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EFFECTS OF DRILL-AND-PRACTICE MODE OF COMPUTER- ASSISTED-INSTRUCTION ON SECONDARY SCHOOL STUDENTS' ACHIEVEMENT IN PHYSICS

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Abstract

The need for individualization of Physics instruction because of perceived students' poor achievement and varying learning rates informed this study. The effect of drill-and-practice mode of computer-assisted-instruction (CAI) on Physics achievement was sought. Non-equivalent control group research design was adopted. 140 senior secondary II students were drawn from two secondary schools in Enugu education zone. Physics Achievement Test (PAT) was used for data collection. PAT had a reliability of .71 using Kuder-Richardson's formula-20. Four research questions and six hypotheses guided the study. Mean, standard deviation and analysis of covariance were used in data analysis ($p \leq .05$). The result showed that students taught Physics with drill-and-practice mode of CAI achieved higher than their counterparts taught same concept with expository method. There was no significant difference between male and female students in Physics achievement. Similarly, there was no significant interaction effect between method and gender on students' achievement in Physics. It was recommended that Physics teachers should adopt drill-and-practice mode of CAI in Physics instruction tosupplement expository method inrushing students' achievement to the next level.

KEY WORDS: Drill-and-practice, computer-assisted-instruction, gender and Physics achievement

Introduction

The worrisome poor state of students' achievement in secondary school Physics deserve the attention of education stakeholders. Anamezie and Eze (2015) noted that Physics was a prerequisite for economic and technological development of any nation. Physics concepts are applied in remarkable areas including telecommunications, electricity, aviation, health and agriculture. Following diverse applications of Physics to a nation's economy, there is much need to equip the Physics students at the secondary school level with much required scientific andtechnological skills and knowledge. The clarion call for equipping Nigerian Physics students with the right scientific and technological knowledge becomes expedient in the light of consistent poor achievement of students in Physics especially in external examinations.Agommuo and Ifeacho (2013) reported that despite the importance and usefulness of sciences including Physics, the achievement level in the later in public examinations was poor. The West African Examinations Council (WAEC) Chief Examiners' annual report of 2012 alsoprovided additional evidence of students' poor achievement in secondary school certificate Physics examination.

Students' consistent poor achievement in

Physics in external examinations in Nigeria has partly been attributed to several factors including poor teaching method. The conventional method of science instruction including Physics has been lecture and expository. Lecture and expository methods of science instruction have their merits in terms of wider coverage of the syllables of large classes and saving instructional time. Both of the methods mainly seem to concentrate on the development of cognitive structures of the students. However, they are deficient in encouragement of the growth of psychomotor behavior among the students. Psychomotor behavior connotes activities that are geared towards concretizing and internalizing learning. Activities in this context mean combination of verbal and skill acquisition to ensure meaningful teaching and learning. Moreover, any teaching and learning that is rooted in the development of psychomotor behavior of the learners is both activity-oriented and child-centered. Activity-oriented and child-centered teaching and learning are emphasized to be used in contemporary science instruction because they discourage rote learning (Aina& Keith,2015; Anamezie & Nnadi,2017).

One of such activity-oriented and child-centered teaching and learning is computer-assisted instruction (CAI).It is a method of instruction in which the computer acts like an instructor: teaches, guides and tests the students until the desired level of proficiency is reached with the aid of specific application software.Onasanya,Daramola and Asuquo (2006) reported that CAI used a combination of text, graphics, sound and video in learning process. CAI is specifically an ingenuous, distinctive and interactive individualized instruction. With CAI, the challenge of learning rate of the learners has been overcome. Each individual learner learns through an interface at his or her rate of learning.According to Qaiser,Ishtiaq&Naseer (2017),the use of CAI as an instructional method in science teaching would empower, expose and endow the students with the ability to build skills, develop critical thinking and improve accessibility to information in science and technological era. In addition, CAI isgood at building desirable attitude in learners towards learning Science including Physics.The CAI package has different modes, ranging from tutorial, drill-and–practice to simulation (Cotton, 1991).The drill-and-practice (D&P)modeprobes into the students' cognitive processes and restructures incorrect conceptions through presentation of the steps that lead to the answer. D&P mode was adopted in this study because the students used in the study had attained Piagetian formal operational stage of reasoning. D&P mode has four steps according to Sharp in Alasoluyi (2015):

> (1) the computer screen presents the student with questions to respond to or problems to solve; (2) the student responds; (3) the computer informs the student whether the answer is correct; (4) if the student is right, he or she is given another problem to solve, but if the student responds with wrong answer, he or she is corrected by the computer. (p.20)

