

EXPERIENTIAL AND OBSERVATIONAL LEARNING TECHNIQUES AND THEIR EFFECT ON SECONDARY SCHOOL BIOLOGY STUDENTS' ATTITUDE TOWARDS ENVIRONMENTAL DEGRADATION

Adeoye, O.R.

Department of Teacher Education
University of Ibadan, Ibadan, Nigeria.
E-mail: funmie16@gmail.com, funmie16@yahoo.com

ABSTRACT

The traditional instructional strategy employed by most biology teachers in teaching environment-related concepts have resulted in low learning outcomes. Two strategies have been proved in literature to have made students to display creative and independent thinking when working on projects, writing papers, or participating in classroom discussions. The study, therefore, investigates experiential and observational learning techniques and their effect on secondary school biology students' attitude towards environmental degradation. This study adopts pretest, posttest, control group, quasi-experimental design. It examined possible effect of experiential and observational learning techniques, gender and mental ability on students' achievement in environmental degradation in biology. The test population consists of senior secondary school two (SSII) students which were randomly selected from four schools in Ibadan Southwest Local Government and Ido Local Government of Oyo state. From the population of SSII students, the sampled subjects will consist of an intact class in each school. Five instruments was used for the study and they are; Students' Environmental Degradation Attitude Questionnaire; Student's Mental Ability Test (SMAT); Teacher instructional guide on the Experiential learning; The Observational learning strategies; and Conventional learning technique. Two hypotheses were tested at 0.05 alpha level. Analysis of result was done using ANCOVA. There was significant effect of treatment on students' attitude to environmental degradation ($F_{(2,168)} = 25.83; P < .05$). It is recommended that Experiential and observational strategies should be adapted as viable strategies for studying concepts in biology. This will enable students to improve their attitude to environmental degradation.

Reference to this paper should be made as follows: Adeoye, O.R. (2014), Experiential and Observational Learning Techniques and Their Effect on Secondary School Biology Students' Attitude towards Environmental Degradation. *J. of Education and Leadership Development* Vol. 6, No. 2, Pp. 25 – 39.

INTRODUCTION

Science as a discipline stands out as a major factor in developmental effort of a nation. Science is very crucial to human living. No wonder, the relevance of science to national goals, aspirations and economy dictates, to a large extent the huge commitment and support which most nations make and give to science and technological development. Its knowledge is used in the production of materials that reduce people's stress, suffering and hunger, protects as well as make life more enjoyable and secured.

Natural disasters are primarily caused as a result of environmental degradation which tends to have become part of the world's daily experiences as it accounts for the destruction of millions of lives and property worth billions of dollars.

Degradation of environment has become recurring features in our urban environment. It is no longer in doubt that our cities are inundated with the challenges of un-cleared solid wastes. Thus, urban residents are often confronted with the hazardous impact to their collective health and safety. The hue and cry over the health consequences of exposed and fermenting rubbish have not been quantified, although their impact is noticeable. A United Nations Report (August 2004) noted with regret that while developing countries are improving access to clean drinking water they are falling behind on sanitation goals (Uwaegbelun, 2004). At one of its summit in 2004, the World Health Organization and the United Nations International Children Education Fund in a joint report stated that: "about 2.4 billion people will likely face the risk of needless disease and death by the year 2015 because of bad sanitation". The report also noted that bad sanitation – decaying or non-existent sewage system and toilets- fuels the spread of diseases like cholera and basic illness like diarrhea, which kills a child every 21 seconds. The hardest hit by bad sanitation is the rural poor and residents of slum areas in fast-growing cities, mostly in Africa and Asia.

Biology, as a science subject, and a prerequisite for many fields of learning, occupies a unique position in the senior secondary schools programme. The reason for this is the fact that biology deals with the study of living things and has relevance to man's existence. Biology involves the study of physiology, biochemistry, anatomy, systems, genetics, evolution and ecology of plants and animals that contribute immensely to the scientific growth of Nigeria.

