GENDER AND TEACHING METHODS AS DETERMINANTS OF SECONDARY SCHOOL STUDENTS' PERFORMANCE AND RETENTION ON THE CONCEPT OF CARBOHYDRATES IN BIOLOGY IN IKOT EKPENE LOCAL GOVERNMENT AREA

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ABSTRACT

The study investigated gender and teaching methods as determinants of secondary school students' performance and retention on the concept of carbohydrates in biology in Ikot Ekpene Local Government Area. The population of this study consisted of six hundred and fifty-six (656) Senior Secondary Two (SS2) Biology Students in all the seven (7) Senior Secondary Schools in the Local Government Area during 2013/2014 school year. The study adopted a quasi-experimental, employing the pre-test, post-test non-equivalent control group design. The data obtained from pre-test and retention test instruments tagged "Cognitive Ability Test and Biology Achievement Test on Carbohydrate" were analysis of covariance (ANCOVA), with pre-test as covariates while all the hypotheses were tested at.05 alpha. The instrument was vetted by expert in biology and test and measurement before the reliability test was conducted with 30 respondents. The test produced the reliability coefficient of 0.89and this proved the instrument to be reliable for the study. From the results of the data analysis, it was observed that there is no significant influence of gender on the performances of students on the concept of carbohydrate nutrients when taught with Demonstration, Computer-Assisted Instruction and Guided-Inquiry teaching approaches". It was also observed that there is no significant influence of gender on the retention of students on the concept of carbohydrate nutrients when taught with Demonstration, Computer-Assisted Instruction and Guided-Inquiry teaching approaches". It was concluded that gender does not affect students' performances and retention on the concept of carbohydrate nutrients when taught with Demonstration, Computer-Assisted Instruction and Guided-Inquiry teaching approaches. One of the recommendations was that there should be provision of equal access to educational opportunities for all citizens of the country at all levels of education irrespective of sex or tribe as it will enhance teaching and learning effectively.

KEYWORDS: **Gender, Performance, Students, Concept of Carbohydrates, Demonstration, Computer-Assisted Instruction and Guided-Inquiry Teaching Approaches, Retention**

Introduction

Science teachers, educators and curriculum designers have over the years engaged in the reviewing of secondary school science curriculum in an attempt to make students learn science through "hands-on" experience. The importance of

biology in our society is no longer in doubt. Nigeria has become one of the greatest importers of food in tropical Africa (Iliyasu, Hamidu and Anwal, 2001), consequently, poverty and hungers are still experienced in most homes. They added that many people are too poor to feed themselves or to satisfy their most basic and elementary requirement for human survival. Biological knowledge has contributed immensely to various aspects of life such that the conversation of natural resources, food production, better health care and proper family life.

One of the objectives of junior and senior secondary school Education in Nigeria is to inculcate in children permanent literacy and numeracy and the ability to communicate effectively. The objectives according to Onwu (1999) include the need to prepare students to observe and explore the environment to explain simple natural phenomena and to develop scientific attitudes such as curiosity, critical reflection and objectivity. Also, to enable students apply the skills and knowledge gained through science to solve everyday problems in the environment, and to develop self-confidence and self-reliance through problem solving activities in science. On students' performance and gender in West African Senior School Certificate Examination (WASSCE), for the years under review by Onwioduokit (2013), male students performed consistently better than their female counterparts (Appendix 1).

Achievement is an important academic factor that has been identified to be influenced by teaching methods. According to Opara (2011), teaching methods influences students' achievement in Biology. However, some biology teachers do not discriminate in the method they use in teaching. They teach all aspects of biology by lecture method (Okafor, 2002), this may be one reason for poor performance of students in this subject (Biology). It is time teachers of science begin to vary in the methods/strategies they use to teach the different aspects for effective measures, so that students would be able to learn more, retain more, and apply what is learnt by engaging in significant activities. It is on the basis of improving students learning in biology, that the study focuses the influence of gender on students' performances and students' retention of the concept of carbohydrates in biology when taught with Demonstration, Computer Assisted Instruction and Inquiry approaches.

Statement of the Problem

The decline in academic performance of students in biology over the years has been a source of concern to teachers, parents, educators and the general public. There have also been debates among researchers over which variables influence student's academic performance. In spite of the efforts made in teaching to enhance student's academic performance in Biology, it appears that this condition gets deteriorating as their academic performance continues to dwindle.