A good number of studies have authenticated the effectiveness of CAI relative to conventional lecture on students' achievements in the science subjects. Danjuma (2015) indicated that CAI, supposedly tutorial was more effective compared to lecture. Gender was not statistically significant on achievement in Physics. Also no significant difference was observed among students of varying abilities. Jega and Mustapha (2017) also indicated that Mathematics students exposed to drill-and-practice mode performed better than their counterparts exposed to lecture in Kebbi state, Nigeria. Suleman, Hussain, Din

and Iqbal (2017) partly indicated that CAI had a significant positive effect on students' achievement in Physics in Pakistan. It can be deduced that few studies investigated the comparative effect of a specific mode of CAI and conventional method of science instruction including expository on science achievement. Investigation of all the modes of CAI on achievement in a specific science subject is bulky. Also, the effectiveness of D & P relative to expository in all content areas of Physics including work, energy and power has not been established, hence its choice.

Another area of academic debate and controversy for researchers in Science Education is the issue of gender difference in academic achievement. A good number of researches have been conducted on gender differences in Science and Mathematics achievement. Nematulla, Alla&Khaliq(2015) carried out a research to ascertain the gender differences in academic achievement in Mathematics at secondary school level in Pakistan, the result was a significant gender difference in academic achievement, in favor of males. In the same vein, the result of a study conducted by Jacob and Linus (2017) showed that female achieved better than their male counterparts. Based on the contradicting results and differences in the opinions of researchers, there is need for inclusion of gender as a variable in this study to further shed more light on the controversial gender-achievement dichotomy.

Purpose of the Study

The purpose of this study was to investigate the effect of CAI on secondary school students' achievement in Physics. Specifically, the study sought to determine the: (i) influence of drill-and-practice mode of CAI on students' achievement in work, energy and power. (ii) influence of drill-and-practice mode of CAI on male and female Physics students' achievement in work, energy and power. (iii) interaction effect of drill-and-practice mode ofCAI and students' gender on achievement in work, energy and power.

Hypotheses

The following null hypotheses tested at .05 level of significance were formulated to guide the study

1. There is no significant difference between the mean Physics achievement scores of students taught work, energy and power using drill-and-practice mode of CAI and their counterparts taught same concepts with expository method.

2. There is no significant difference between the mean Physics achievement scores of male and female students taught work, energy and power using drill-and-practice mode of CAI.

3. There is no significant interaction effect of drill-and-practice mode of CAI and students' gender on students' achievement in work, energy and power.

Method

The research design adopted was non-equivalent control group. The area covered in this study was Enugu education zone of Enugu state. The zone consists of Enugu East, Enugu North and Isi-Uzo Local Government Areas. The population for the study consisted of all senior secondary two (SSII) students in the sixty-four (64) secondary schools in Enugu Education Zone of Enugu State, numbering nineteen thousand, three hundred and fifty-eight (19,358)(Post Primary School Management Board, Agbani Zone, 2018). A sample of two hundred and sixty-five (265) senior secondary school II (SS II) Physics students consisting of

one hundred and one male (101) and one hundred and sixty-four(164) female bested in four schools was used. Two schools werepurposive sampled to form the experimental group because of the presence of functional computer laboratories, while two schools used as control group had no computer laboratories. SS II Physics students were purposively sampled because the Physics curriculum required them to cover the contents of work. energy and power at a deeper level.Furthermore, simple random sampling technique was used to sample four (4) intact classes. The four classes were used as experimental group. The members of the experimental group in each of the two schools were taught the selected Physics topics using mechanics application softwarewhile the control groupwas taught the same topics using expository method. Physics Achievement Test (PAT) which was developed by the researchers was used to collect data. PAT was developed by the researchers. It was made up of thirty (30) multiple choice questions with four options lettered A-D. The thirty items emerged after calibrating a 42-item multiple choice questions with three-parameter dichotomous model available in xcalibre 4.20 software. The difficulty, discriminating and guessing parameters for the thirty items were at acceptable ranges: .35 - .75, ≥ .6 and ? .5 respectively. For the calibrated items a balance was maintained between the focal (male) and reference (female) sub-groups using Mantel-Hanszel's differential item functioning (DIF) approach. The essence of calibrating the test-pool was to increase the internal validity of the test. The items weredrawn using a table of specification to ensure adequate coverage of the content areas of work, energy and power vis-à-vis the lower levels of Bloom's taxonomy: knowledge, comprehension and application prior to calibration. PAT wasalso face validated by three research experts in Physics Education prior to calibration. Since the items of the PAT are dichotomously scored, Kuder-Richardson's formula 20 (KR-20) was used to determine the internal consistency reliability. A reliability coefficient of .71 was obtained. The instrument was administered no 20 SS II students on a parallel population. The researcher briefed the two regular Physics teachers in the two secondary schools used in the study for a period of two weeks on how to usethe D&P CAI. PAT was administered to all the subjects of the study as pretest and posttest. The posttest was a parallel test to the pretest with the same number of items.The two tests drawn from the same table of specification had coefficient of equivalence of .83. The coefficient of equivalence of pretest and posttest was computed using Pearson's product moment correlation coefficient.The posttest was administered at the end of a six-week treatment.The hypotheses were analyzed with analysis of variance (ANOVA) at .05 level of significance. The choice of ANOVA was because the result of preliminary analysis of method and gender main and interaction effects predicting the pretest indicated no significant difference. The preliminary result provided evidence of no initial group differences in abilities across the various sub-groups. The null hypotheses were rejected when probability (p) value was less than the significance values at .05.