In line with this, the National Policy on Education (2013), makes Biology as one of compulsory science subject, while it is the most preferred science subject chosen by non science students in Senior Secondary classes (Ogundiwin, 2013). Environmental Education concepts such as pollution and conservation techniques are found in the content of this subject

Consequently, Attitudes are acquired through learning and can be changed through persuasion using variety of techniques. Attitudes, once established, help to shape the experiences the individual has with object, subject or person. Although attitude changes gradually, people constantly form new attitudes and modify old ones when they are exposed to new information and new experiences (Akinwumi, 2009). Gagne (2009) defines attitudes as an internal state that influences the personal actions of an individual, he recognized attitude as a major factor in subject choice. He considers attitudes as a mental and neutral state of readiness, organized through experience,

exerting a directive or dynamic influence upon the individual's responses to all objects and situations with which it is related. Teachers have the opportunity of structuring lessons cooperatively, competitively or individualistically and the decisions teachers make in structuring lessons can influence students' interactions with others, knowledge, and attitudes.

A non-challant attitude of some students to biology has been attributed to poor academic performance of students. According to Eggen and Kauchak (2006), positive students' attitudes are fundamental to students' academic performance. Fisher et al (2008) also noted that high levels of learning occur and learners feel good about themselves and the materials they are learning when teachers use instructional time efficiently. The way teachers interact with students influences their attitude toward school and their academic performance. How students perceive their teacher attitudes to teach in the classroom is highly essential and related to students' academic performance, (Ehinderro and Ajibade, 2008).

The development of environmental attitude is very essential for all citizens and professions to advance towards sustainable development. The task of education, training and information is to relay the environmental consequences of decisions and right solution modes for everyone, (Ogunbiyi, 2005). Knapp & Benton (2006) noted that education is supposed to communicate effectively to the public including the nature and magnitude of the environmental problems, and array of alternatives available for their solution and sufficient insight towards the right attitude and sustainable use of environmental resources must be emphasized in environmental education. Adegbile (2002) was of the opinion that teachers who wish to impact the knowledge including magnitude of these environmental problems must employ metacognitive (ability to monitor, use and control thinking skills) teaching strategies.

Experiential learning activities have been developed to foster student achievement in science. Researches carried out by Krapp, in Jegede (2007), Supplee, in Jolaoso (2012) both revealed that students benefit through experiential learning in their science classes by motivating students to contribute to their group, by learning cooperation skills and through enhanced self-esteem, more than using any other method that will not involve the learners in the teaching-learning affair. Kolb in his work has this to say "The more open-ended and non formulaic an assignment is, the more likely students will rely on their own experience and reflection and immerse themselves in the topic", meaning that learning by self-experience gives unlimited achievement in any course of study and more particularly in science, of which Biology is one. House as cited in Adeoye ((2007) found out in his work that more frequent use of experiential learning strategy during science lessons was significantly correlated with higher student achievement in science.

Scott and Sarkees-Wircenski (2008) emphasize that most environmental degradation programs are real-life in nature and should be experiential with students writing about what they learned, how they applied it and how they can become a better employee. Kolb and Kolb (2005) experiential learning theory also aligns with Scott and Sarkees-Wircenski in that experiential learning and real life learning are mutually supportive. While the nature of environmental degradation programs is similar throughout the country, the inclusion of experiential learning techniques throughout the students' learning experience can provides significant benefit according to Kolb and Kolb (2005). Many environmental degradation educators endorse the application of theoretical knowledge in a lab or environmental degradation setting as representing an experiential base that provides students with diverse learning opportunities and experiences. Doolittle and Camp (2009), state that experiential learning aligns with constructivism which posits that learners construct meaning from their experiences.

The rationale of observational learning is based on Bandura's (1986) social learning theory. It explains learning as a continuous interaction between cognitive, behavioural, and environmental influences. For effective modeling, several conditions need to be fulfilled; students need to pay attention to relevant elements in the learning environment; to store and transform information in memory; to be able to translate mental conceptions into actions and be motivated to do so.

Schunk and Zimmerman (2007) elaborated Bandura's theory into a social cognitive model of self-regulation in reading and writing. According to this model, learning of a new task occurs in four phases: observation, emulation, self-control, and self-regulation. Observation is a first step in the learning process. Then the learner emulates the model's general style. Encouraged by feedback, the learner can internalize the skill and finally use the strategy independently and in various contexts. Here, we focus on the first phase: observation. Observational learning is closely related to cognitive apprenticeship. In cognitive apprenticeship, an expert model externalizes internal processes. Collins, Brown, and Newman (2006) describe how observation, as an element of cognitive apprenticeship, provides strategic knowledge to the learner, and also changes students' conception of what the modeled skill involves.