The way students learn is as important as the way they are learning. The use of appropriate teaching methods would enhance effective retention of the concepts of carbohydrates for subsequent recall and use in examinations. Strategies used in the teaching of biology do seem to have helped in improving students' academic achievement and retention. It is therefore inevitable to try out other teaching approaches that could enhance effective teaching and learning of biology, though Igwue (1990) indicated that there is no one best method. Studies, however, show that some methods are more effective than others (Nwosu + Nzewi, 1990). It is therefore pertinent to find out the extent to which gender influences students' performances and students' retention of the concept of carbohydrates in biology when taught with Demonstration, Computer Assisted Instruction and Inquiry approaches.

Purpose of the study

The purpose of this study is to determine the influence of gender on students' performances and students' retention of the concept of carbohydrates in biology when taught with Demonstration, Computer Assisted Instruction and Inquiry approaches. Specifically, the study is designed to achieve the following objectives:

1. To ascertain the influence of gender on students' performance on the concept of carbohydrates in biology when taught with Demonstration, Computer Assisted Instruction and Inquiry approaches.

II. To ascertain the influence of gender on students' retention on the concept of carbohydrates in biology when taught with Demonstration, Computer Assisted Instruction and Inquiry approaches.

Research Questions

In order to achieve the above stated objectives, this study will attempt to provide answers to the following research questions:

I. How does gender influence the performance of students on the concept of carbohydrates when taught with Demonstration, Computer-Assisted Instruction and Guided-Inquiry teaching approaches?
II. How does gender differentiate the retention of students on the concept of carbohydrates when taught with Demonstration, Computer-Assisted Instruction and Guided-Inquiry teaching approaches?

Research Hypotheses

The following null hypotheses were formulated to guide the study:

I. There is no significant influence of gender on the performance of students on the concept of carbohydrates when taught with Demonstration, Computer Assisted Instruction and Guided-Inquiry teaching approaches.
II. There is no significant influence of gender on the retentions on the concept of carbohydrates when taught with Demonstration, Computer-Assisted Instruction and Guided-Inquiry teaching approaches.

Review of Related Literature

Bandura – Learning Theory (1977)

Albert Bandura was a Social psychologist of Canadian descent who worked in America. Albert Bandura Social Learning Theory (IMCC) states that behavior is learned from the environment through the process of observation. Albert Bandura Social Learning theory commonly referred to as observational or imitation theory is primarily based on what a child learns in his environment, interaction and observation of others (Okoli, IIOOII). Children observed the people around them behaving in various ways. Individuals that are observed are called models. In the society, children are surrounded by many influential models such as parents within the family, members of the peer group and teachers at school. These models provide examples of behavior to be observed and imitated. This theory has a wide application in students' theories of learning in order to provide a comprehensive model that could account for the wide range of learning experiences that occur in the real world. This theory is concerned with personality development (Sprint Hall and Print Hall, IMDI). Social theorists believe that personality is simply something that is learned. It is the sum total of all the ways we have learned to act, think and feel (Sprint Hall and Print Hall, IMDI). This theory is described as such because it concerns itself with learning from other people in the society. According to Okoli (IIOOII), an inadequate environment will result in inadequate personality development. This is described as Reciprocal Determinism. This model consists of three main factors: behavior, person (cognitive) and environment. These factors interact to influence learning.

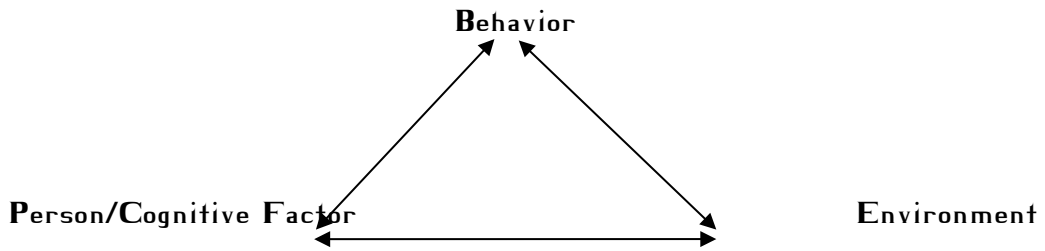

Figure 1: Bandura Model

Source: Bandura, 1977

Social learning theory rest heavily on the concept of modeling or learning by observing behavior. Bandura (IMCC) outlines three types of modeling stimuli to include:

- **Live Model:** This involves an actual person demonstrating the desired behavior. This is applicable in demonstration teaching techniques.
- **Verbal Instruction Model:** This involves an individual describing the desired behavior in detail who instructs the participants on how to engage in the behavior. This is an application in the enquiry teaching approach.
- **Symbolic Model:** This involves modeling occurring by means of the media which include movies, television, internet, radio and literature. This modeling has a wide application in the computer-assisted instruction approach. According to Bandura (IMCC) whatever information is gleaned from observation, is influence by the type of model as well as a series of the following cognitive and behavioral processes:
- **Attention:** In order to learn or observe behavior, the observer must pay attention. Any damper on attention decreases learning. For example, if an observer is sleepy, groggy, drugged, sick, nervous or hyper, learning is decreased. Accordingly, the characteristics of a model influences attention. For example, if a model is colorful and dramatic, attractive or prestigious, appears to be particularly competent. Computer-assisted instructional approach adapts these variables. The use of televisions has a high enhancing influence on students' performance and retention.
- **Retention:** In order to reproduce (remember) an observed behavior, the observer must remember features of the behavior (imagery and language). The observer (learner) features what the model is doing in the form of mental images or verbal descriptions. When these features are stored, they can later be "brought up" for the purpose of reproduction in the learner's behavior. This process is consequently, influenced by observers' characteristics (cognitive capabilities, cognitive rehearsal) and event characteristics (complexity).
- **Reproduction:** This involves translation of the images or description into actual behavior. Observer's characteristics that affect reproduction include cognitive capabilities and previous performance.
- **Motivation:** The decision of an observer (learner) to reproduce or refrain from reproducing an observed behavior is dependent on the motivations and expectations of the observer along with the anticipated consequences and internal standards. Smith (IMDV), opines that social learning is a powerful principal of operation of demonstration method. In this method, the student observes another person (teacher) who serves as a model and then proceed to imitate what the model does. According to Feldman (IMMV), Social Learning is facilitated by a number of factors which includes attention, memory, motor skills, reinforcement, and identification.

Gender and Academic Achievement

Keller (IMMI) defines gender as a cultural construct that distinguishes the role, behavior, mental and emotional characteristics between female and males developed by a society. Gender can be looked at in terms of a psychological term used to describe the basis of being born of either female or male (Basow, IMMI). Basow sees genders' role as not being born of either male or female. Gender is defined as the social differences and relations between men and women which are learned and varied widely among societies and culture, and change over time. Okeke noted that gender

deals with roles, responsibilities, constraints and opportunities the society grant for man or woman.

Ukwungwu (IIOOII) observed no gender superiority in academic performance. Popoola (IIOIO) maintained that if both groups learn the same thing, they are likely to achieve the habit the same way. Adigwe (IMMII) also saw girls as having a predominantly low interest in science and technology while boys are seen to be more practically, more scientifically and more technologically oriented. Such reports together with cultural expectations and stereotype held about sex roles have caused tremendous damage to women's education. In many developing countries, women education has only been taken seriously within the last decade. In Nigeria, the campaign for women education has only recently received government approval. Nigerian cultural expectations and stereotypes held about sex roles have significant effects on female performance. Such feminine roles include the fact that a woman's place is in the kitchen.

Ogunleye (IMMM) observed that male and female students' performance equally on acquisition of science process skill tests. Onwioduokit (IMML) on effects of gender difference among undergraduate students' academic achievement in science concluded that women's performance in science was not significantly different from that of their male counterparts. Shaibu and Mari (IIOOO) revealed that female students performed significantly better than male students in their understanding of science process skill, while males perform better than females in the ability to solve problems in science. Erinosho (IMMV) and Nsofor (IIOOI) seem to concur that both males and females could do well in science if exposed to similar learning conditions. Archibong (IMMC) reported no significant difference in the achievement of female and male students exposed to certain chemical concepts. Anagbogu (IIOOIII) compared the performance of boys and girls using scientific training manual. The study showed that a new approach to teaching of science will improve scientific performance of girls in the study of science. In the result, girls performed better than boys using strategies that were human oriented.

Isyaku and Kago (IMML) examined the effect of sex in the academic performance of field-independent junior secondary school II children in Sokoto State. The analysis of the data obtained showed that there was difference in their academic achievement with female independents and female dependents showing superiority over their male counterparts. This reason adduced was that the female students came from schools with best teachers and learning materials. Sonumesi (IMMV) reported that there was no significant difference in the academic attainments of female field-independent and male field-independent Senior Secondary II students in biology. On the contrary, Tobin and Garnet (IMDC) observed that the female field-dependent students scored significantly high in the biology achievement test than their male counterparts (Tobin and Garnete, IMDC).

