack of enough funds, poor knowledge of construction and development of innovative techniques and instructional materials by teachers amongst others.

The problem of adequate knowledge of ecological concepts of Biology at Senior Secondary School (SSS) levels to a large extent hindered the effective implementation of Biology curriculum at all levels of education in most institutions of learning. These problems and other related problems such as examination malpractice bribery, corruption, and general moral decadence in our society has our colleges contributed to the academic decay. This study therefore tries other innovative teaching strategy (ECOPOCOWI) and resource materials toward improving teaching and learning in secondary schools within Bichi educational zone kano state, Nigeria.

Objective of the Study

The following objectives were developed to guide the study;

1. To determine the effectiveness of using innovative teaching strategy with improvised instructional material on academic achievement of Senior Secondary School (S.S.S.) Biology students.

2. To determine the effects of using innovative teaching strategy with ecological instructional material on academic achievement of S.S.S Biology in ecological concepts.
3. To determine the effects of using lecture method with improvised instructional material on academic achievement of S.S.S biology students.
4. To determine the effectiveness of using lecture method with ecological instructional material on academic achievement of S.S.S biology students.

Research Question

1. What are the effect of using innovative teaching strategy with improvised instructional material and those without it on academic achievement of S.S.S students using some Ecological concept of biology?
2. What is the effect of using innovative teaching strategy with ecological instructional material and those without it on academic achievement of S.S.S .students using some Ecological concepts of biology?
3. What is the effectiveness of using lecture method with improvised instructional material and those without it on academic achievement of S.S.S students using some Ecological concepts of S.S.S biology?
4. What is the effect of using lecture method with ecological instructional material and those without it on academic achievement of S.S.S. students-using some Ecological concepts of biology,?

Null Hypotheses

- H₀₁: There is no significant difference in the academic achievement' of students taught using innovative teaching strategy with combine improvised instructional material and those without it in some Ecological concepts
- H₀₂: There is no significant difference in the academic achievement of S.S.S students taught using innovative teaching strategy with ecological instructional material and those without it in some Ecological concepts of biology.
- H₀₃: There is no significant difference in the academic achievement of S.S.S students taught using lecturer method with combine improvised instructional material and those without it in some ecological concepts of Biology.
- H₀₄: There is no significant difference in the academic achievement of S.S.S

students taught using lecture method with ecological instructional material and lecture method without it in some Ecological concepts of Biology.

Table3 Ecological Test Blue Print

CONT ENT	WEI GHT	Know ledge 30%	Compre hension 22%	Applic ation 17%	Anal ysis 12.5 %	Synt hesis 10%	Evalu ation 7.5%	To tal 10 0 %
Ecolog y concep t	25%	3	3	1	1	1	1	10
Ecolog y terms	20%	3	1	1	1	1	1	8
Adapt ation	17%	2	1	2	2	0	0	7
Food chain	20%	2	2	1	1	1	1	8
Applic ation Ecolog y	17.5 %	2	2	2	0	1	0	7
Total		12	9	7	5	4	3	40

Research Instruments An Ecology Achievement Test (EA,T) made up of 50 multiple choice test items drawn from previous WAEC question papers (questions bank) was used as an instrument The tests items were validated by Senior Lecturers at the department of science education, Ahmadu Bello University, Zaria and experienced teachers from the two secondary schools that were used for the study. From the 50 test items constructed 40 were accepted based on the valuator's recommendations. The reliability of the test items was determined using the test-retest method and Pearson Product Moment Coefficient statistic

Methodology

This study investigated the impact of innovative teaching strategy and lecture with or without use of resource materials at senior secondary two level of education. The study employed a quasi-experiment, test, posttest design. The population of the study comprised of all state owned both males and females' senior secondary schools, my main concerning are on male schools in Bichi Educational Zone made up of two thousand one hundred and twenty-eight students.

Table ;1 Population for the Study

S/N	Bichi Educational Zone	Number of schools offer biology	Number of Students
1	Bichi	5	824
2	Danzabuwa	2	169
3	Tsanyawa	2	218
4	Kwandawa	2	122
5	Kabagiwa	2	92
6	Kiyawa	2	137
7	Unguwa-Gyartai	2	109
8	Yandade	3	115
9	Kunchi	3	174
10	Shuwaki	2	168
	Total	25	2128

Source; Bichi Education Zonal Office (2015)