Statement of the Problem

One of the reasons for the negative attitude to the subject identified by science educators that could be responsible (among other factors) for the poor attitude to Biology is the teachers' use of ineffective methods of teaching the subject.

It has been revealed through many researches that if new teaching strategies and technology that emphasize students' active participation in the learning process,

there may be positive attitude towards Biology. This research work therefore intends to investigate the effect of experiential and observational learning strategies on students', attitude towards Biology, in Oyo State. The study will further determine gender and mental ability as moderator variables.

Hypotheses

The following null hypotheses for the research will be tested at 0.05 level of significance.

H₀₁: There is no significant main effect of treatment on students' Achievement in Biology.

H₀₂: There is no significant main effect of gender on students' Achievement in Biology.

METHODOLOGY

This study adopts pretest, posttest, control group, quasi-experimental design.

Sample and Sampling Techniques

The test population will consist of senior secondary school two (SSII) students which will be randomly selected from four schools in Ibadan Southwest Local Government and Ido Local Government of Oyo state. From the population of SSII students, the sampled subjects consist of an intact class in each school. One class formed the experiential and observational learning techniques class while the remaining one served as the control group where conventional classroom teaching method was used. Two experienced teachers were assigned to teach the experimental and control groups. The two teachers selected to teach the subjects have been teaching Biology in the secondary school for the past eight years and are graduates of Biology education.

Research Instruments

Five instruments were used for the study and they are;

1. Students' attitude to environmental degradation questionnaire (SAEDQ)
2. Student's mental ability test (SMAT)
3. Teacher instructional guide on the;
4. Experiential learning techniques
5. Observational learning techniques
6. Conventional learning technique

Students' Attitude to Environmental Degradation Questionnaire (SAEDQ)

SAEDQ aimed at testing the affective domain of the students, particularly their attitude towards environmental degradation.

Section A: Consists of the personal data of the respondents in terms of gender, school, age etc.

Section B: This section assess students' attitude towards the environment. It consist of a twenty-item questionnaire rated on a four-point likert type ordinary scale ranging from Strongly agreed (SA), Agreed (A), Disagreed (D), to Strongly disagreed (SD).

Validation of SAEDQ

This instrument, which was developed by the researcher, was validated by four secondary school teachers and four science education lecturers in tertiary institutions. The reliability coefficient was calculated using Cronbach alpha $r = 0.81$.

Student's mental ability test (SMAT)

This test was made up of ten (10) multiple choice items with four options. The questions were prerequisite science concepts for the understanding of biology.

Validation of SMAT

Five experts in the field of science education and test construction were subject the test (SMAT) to face and content validity.

The reliability coefficient of the instrument was determined using Kuder – Richardson formula 20(KR20). The difficulty and discriminating indices of each test item was computed to further validate the instrument. The difficulty levels and the discrimination index range were found. The scores of the participants in the instrument were used to classify them into high and low science achievers.

Teacher Instructional Guide on the Experiential Learning Strategy

The experiential learning technique includes

- Step 1: Students are divided into small groups
- Step 2: Students follow instructions
- Step 3: Students relay their previous experience on each concept / topic
- Step 4: Students are exposed to new learning or experience through e.g. Measurements, observations and manipulation of apparatus
- Step 5: Students ask question based on the differences and similarities between their previous and their new experiences
- Step 6: Right and wrong conceptions are reconciled
- Step 7: Students put down notes.

Validity of Teacher Instructional Guide on the Experiential Learning Strategy

This contains the roles of the teacher and the students in Experiential learning situation. Expertise in the field of educational psychology that are knowledgeable in experiential learning techniques did the face validity while experts in biology education also did the editing of the guide.

Teacher Instructional Guide on the Observational Learning Strategy

Observational strategy has the following steps.

- Teacher presents the topic in form of demonstration and discussion
- Students in five member heterogeneous academic teams within the group will engage themselves in intensive observational study of the learnt materials by studying, workshops and drilling each other.
- Teacher will give questions on the topic to the students in form of quiz.
- Students will answer the questions individually without assistance from their mates.
- The average score of members of each student will be calculated to find the group's mark.
- The teacher will recognize and reward the best three groups.
- Teacher will give assignment to the students.