The provision of equal access to educational opportunities for all citizens of the country at all levels of education irrespective of sex or tribe has become very vital for achievement of the MDGs. Okeke (IIOOC) indicates that females are grossly under-achievers in STEM disciplines. Oloyede (IIOII) noted that female under-achievement in STEM disciplines. Oloyede (IIOII) noted that female under-achievement in STEM is historical and has been brought about by several interrelated socio-cultural and interacting school factors which act jointly and singly to suppress female interest, enrolment, participation and achievement in STEM education at various levels of the Nigerian education system. These factors include sex-stereotyping, gender bias in curriculum materials, science teaching strategies used by STEM teachers, low expectation of female students and sexual harassment of females.

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Many reports have shown that women are still disadvantaged in Nigeria. For example, John and Davou (IIOOD) reported that percentage of educated females in Nigeria as IIIII% and Males LC%. Improvement in girl-child access to education has been reported by Dantata (IIOOV). Perhaps with many recent reforms surging up in education, increased awareness of the MDGs, many conferences and seminars addressing the issue of gender equality, the situation may or may not have improved.

There is evidence that gender stereotyping in science and female under-achievement as reported by Okeke (2006) and Oloyede (2011) still manifest in schools. Perhaps most female students still consider science subjects as more suitable for males. If this perception is not urgently curbed, the realization of the gender equality of the MDGs may still remain farfetched. Research findings by Oloyede (2011) showed that female students perform better than males in both Physics and Chemistry. This is quite encouraging, contrary to the popular notion of under achievement of girls in science and reported by Nwaiwu and Audu (2008) and Okeke (2006). Research findings indicate great hope that gender equality, as one of the MDGs, could be attained if urgent attention is given to sensitization of female students to choose science subjects in Senior Secondary, especially those who consistently did well in Basic Science at the JSS level.

METHODS

Research Design

The study was quasi-experimental, employing the pre-test, post-test non-equivalent control group design. There was no randomization of subjects in the study. Intact classes were assigned to the three experimental groups, demonstration, computer-assisted instruction and guided-inquiry approaches.

Area of the Study

The research area for this study was Ikot Ekpene Local Government of Akwa Ibom State. Ikot Ekpene Local Government is made up of 4 local government areas with head quarters at Ikot Ekpene town.

Population of the Study

The population of this study comprised all the six hundred and fifty-six (656) Senior Secondary Two (SS2) Biology Students in all the seven (7) Senior Secondary Schools in the Local Government Area during 2013/2014 school year (Ikot Ekpene LEC Report, 2014).

Sample and Sampling Techniques

The sample for this study was two hundred and sixty-four (264) Senior Secondary Two (SS2) Biology Students representing 40.24% of the target population in six intact Biology classes of the six (6) co-educational Senior Secondary schools in Ikot Ekpene Government Area. Stratified random sampling technique was used in selecting the sampled schools. Simple random sampling method (paper balloting) was used to assign each of the three school to each of the experimental groups (Demonstration, Computer-Assisted Instruction and Guided-Inquiry). This assignment of schools took place in both urban and rural areas of the Local Government Area.

Instrumentation

The following researcher developed instruments were used to collect data for the study

1. Cognitive Ability (CAT)
2. Biology Achievement Test on Carbohydrate, BATC

Cognitive Ability Test (CAT): The cognitive Ability Test (CAT) was designed to measure the respondents understanding of basic biological concepts studied in their earlier lessons. It consisted of twenty-five (25) multiple choice objective test items.

Biology Achievement Test on Carbohydrate: The biology Achievement Test on Carbohydrate (BATC) was a twenty-five (25) items, 5 options multiplechoice objective test was developed to measure the students understanding of the concept investigated.

Validation of the Instruments

The two research instruments (cognitive Ability Test (CAT) and Biology Achievement Test (BAT) were subjected to both content and face validity Validation copies of the instrument were sent to experts in educational measurement and evaluation, specialists in science education and experienced biology teachers.