A sample of eighty five (85) students was selected using intact-classes in two male senior secondary schools in Bichi educational zone (Bichi Government senior secondary opposite FCET Bichi and G.S.S.Tsanyawa) blotting method was used for selecting 85 students which were found to be equivalent after pre-test. The Instruments used for this study is Ecological Achievement Test (EAT) developed by the researcher and validated by three experts of science education in Ahmadu Bello University Zaria, The reliability of the instrument was found to be 0.84 which adjudged the instrument to be reliable. ECOPOCOWI; innovative teaching strategy adapted from Obeka (2009), ECOPOCOWI; ecological instructional material and "ECOPOCOWI;" improvised instructional material were used for

this study. The ecological concepts of senior secondary school Biology used in this study are Ecosystem Competition Population Conservation of Natural Resources and Wild life Management ECOPOCOWI. The group one and two classes were taught for five weeks respectively using the concepts. At the end of the treatment, the post - test was administered to both, classes. The result of both groups was collected and subjected to t-test statistics.

Table 1 t-test analysis of students mean scores in innovative strategy with improved improvised material and those without it

Method	N	X	SD	DF	t-Cal	t-Crit	p-Value	Decision
Innovative strategy with improved material	43	46.02	1.03					
				43	2.66	1.65	0.04	Significant
Innovative strategy without improved material	42	35.26	2.40					

$P < 0.05$

The result in Table I showed that t-calculated is greater than t-critical at p-value of 0.05. This showed that there was a significant difference between the mean score of students taught. Using innovative teaching strategy with combine improvised material and those taught without it the null hypothesis is therefore rejected.

Table 2; t-test Analysis of Students Mean Scores in innovative Teaching Strategy with ecological instructional Material and those without it.

Method	N	X	SD	DF	t-Cal	t-Crit	p-Value	Decision
Innovative strategy with ecological	43	43.76	2,01					

instructional material								
				43	0.782	1.68	0.04	Not significant
Innovative strategy without ecological instructional material	42	42.06	1.94					

P<0.05

The result in Table 2 showed that t-calculated is less than t-critical at p-value of 0.< 0.05. level of significance This implied that there was no significant difference between the mean score of subjects taught Using innovative teaching strategy with ecological instructional material and those taught without it the null hypothesis is therefore retained.

Table 3; t-test Analysis of Students Mean Scores in Lecture Class with combine Improved Material and those without it.

Method	N	X	SD	DF	t-Cal	t-Crit	p-Value	Decision
Lecture method with improved model, chart, materials	43	45.2	1.06					
				43	2.89	1.60	0.04	Significant
Lecture method without improved model, charts, materials	42	40.63	2.72					

P<0.05

The result in Table 3 showed that t-calculated was higher than t-critical at p value of < 0.05 level of significance. This implied that there is a significant difference in the mean score of students taught. Using lecture method with improved materials and those taught without it.: The null hypothesis is thus rejected.

Table 4 t-test Analysis of Students in a Class of Students Using Lecture Method with Ecological Instructional Materials and those without it.

Method	N	X	SD	DF	t-Cal	t-Crit	P-Value	Decision
Lecture method with ecological instructional materials	43	40..48	1.02					
				43	0.84	1.66	0.44	Not signit
Lecture method without ecological instructional materials	42	40.00	1.36					

The result in Table 4 showed that t-calculated is less than t-critical at p value of < 0.05 level of significant difference between the mean score of students taught using lecture method with ecological instructional material and those without it in some ecological concepts of SSS Biology. The null hypothesis is therefore retained.

Discussion of Results

The objective of this study was to investigate the effects of using innovative teaching strategy and with integrated resource materials on academic achievement of S.S.S. Biology students using Ecological concepts. The result from hypotheses testing showed that students exposed to innovative teaching strategy with

combine improvised materials and those without it. Table 1 showed significant difference in academic achievement. The result in Table 2 the other hand showed that there was no significant difference using innovative teaching strategy with ecological instructional material. The result of this study further showed using lecture method with ecological instructional material and improvised instructional material, influence academic achievement. Folorunso & Nwosu, (2006). The findings of this study is supportive of studies reported by Mohammed (2012), Obomanu and Nbina (2010) and Lapini, (2012) who in their separate studies found that, innovative teaching strategies with integrated resource materials enhance academic achievement of students. This helps the students to collaborate in a practical rather than passive manner which has positive effect on students' academic achievement.

Education Implication

The result of this study has for reaching educational implication and implies that; when students are taught using innovative teaching strategy with integrated improvised resources, they are actively involved and learn in active rather than passive manner. This has influence on academic achievement of students, and practical, knowledge gained help to solve real life problems requiring constructive innovative ideas.

Conclusion

Based on the findings of this study," it can be concluded that: Innovative teaching strategy enhances academic achievement of secondary school level Utilization of resource materials (standard and improved ecology materials) has positive outcome in learning difficult ecological concepts of senior- secondary school. Activity oriented strategy and utilization of resource materials facilitate students interactive and enhances academic achievement of students. Lecture method when incorporate with innovative resource materials enhances academic achievement of senior secondary school students.