Validity of Teacher Instructional Guide on the Observational Learning Strategy

This contains the roles of the teacher and the students in Observational learning situation. Expertise in the field of educational psychology did the face validity and the editing of the guide.

Conventional Learning Technique Guide

This contains the roles of the teacher and the students in conventional learning situation. Expertise in the field of education did the face validity while experts in biology education did the editing of the guide.

Evaluation Sheet for Assessing Teachers' Performance on the Use of the Strategies (ESAT)

This is the guidelines for evaluating performance of the trained teachers on the effective use of these strategies

- (1) Experiential learning techniques
- (2) Observational technique.
- (3) Conventional technique.

This is a rating scale that is made up of two sections

Section A – This consisted of the personal data of the trained teacher containing name, school, period, class taught, date and the summary of the concept discussed in the class.

Section B - This consisted of items to be evaluated. The items were placed on a 5-point likert type rating scale ranging from Very Good (VG), Good (G) Average (AV) Poor (P) and Very Poor (VP).

The scoring of ESAT is as follows:

Very Good (VG)	- 5marks
Good (G)	- 4 marks
Average (AV)	- 3 marks
Poor (P)	- 2 marks
Very Poor (VP)	- 1 mark

Procedure for Data Collection

The procedure for data collection was in three main phases and it lasts for eight weeks. The phases were:

- Visitation to the schools for one week
 - One week for pre- test
 - Training of teachers(research assistance) for two weeks
 - Six weeks for treatment using the research assistant on the listed strategies. This takes place simultaneously in all the school selected.
 - One week for post - test
- (Prior to the collection of data, the participating teachers will be trained. The training program will last for two weeks. The training of the teachers will focus on the use of experiential and observational learning techniques and conventional technique.)

Pre-Test

The instrument was administered in the following order; students' attitude to environmental degradation questionnaire, follow by the student's mental ability test.

Treatment

i. Experimental Group

Experimental Group 1: Treatment in this group involves experiential learning technique in the following steps.

- | | |
|---------|--|
| Step 1: | Students are divided into small groups |
| Step 2: | Students follow instructions |
| Step 3: | Students relay their previous experience on each concept / topic |

- Step 4: Students are exposed to new learning or experience through e.g. Measurements, observations and manipulation of apparatus
- Step 5: Students ask question based on the differences and similarities between their previous and their new experiences
- Step 6: Right and wrong conceptions are reconciled
- Step 7: Students put down notes.

Experimental Group 2: Treatment in this group involves Observational learning techniques in the following steps.

- Teacher presents the topic in form of demonstration and discussion
- Students in five member heterogeneous academic teams within the group will engage themselves in intensive observational study of the learnt materials by studying, workshops and drilling each other.
- Teacher gives questions on the topic to the students in form of quiz.
- Students answer the questions individually without assistance from their mates.
- The average score of members of each student was calculated to find the group's mark.
- Teacher recognizes and rewards the best three groups.
- Teacher gives assignment to the students.

Control Group

Here students will sit individually and not in group throughout the lesson.

The treatment for each lesson involved the following steps:

- Teacher presents the lesson in form of lecture method.
- Students listen to the teacher and write down chalkboard summary.
- Students ask the teacher questions on areas of the topic that is not clear to them.
- Teacher asks the students questions and the students will answered individually.

Post Test

After six weeks of treatment, post-test will be administered on the experimental and the control groups. The students' attitude to environmental degradation Questionnaire (SAEDQ) was re-administered.

Procedure for Data Analysis

Analysis of data collected was done using Descriptive Statistics (mean, standard deviation) including Bar charts to explain the mean distribution of the various groups (Treatment, Gender and Mental ability). The data was also analyzed using inferential statistics of Analysis of Covariance (ANCOVA) of the posttest scores with the pretest scores as the covariates. Multiple classification analysis was used to determine

estimated marginal means of different groups. Scheffé post hoc test will be used where significant main effects were obtained. Line graphs were used to explain the significant interaction effects.

RESULT

H0₁: There is no significant main effect of treatment on students’ attitude to environmental degradation.