Reliability of the Instrument

Field Trial: Biology-Achievement Test on carbohydrate (BATC) was used for the field-trial. Biology Achievement Test on carbohydrate (BATC) was administered to thirty (IIIO boys and IX girls) senior secondary biology two (SSII) students form one senior secondary school in Essien Udim Local Government Area that did not form part of the sample for the study. Their responses to the package and indeed their scores were determined. The test score was used to establish the reliability, difficulty and discrimination indices of the research instrument. Such responses were subjected to an internal consistency reliability test using Kuder Richardson Kr-III formula (Ali, IIOOL).

Method of Data Analysis

The data obtained from pre-test and retention test instruments were analysis of covariance (ANCOVA), with pre-test as covariates. All the hypotheses were tested at.OX alpha.

RESULTS AND DISCUSSIONS

Results

Answering the Research Questions

Research Questions

Research Question One

How does gender influence the performance of students on the concept of carbohydrate when taught with Demonstration, Computer-Assisted Instruction and Guided-Inquiry teaching approaches?

Table 1: Mean and Standard Deviation of students' pre-test and post-test scores classified by treatment groups or Gender

Treatment Groups	Gender	Sample Size (n)	Pre test		Post-test		Mean Difference
			$\bar{X}$	SD	$\bar{X}$	SD	
Demonstration	Male	VII	IIII. XC	III. MIII	LX. XII	V. IIIII	VII. MX
	Female	VV	IIC. LV	X. ML	XIII. XM	L. IIIX	IIX. MX
Computer-Assisted Instruction	Male	VC	IIX. MV	L. MM	LV. IIII	L. LM	IIID. IM
	Female	VO	IIII. DO	X. CL	LV. MO	L. VV	VII. IO
				Dr Aniekan Udeme-Obong			
Guided-Inquiry	Male	VI	IIM. XL	X. IIII	XX. OII	C. MIII	IIX. VL
	Female	XO	IIII. ML	V. LIII	XX. IIIL	L. MII	IIIII. VO

In table I, the post-test, pre-test means differences displayed are VII. MX and IIX. MX respectively, for the male and female students taught using Demonstration method, for that for the male and female students in Computer Assisted Instruction group are IIID. IM and VII. IO respectively, while the scores of their counterparts taught with Guided Inquiry approach are IIX. VL and IIIII. VO respectively. A comparison of these results shows that Demonstration method had the best enhancing effect on the performance of the male and females while the female students benefitted most from the Computer Assisted Instruction.

Research Question Two: How does gender differentiate the retention of students on the concept of carbohydrate when taught with demonstration, Computer-Assisted Instruction and Guided-Inquiry teaching approaches?

Table 2: Mean and Standard Deviation of students' pre-test and retention scores classified by treatment groups and Gender

Treatment	Gender	Sample	Pre test	Post-test	Mean

Groups		Size (n)	$\bar{X}$	SD	$\bar{X}$	SD	Difference
Demonstration	Male	VII	IIII. XC	III. MIII	XIII. MX	V. XL	IIII. IIID
	Female	VV	IIC. LV	X. ML	VC. MI	X. MM	IIO. IIC
Computer-Assisted Instruction	Male	VC	IIX. MV	L. MM	VM. OL	L. XM	IIIII. II
	Female	VO	IIII. DO	X. CL	XD. MO	C. IM	IIIL. IO
Guided-Inquiry	Male	VI	IIM. XL	X. IIII	VD. IIIM	L. LD	ID. DIII
	Female	XO	IIII. ML	V. LIII	VD. DO	C. IIC	IIX. DV

In table II, the retention pre-test mean differences displayed are IIII. IIID and IIO. IIC respectively, for the male and female students taught using Demonstration method; that for the male and female students in Computer Assisted Instruction group are IIIII. II and IIIL. IO respectively, while the scores of their counterparts taught with Guided Inquiry approach are ID. DIII and IIX. DV respectively. A comparison of these results shows that Demonstration method had the best enhancing effect on the retention of the male students while the female students benefitted most from the Computer Assisted Instruction.

Hypotheses Testing

Hypothesis One

There is no significant influence of gender on the performance of students on the concept of carbohydrate when taught with Demonstration, Computer-Assisted Instruction and Guided-Inquiry teaching approaches.

Table 3: Summary of Analysis of Covariance (ANCOVA) of students' post-test scores classified by treatment groups and gender with pre-test as covariate.