Results

Table 1 shows the descriptive statistics of students' scores on work, energy and power during the pretest and posttest for students exposed to drill-and-practice CAI and expository methods.

Table 1: Pretest and posttest achievement scores of the D&P CAI and expositorygroups.

Group	N	Pretest Mean	Standard Deviation	Posttest Mean	Standard Deviation
D&P CAI	138	29.8	1.2	83.7	.73
Expository	127	21.1	2.8	52.4	3.5

The pretest-mean achievement score and standard deviation for the D & P group were 29.8 and 1.2 respectively while those of the expository group were 21.1 and 2.8 respectively. However, the posttest-mean achievement scores and standard deviation were 83.7 and .73 respectively for D & P group while 52.4 and 3.5 were for expository. In the posttest, D&P group had ahigher mean of 83.7 and lower standard deviation of .73. Similarly, the expository group also had a mean of 52.4 and a standard deviation value of 3.5. Also the mean score for D&P group appeared more reliable than that of expository group as revealed by the standard deviation values of both groups. There were more extreme scores in the expository group.

Table 2: Pretest and posttest achievement scores of male and female students.

Group	N	Pretest Mean	Std.Dev.	Posttest Mean	Std.Dev.
Male (D&P CAI)	49	18.6	6.11	72.5	4.01
Male (Expository)	52	19.1	5.07	42.3	8.44
Female (D&P CAI)	89	18.1	6.06	73.1	4.20
Female (Expository)	75	18.42	6.14	40.11	4.32

In the D&P group, the pretest-mean achievement scores and standard deviations were 18.6 and 6.11 for male students and 18.1 and 6.06 for female students respectively. Similarly, the posttest-mean achievement scores and standard deviations were 72.5 and 4.01 for male students and 73.1 and 4.20 for female students. In the expository group, the pretest-mean achievement score and standard deviation were 19.1 and 5.07 for male students and 18.42 and 6.14 for female students respectively. The posttest-mean achievement score and standard deviation were 42.3 and 8.44 for male students and 40.11 and 4.32 for female students.

Hypothesis 1:

$H0_1$: There is no significant difference between the mean Physics achievement scores of students taught work, energy and power using drill-and-practice mode of CAI and their counterparts taught same concept with expository method in the posttest.

Table 3 shows the ANOVA results of students' achievement scores in Physics. The result shows that f-calculated value of 191.332for method main effect has probability of .044. The probability value of .044 is less than .05 set out for the study. Hence, the methods of instruction were significantly different in favour of drill-and-practice mode of CAI.

Hypothesis 1:

Table 3: ANOVA results of students' achievement scores in Physics.

Source of Variance	Sum of squares	Df	Mean squares	F-calc.	Level of significance	Decision
Pretest	21671.411	1	21671.411	189.212	.210	NS
Main effects	66142.334	2	33071.167	191.332	.023	S
Method	59441.716	1	5944.716	662.140	.044	S
Gender	5227.853	1	5227.853	312.114	.100	NS
Method*Gender	119.213	1	119.213	528.008	.057	S
Explained	85349.601	4	21337.400	157.362		
Residual	182654.911	261	71.475			
Total	104004.512	265	392.469			

S = significant, NS = Not significant at .05 level of probability

Hypothesis 2:

$H0_2$: There is no significant difference between the mean Physics achievement scores of male and female students taught work, energy and power using drill-and-practice mode of CAI in the posttest.