Table 1: Summary of ANCOVA of Posttest Achievement Scores by Treatment, Gender and Mental Ability

Source		Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Intercept	Hypothesis	63188.31	1	63188.31	40.05	.09	.97
	Error	1735.59	1.10	1577.61			
Pre achievement	Hypothesis	53.44	1	53.44	.66	.42	.00
	Error	13673.65	168	81.39			
Treatment	Hypothesis	7998.76	2	3999.38	25.83	.04*	.96
	Error	315.27	2.04	154.84			
Gender	Hypothesis	73.98	1	73.98	.66	.53	.32
	Error	156.71	1.39	112.57			
Mental ability	Hypothesis	4251.58	1	4251.58	190.03	.24	1.00
	Error	8.74	.39	22.37			
Treatment *Gender	Hypothesis	296.16	2	148.08	4.50	.18	.81
	Error	68.07	2.07	32.94			
Treatment *Mental ability	Hypothesis	88.71	2	44.36	1.25	.41	.48
	Error	96.29	2.70	35.61			
Gender *Mental ability	Hypothesis	12.35	1	12.35	.31	.61	.07
	Error	156.05	3.95	39.46			
Treatment *Gender* Mental ability	Hypothesis	65.23	2	32.61	.40	.67	.01
	Error	13673.65	168	81.39			

*Significant at p<.05

Table 1 shows that there is significant effect of treatment on students’ attitude to environmental degradation ($F_{(2,168)} = 25.83$; $P<.05$). This implies that the posttest attitude scores for the two experimental groups and control are significantly different. Hypothesis 1 is therefore, rejected.

Table 2: Estimated Marginal Means for Posttest Attitude Scores by Treatment

Treatment	N	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Experiential	50	55.76	1.45	52.90	58.62
Observational	90	52.44	2.35	47.81	57.07
Control	43	36.18	1.44	33.35	39.02

Table 2 shows that students in the Experiential group had the highest adjusted posttest attitude score ($X=55.76$), followed by those in the observational group ($X=52.44$), with the control group trailing behind ($X=36.18$).

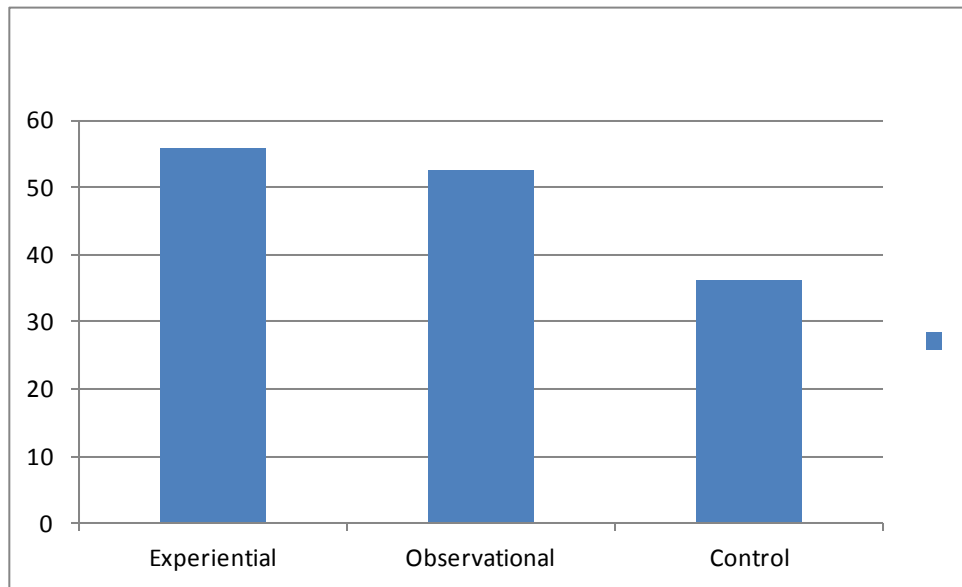


Figure 1: Estimated Marginal Means for Posttest Attitude Scores by Treatment

The actual source of significant main effect of treatment on students’ attitude is presented in Table 3.

Table 4: Scheffé Post hoc Analysis for Posttest Attitude Scores by Treatment

Treatment	N	Mean	Treatment		
			1.Experiential	2.Observational	3.Control
Experiential	50	55.76			*
Observational	90	52.44			*
Control	43	36.18	*	*	

*Pairs of groups significantly different at $p < .05$

Table 4 shows that the pairs of experiential versus control ($P < .05$) and Observational versus control ($P < .05$). These are the two sources of the significant main effect of treatment on students’ attitude. The pair: Experiential versus Observational did not contribute to it.