Source of Variation	Sum of Square	df	Mean Square	F-cal	Sig.	Decision at p<.05
Covariate: *Pre-test*	CL. IIIII	I	CL. IIIII	I. CM	. ID	Ns
Main Effects: *Instructional Methods*	IOIIID. LII	II	XIM. IIII	III. ID	. OO	S
gender	IIII. CV	I	IIII. CV	. IIIII	. XC	Ns
Interaction Effects:						
Instructional Methods Gender*	VXMD. OM	II	IIIIMM. OX	X. MII	. OO	S
Error	IOMXD. III	IIXC	Dr Aniekan Udeme-Obong			
Total	ICXDII. XIII	IILIII				

R Squared = .IIICC (Adjusted R Squared = .IIILII)

In Table III, the Calculated F-Value for the main effect of gender on the students' performances, given instructional methods, at df I, IIXC is .IIIII, while its corresponding significant level is .XC alpha. This reflects a significant influence on the performances of the students in carbohydrate nutrients when taught with Demonstration method, Computer Assisted Instruction and Guided-Inquiry approach. Hence, Hypothesis one which assumed that "There is no significant influence of gender on the performances of students on the concept of carbohydrate nutrients when taught with Demonstration, Computer-Assisted Instruction and Guided-Inquiry teaching approaches" was upheld. The finding was therefore in agreement with the finding of Onwihrhiren (IIOOII) who asserted that no significant interaction exists between teaching strategies and gender of students' academic performance and retention of scientific concepts.

Hypothesis Two: There is no significant influence of gender on the retention of students on the concept of carbohydrate nutrients when taught with Demonstration, Computer-Assisted Instruction and Guided-Inquiry teaching approaches.

Table 4: Summary of Analysis of Covariance (ANCOVA) of students' retention scores classified by treatment groups and gender with pre-test as covariate

Source of Variation	Sum of Square	df	Mean square	F-cal	Sig.	Decision at p<.0X
Covariate: *Pre-test*	III. VC	I	III. VC	. XI	. VD	Ns
Main Effects: *Instructional Methods gender*	IIIIIID. IIX	II	LIM. IIII	IV. CD	. 00	S
	I0C. XC	I	I0C. XC	II. XC	. II	Ns
Interaction Effects:						
*Instructional Methods*Gender*	IIVIII. DIII	II	IIIOL. VI	IID. D0	. 00	S
Error	I0CLL. IIV	IIXC	VI. DM			
Total	IVCLC. MV	IILIII				

R Squared = .IICI (Adjusted R Squared = .IIXV)

Table v showed a calculated F-ratio for the main effect of gender on the students' retention, given instructional methods, at df I, IIXC as II. XC, while its corresponding significant level is .II alpha. This significant level is greater than e.0X, indicating that gender had no significant influence on the retention of the students in carbohydrate nutrients when taught with Demonstration method, Computer Assisted Instruction and Guided-Inquiry approach. Hence, Hypothesis II which assumed that "There is no significant influence of gender on the retention of students on the concept of carbohydrate nutrients when taught with Demonstration, Computer-Assisted Instruction and Guided-Inquiry teaching approaches" □ was upheld. The result therefore agrees with the report of Popoola (IIOI0) who highlighted that there is no significant interaction effect exists among teaching approaches (demonstration, computer-assisted instruction and guided-inquiry), gender and retention of biology concepts.

Conclusion

Based on the observations made in this study it is concluded that: there is no significant influence of gender on the performances of students on the concept of carbohydrate nutrients when taught with Demonstration, Computer-Assisted Instruction and Guided-Inquiry teaching approaches and that there is no significant influence of gender on the retention of students on the concept of carbohydrate nutrients when taught with Demonstration, Computer-Assisted Instruction and Guided-Inquiry teaching approaches.

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Recommendations

I. There should be provision of equal access to educational opportunities for all citizens of the country at all levels of education irrespective of sex or tribe as it will enhance teaching and learning effectively.
II. Textbook authors should adopt computer-assisted instruction and demonstration teaching approaches in presenting materials and activities in their books.

REFERENCES

Adigwe, J. C. (IMMII). General Deference in Solving Chemical Problems Among Nigerian StudentsResearch *in Science and Technology Education,10(2):20-22*

Ali, A. (IIOOL). Conducting Research in Education and the Social Sciences. Enugu: Tashiqa Networks Ltd, pp. M-ID

Anagbogu M.A. (IIOOIII) Developing New Strategies for Teaching Girl-Child Science and technology in the Net minimum Benin *Journal Educational Studies, 1*C(I+II):IIIO-IIIII.