From Table 3, the f-calculated value of 312.114 for gender main effect has probability of .100. The probability value of .100 is more than .05 set out for the study. Hence, gender was not significantly different.

Hypothesis 3:

$H0_3$: There is no significant interaction effect of drill-and-practice mode of CAI and students' gender on students' achievement in work, energy and power in the posttest.

Table 3, the f-calculated value of 528.008 for interaction effect of method and gender has probability of .057. The probability value of .057 less than .05 set out for the study. Hence, the interaction of method and gender was significantly different.

Discussion

The results of the study showed that the Physics students taught with drill-and-practice mode of CAI achieved better than their counterparts taught same concept with expository method. This finding agrees with earlier finding of Danjuma (2015) who reported that CAI was more effective than lecture in Physics achievement. It also agrees with the submission of Jega&Mustapha (2017) that drill-and-practice mode of CAI was better than lecture in Mathematics achievement. The result supports earlier study by Suleman, Hussain, Din &Iqbal (2017) who reported that CAI had a significant positive effect on achievement in Physics. Evidently, the result implicated method of teaching as a factor affecting students' achievement in Physics. Drill-and-practice mode of CAI appears better than lecture because it is both activity and student-oriented. It probes into the cognitive schemata of the students by forcing them to think. It also reconstructs the alternative students' schemata in case of question failure.

There existed no significant difference between male and female Physics students' achievement in Physics with the use of drill-and-practice mode of CAI. The result is in line withDanjuma (2015) who reported that gender was not significantly different in achievement in Physics under CAI.The implication of the result is that drill-and practice mode of CAI has the potency

to equalize gender gap in Physics achievement. This reason is adduced to the fact that drill-and-practice mode of CAI is a respecter of students' varied learning rates.

The interaction between drill-and practice mode of CAI and students' gender on students' achievement in Physics was significantly different. The result implied thatmale and female Physics students didnot achieve differently under drill-and practice mode of CAI but achieved differently under expository method. The result of the interaction of the main effects of gender and method further authenticated the effectiveness of drill-and-practice mode of CAI relative to expository method.

Conclusion

Students taught Physics with drill-and-practice mode of CAI achieved better than their counterparts taught same conceptswith expository method.Gender did not vary in Physics achievement under drill-and-practice mode of CAI. There was no significant interaction effect of drill-and-practice mode of CAI and students' gender on achievement in Physics.

Recommendations

Consequent upon the findings of this study, the following recommendations were made.

Drill-and-practice mode of CAI should be used in teaching Physics in senior secondary schools as a supplement to expository method.Physics teachers should be trained through intensive seminars, workshops and in-service trainings on the use of drill-and-practice mode of CAI for teaching and learning of Physics.The governments should equip Physics laboratories in secondary schools with functional computers with alternative energy sources and requisite software.

References

Agommuo, P. C. & Ifeacho, A. O. (2013).Secondary school students' assessment of innovative teaching strategies in enhancing achievement in Physics and Mathematics.*Journal of Educational and Social Research*, 3(8),121-128

Aina, J. & Keith (2015). Teaching Method in Science Education: The need for a Paradigm Shift to Peer Instruction (P1) in Nigeria Schools.*International Journal of Academic Research and Reflection*, 3(6),6-15.

Alasoluyi, O. E.(2015). Effect of computer assisted instruction on students' performance in Economics in secondary schools in Ekiti State, Nigeria. *Unpublished M. Ed Dissertation,*Ahmedu Bello University, Zaria - Nigeria.http://kubanni.abu.edu.ng/jspui/bitstream/123456789/7046/1/EFFECT%20OF%20COMPUTER%20ASSISTED%20INSTRUCTION%20%28CAI%29%20ON%20STUDENTS%e2%80%99%20PERFORMANCE%20IN%20ECONOMICS%20IN%20SENIOR%20SECONDARY%20SCHOOLS%20IN%20EKITI.pdf

Anamezie, R. C. &Nnadi, F. O. (2017). Location as a factor in teaching Physics using constructivist instructional method. *Journal of Research in Science and Technology Education* 7(1), 93-103,

Anamezie, R.C.&Eze, A. E.(2015).Effects of constructivist teaching method on students' achievement in Physics in Secondary Schools in Enugu education zone. International *Journal of Studies in Education*, 9(1): 223-227.