H0₂: There is no significant main effect of gender on students’ attitude to environmental degradation.

From Table 1, Gender has no significant effect on students’ attitude to environmental degradation ($F_{(1,170)} = .66; P > .05$). Hence, hypothesis 2b is not rejected.

Table 5: Estimated Marginal Means for Posttest Achievement Scores by Gender.

Gender	N	Mean	Student Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Male	76	47.15	1.46	44.27	50.03
Female	107	49.10	1.43	46.27	51.94

Table 5 shows that the female students had slightly higher attitude score ($X=49.10$) than their male counterparts ($X = 47.15$).

DISCUSSION

There was significant difference in the effect of treatment on attitude, this findings show that both strategies: experiential and observational strategies enhanced students' attitude above the conventional strategy. This result suggests that the experiential strategy and Observational strategies effectively disseminated the attitude of learners exposed to it than those exposed to conventional strategy. These may be attributed to steps involved in which the learners were allowed to engage in various learning activity that enable them to find out and develop their own knowledge of the concepts individually or use their thinking skills for planning and evaluation. This collaborate the findings of Okoli (2006) who reported that appropriate teaching strategies (i.e. investigative laboratory approach, hands-on-minds-on scientific activities) enable students to acquire science process skills.

The poor performance of the conventional strategy (conventional) in the post test attitude mean score when compare with the other treatment groups meant scores may not be unconnected with the fact that the group was exposed to the strategy which is teacher-centered conventional strategy to only allow students to listen passively, with little or no interaction with the teacher's collaborate with findings of Okolo (2006,) Akinwumi (2009), Martins and Oyebanji (2000) Olaoye and Adekoya (2010), Suleiman (2011). This is because conventional strategy often compels learners to the passive recipient position of fact subjected down to students by the teachers.

These findings is in mutual agreement with the findings of Ogundiwin (2013), Akinwumi (2009) Ajiboye (1996), Ige (1998) Olagunju (1998) and Bora (2003) who found that gender did not have a significant man effect on students achievement. The reason was that both male and female were given the same opportunity to participate actively in the process of knowledge and attitude.

EDUCATIONAL IMPLICATIONS

The exposure of the learners to experiential and observational strategies has been found to positively affect the improvement of students' attitude towards biological concepts. The findings have showed the importance of using teaching strategies that are participatory and students' centre where students are trained to take control and direct their learning process for effective learning.

The study also revealed that there is need for total involvement in our educational system the experiential and observational strategies that could help in providing quick and easy understanding and assimilation of biological concepts.

Teachers should take cognizance of students' level of mental ability in soliciting learning and impact right and necessary attitude towards science. Most of the academic problems encountered by students in learning could be described in term, of their mental ability level (some students are fall into the low and high mental ability); for the mental ability determine the performance of the students. Therefore special attention should be given to learners' mental ability in relation to the choice of strategies that the teacher will apply in the classroom.

RECOMMENDATIONS

Based on the results and discussion, the following recommendations are advanced

- (1) Experiential and observational strategies should be adapted as viable strategies for studying concepts in biology. This will enable students to improve attitude of students to biology.
- (2) The teacher training curriculum at all levels of education should be upgraded to education that related to the real life situation by incorporating (i.e. activity innovative pedagogical strategies bases instructional strategies such as experiential and observational strategies).
- (3) Teaching strategies like experiential and observational strategies learning that reduce the gender difference in biological concepts attitude as recorded in this research work could be used to reduce learning anxiety for both sex (male and female) students.
- (4) Government should utilize the services of various bodies such as Science Teachers Association of Nigeria (STAN); All Nigeria Conferences of Principals of Secondary Schools (ANCOPSS); National Union of Teachers (NUT); and faculties/institutes of education in the universities to organize in services training programmes, workshops, conferences and seminars for serving biology teachers to update their knowledge on the issue of innovate teaching strategies such as experiential and observational strategies that can enhance acquisition of right attitude by biology students.

REFERENCES

- Adeoye O.R. (2014) Experiential and Observational Learning Techniques and their Effect on Secondary School Biology Students' Performance and Attitude to Environmental Degradation an Unpublished M.Ed Dissertation University of Ibadan.

Adeoye, O.R.