Archibong, A. U. (IMMC). The relative Effectiveness of Activity-Bases Approach and Lecture Method on the Cognitive Achievement and Integrated Science Students. *Journal of Science Teachers' Association of Nigeria, 32 (1&2):37-42*

Bandura A, (IMCC) *Social Learning Theory, Englewood Cliffs: Prentice-Hall, PP.191-215.*

Basow, S. E (IMMI) Gender Role and Achievement in Science. *Journal of Technical Education, 1(2):165-168.*

Dantata, G.B.F. (IIOOV) General and Child Right Issues and Education for Sustainable Development Proceedings of the National Conference of Institute for Development of Research, ABU

Feldman, R.S. (IMML). Understanding Psychology.Boston McGraw □ Hill Book. Cop. IIM

Iliyasu, A. Y. Hamidu and Anwal, IIOOL), Agricultural Education: A panacea to Food Security and poverty Eradiation: *Nigeria Journal of Professional Teachers, 1 (49-51*

Isyaku and Kalgo, F.A. (IMML). Deference in Academic Achievement of FieldIndependent/Dependents: Junior Secondary School of Teacher Sokoto State. *Journal of Teacher Education, 7, 71-97.*

John, G.M. S. M and Davou, (IIOOD). Gender Imbalance in Women's Right Issues and Education.Academic Staff Union (ASU) in Nigeria. Reseedings of III[rd] National Conference of Collages of Education, Grinder Chapter, III-IIV October, IIOOD

Keller, S. S. (IMMI). Gender Effect and Career in Science.*Journal of Science Education, 1(27):761-765.*

Nwaiwu,N. E. and Audu, B. (IIOOX) Influence Factor in Female Engineering and Technical Education in Nigeria. Knowledge Review: IO(I):D-II

Nwosu, A.A. and Nzewi, U M. (IMMD).Using the Constructivist Model to Communicate Science.IIIM[th] STAN Annual Conference, Proceeding, IIIVM-IIIXIII.

Dr Aniekan Udeme-Obong

Ogunleye, W. G. (IMMM). *Science Education in Nigeria.*Lagos: Sunshine International Publication Ltd.

Okafor, P.N. (IIOOII). Laboratory Resources and Utilization as Correlates of Chemistry Students' Learning Outcomes. VI[st] STAN Annual Conference Proceedings, pp. ILM-ICC.

Okeke, E.A.C. (2006). Making Science Education Accessible to all *Inaugural Lecture of the University of Nigeria, Nsukka, August 9.*

Oloyede, O.I. (2011), Gender-Based Imbalances on Women's right issues and Reform in STEM Education Nigeria STAN Conference Proceedings. August, pp, 220-228.

Okoli, G. (2001). *Readings Psychology of Leaning.* A Simplified Approached. Lagos, God's Glory Publishing Co.

Onwioduokit, F. A. (1994) The relative Effect of Ausubelian and Gagne Sequences of Instruction on Students' Performance. Journal *of Science and Science Education, 3(1) 65-75.*

Onwioduokit, F.A. (2010). The Ordeal of Science Teaching in the Contemporary Society A Need for Paradigm Shift for the new Generation. 34th*Inaugural Lecture Series.University of Uyo, Uyo.*

Popoola, F. R. (2010). Opinions of Male and Female Students of Gender Difference in Mathematics Learning in Nigeria. *International Journal of Research in Education, 2(1):107-116.*

Shaibu, A. A. + Mari, J. S. (2000).*Encyclopedia of Informal Education.*Birmingham: Methuen + co. Ltd.

Smith, M. U. + Good, R. (1987).Problem-solving and Classical Genetics.*Successful Journal of Research in Science Teaching,* 23 (2):387-423.

Sonumesi,R. K. (1997). Students Cognitive Styles and Achievement in Chemistry on Unpublished B.Sc. (ed.) Project, Adeyemi Collage of Education, Ondo.

SprintHall, R. C. and Print Hall, N. A. (1983). Educational psychology: A Development Approach. New York: Addition Wesley publishing Company.

Tobin, K. and Garnette, P. (1983). Gender Related Differences' in Science Activities *Journal of Science Education, 7(1): 91-103.*

Ukwungwu, J.O. (2001). Gender deference Study of Performance of Integrated Science, A Summary of Studies conducted in Nigeria. *Journal of Science Teachers Association of Nigeria (STAN). 37(1&2):55-59.*