Recommendations;

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

1. Curriculum planners and developers like NERDC, STAN amongst others should organize Seminars, workshop and conferences on innovative

teaching strategies towards improving teaching and learning.

2. "ECOPOCOWI" simulation game have been found to be efficacious in engender academic achievement, hence curriculum planners like NERDC should incorporate it in her Curriculum of senior secondary school as a teaching strategy.
3. Federal Ministries, Parastatals and Agencies responsible for secondary educations should endeavour to enlighten the populace on the implications of improved ecological instructional material in Nigeria such as improvised model, chart and real ecological instruments.
4. Stakeholders, school administrators and teachers should mobilize the students on the utilizing aesthetic material by conserving and managing in ecological garden for achieved academic excellence in Nigeria

References

- Achor, E.E., H.M. Wude and Z.P. Duguryil, (2014). Do cooperative learning strategies have the potentials to eliminate gender difference in student's achievement in biology: Effect of STAD and Jigsaw cooperative strategies? *Journal of Science, Technology, Mathematics and Education (JOSTMED)*, 10(1): 136-146.
- Ahmad, R. N. (2011) Attitudes towards biology and its effects on student's achievement *International Journal of Biology*, 3(4), 100-104
- Anthony Ali (2004), Curriculum Innovation Instructional Material Production and Utilization. *A key note paper presented at the 22^m - 25th September 2004 Second National Conference Organized by CUDIMAC, University of Nigeria, Nsukka*
- Federal Ministry of Education (2012): *Nigerian New Policy on Science and Technical Guidelines* (Revised). Lagos. Federal Government Press.
- Folorunso. O. and Nwosu, A.A. (2006). Effects of Students and Teachers' Improvised Materials on Students' achievement in Senior Secondary School Certificate Biology: Implication for resource supply in State Education, *47th STAN Annual Conference Proceedings*, 138-142
- Ibrahim. T.A.(2012). *Problems and prospect of using spacemen's and apparatus for effective teaching of biology in secondary school*. Unpublished BSc (ed) project in the department of sciences education, Bayero University Kano.
- Lapini, M.A. (2012). Effects of Conceptual Change Instructional Strategy on Biology Performance O Level Average Secondary School Students in Giwa Educational Zone. *Journal of Studies in Science and Mathematics. Zaria: Ahmadu Bella University*, 2(1):47-56.
- Mohammed, I. (2012). Effects of Improved and Conventional Instructional Materials on Pupils Academic Achievement and Attitude to Basic Science. *Unpublished M.Sc. (Ed) Thesis*. Zaria; Department of Science Education, Ahmadu Bello University.
- Nwana, O.C (2010). Implementation Nigeria Education of Education Curriculum Reform and Human Capital Development. *Key Note Address Delivered at National Association of Educational Researchers and Evaluation (NAERE) Conference Held in University of Port - Harcourt*, 12th -16th July, 2010.

- Obeka, S.S. (2009). "Expodetvalad" and "Power" Simulation Games 'of Geography and Environmental Education. Zaria: Ahmadu Bello University Pres Limited.
- Obomanu, B.J. and Nbina, J.B. (2010). An Assessment of the Effects of Solving Instructional Strategies on Students' Achievement and Retention in Chemistry with Respect to Location in River State, Academic Arena, Retrieved on October 24, 2012 from (<http://www.science-pub.net>)
- Onasanya, S.A, and Omasewa, E.O. (2010). Effects of Improvised and Standard Instructional Materials on Secondary School Students' Academic Performance in Physics in Ilorin, Nigeria. *Singapore Journal of Science Research* 1:68-76
- Stake, J., & Mares, K. R. (2011). Science enrichment programs for gifted high school girls and boys: Predictors of program impact on science confidence and motivation. *Journal of Research in Science Teaching*, 48(10), 1065-1088
- Ugo E.A. and Akpoghol, T.V. (2016), Improving Science, Technology, Engineering and Mathematics (STEM) Programs in Secondary Schools in Benue State Nigeria: Challenges and Prospects. *Asia Pacific Journal of Education, Arts and Sciences*, 3 (3), 6-16.
- UNESCO (2014) Education for sustainable Development/United Nation, unesco.org downloaded on 24th of September 2019.
- Wabuke J. M., (2013) 'The role of student-related factors in the performance of Ecology subject in secondary schools in Eldoret Municipality, Kenya' *journal of Emerging Trends in Educational Research and Policy Studies (JETERAPS)* 4 (1), 64-73