Adesoji, F.A. (2008). Managing Students Attitude toward Science through Problem-Solving Instruction Strategy, *Anthropologist* 10(1), 21-24.

Adodo, S.O. (2007). Correlates of Students Variables and Achievement in Integrated Science; *Journal of Educational Research and Development*. 1(2) 208-214.

Afuwape, M.O and Olatoye, R.A. (2004). Improving Students' Achievement in Integrated Science. The Role of Simulation, Game and Numerical Ability. Programme and Abstract European Conference on Research in Chemical Education. 24th-28th August, Ljubljana, Slovenia. Pgs, 39-41.

Akinwumi I.O., (2009). Effects of Inquiry Strategy on the Achievement of Senior Secondary School Students in Biology. *Unpublished M.Ed Thesis University of Ibadan*.

Bandura, A. (1962). *Social Learning through Imitation*, University of Nebraska Press; Lincoln, N.E.

Bandura, A. (1997). *Social Foundations of Thought and Action: A Social Cognitive Theory*, New York: Prentice Hall.

Bora, B., (2003). Values Education Strategies: Implication for Teaching Environmental Education. *Conner Stone Journal of Values Education* 40 (1) pp. 19-37.

Chamber, D. G (2009). The Effects of Gender-Based Class Grouping on Middle School Student Achievement: Teachers' Administrators' and Parents' Perceptions. Ed. D, Anambra State University, CIA World Facebook 2010, 'Nigeria.

Chen Q. (2009). Family Background, Ability and Student Achievement in Rural China: Identifying the Effects of Unobservable Ability Using Famine-Generated Instruments. *Gansu Survey of Children and Families Papers*.

Eggen P.D. & Kauchak D.P. (2006). *Strategies and Models for Teachers Teaching Content and Thinking Skills*, 5th Edition, Pearson Education Inc.

Federal Government of Nigeria (FME) (2004). *Nigerian National Policy on Education (Revised)* Yaba, Lagos. NERDC Press (ed).

Federal Ministry of Education (FME) (2007). *9-Year Basic Education Curriculum: Basic Science*. Abuja: Nigerian Educational Research and Development Council (NERDC).

- Gale (2013). Encyclopedia of Education, Encyclopedia of Education Parenting Influence of Parents Level of Education. Date Retrieved, 15/03/2013.
- Jiusto, S. and DiBiasio, D. (2006). Experiential Learning Environments: Do They Prepare Our Students to be Self-Directed, Life-Long Learners? *Journal of Engineering Education*.
- Juch, A. (2003). Personal Development: Theory and Practice in Management Training. Chichester, UK: Wiley.
- Knapp, D., & Benton, G.M. (2006). Episodic and Semantic Memories of a Residential Environmental Education Program. *Environmental Education Research*, 12(2), 165- 177.
- Kolb, Alice Y. and Kolb, David A. (2005). Learning Styles and Learning Spaces: Enhancing Experiential Learning in Higher Education. *Academy of Management Learning & Education*. Vol. 4, No. 2, 193 – 212.
- NERDC (2007). Nigerian Educational Research and Development Council: Universal Basic Education Commission. Abu.
- Ogundiwin O.A (2013). Effect of Pre-Theoretic Intuition Quiz and Puzzle-Based Critical Thinking Motivation Strategies on Students Learning Outcomes in Selected Environment Related Concepts, in Biology. Unpublished PhD Thesis Submitted to Teacher Education Department University of Ibadan, Ibadan.
- Olatoye R.A and Adekoya Y.M. (2010). Effect of Project Based Demonstration and Lecture Teaching Strategies on Senior Secondary Students Achievement in an Aspect of Agricultural Science. *International Journal of Educational Research and Technology* 1.1.19-29.
- Oludipe, D.I. 2011. Developing Nigerian Integrated Science Curriculum. *Journal of Soil Science and Environmental Management* 2.8: 134-145.<http://www.academicjournals.org/JSSEM>.
- Osborne, J., Simon, S. & Collins, S. 2003. Attitudes towards Science: A Review of the Literature and Its Implications. *International Journal of Science Education*, 25((9) 1049 – 1079.
- Oyediran, A.M, Agoro, A.A. & Fabiyi, O.O. 2004. A Multimedia Approach to the Teaching of Some Difficult Topics in Integrated Science. *Journal of the Science Teachers, Association of Nigerian* 39.1.2: 108-112.