Cotton, K. (1991). Computer assisted instruction. *Online Manuscript*.https://educationnorthwest.o

rg/sites/default/files/Computer-AssistedInstruction.pdf

Danjuma, A.B. (2015). Effect of computer assisted instruction on academic achievement among NCE Physics students of different abilities in Niger State, Nigeria. *Unpublished MSc ED Dissertation*, Ahmadu Bello University, Zaria, Kaduna state, Nigeria http://kubanni.abu.edu.ng/jspui/handle/123456789/7462

Jacob, F. & Linus, K.S. (2017).Effect of gender on senior secondary school students' academic achievement in Geography in Ganye Education zone, Nigeria.*European Journal of Educational Studies*, 3(issue 4)

Jega, S.H., & Mustapha, A.G. (2017). The effects of two modes of computer assisted instruction on students' achievement in simultaneous linear equations in Kebbistate.*International Journal of Education and Evaluation*,3(11), 9-18. www.iiardpub.org

Nematulla, M.Y., Alla, B.G.&Khaliq, D. (2015). Analytical studies of gender difference in academic achievement in Mathematics at secondary school level. *British Journal of Education, Society and Behavioural Sciences*. 11(4) 1-7,

Onasanya, S.A., Daramola, F.O.,&Asuquo, E.N. (2006). Effect of computer assisted instructional package on secondary school students' achievement in Introductory Technology in Ilorin, Nigeria. *The Nigerian Journal of Educational Media and Technology*, 12(1)

Post Primary Schools Management Board, Agbani Zone, (2018). *School population Records.* Statistics Unit

Qaiser,S.,Ishtiaq,H.Naseer,U&Khalid,I. (2017). Effect of Computer-Assisted Instruction on students' academic achievement in Physics at secondary school level.*Journal of Education and Practice*, 8(7), 9-17

Sharp, V. F. (1996).*Computer Education for Teachers*. Boston, USA: McGraw Hill

Suleman,Q.,Hussain, I.,Din, M.N.,&Iqbal, K. (2017). Effect of computer assisted instruction (CAI) on students' academic achievement in Physics at secondary school level. *Computer Engineering and Intelligent Systems*, 8(7), 9-17.www.iiste.org

West African Examinations Council, WAEC (2012).*Chief Examiners' Report*. Lagos, Nigeria: WAEC press.

SECONDARY SCHOOL STUDENTS' ATTITUDE TOWARDS MATHEMATICS IN SCHOOLS IN ENUGU EAST LOCAL .GOVERNMENT .AREA OF ENUGU STATE

BY

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Abstract

This study investigated secondary school students' attitude towards Mathematics in some selected schools in Enugu East Local Government Area Enugu State. The study was borne out of the increasing poor performance of students in Mathematics. It adopted a descriptive survey design. Two research questions and two hypotheses guided the study. An adapted questionnaire on attitude scale called Fennema-Sherman Mathematics Attitude Scale(FSMAS) was used to collect data on students' attitude with respect to students' personal confidence to do Mathematics and perceived usefulness of Mathematics. A sample size of 300 (male = 120 and female = 180)SSS students was randomly sampled from five schools out of ten schools that was used for the study. The research questions were answered with mean score and standard deviation while the hypotheses were tested with t-test statistic at p-value of .05 level of significance. Thereafter, the findings revealed that there is significant difference between male and female students' personal confidence to do Mathematics. More so, there was no significant difference between male and female students' perceived usefulness of Mathematics. Based on the findings, the researchers recommended that Mathematics teachers, parents and all who come in contact with the students should encourage the students to develop more positive attitude towards Mathematics. More importantly,Mathematics teachers should be mindful of their actions, especially when in contact with the students, as this might make or mal students' attitude towards Mathematics.

Key word: *Students' attitude, Mathematics and Secondary school.*

Introduction

There has been an increased demand for the improvement of the students' achievement in Mathematics. This is because knowledge of Mathematics is an essential tool in our society (Mohamed&Waheed, 2011). Disciplines where numbers are predominant and form integral part of Mathematics include: Statistics, Accounts, Arithmetic, Engineering, etc. For example, the earliest civilization of mankind came through mathematical manipulations. Mathematics is a tool that can be used in our daily life to overcome such difficulties as balancing an account, transacting businesses, etc. Due to this, Mathematics has been considered as one of the most important core subjects in a school curriculum. That is why it is made compulsory by the Nigerian National Policy on Education, (Federal Government of Nigeria FGN, 2014), for all students in both primary and secondary

schools. This policy places these two broad objectives on secondary school education:

1. To prepare students for useful living within society and;
2. To prepare students for higher education

Analyzing the broad aims of secondary school education according to the National Policy on Education, Obodo (2004) observed that Mathematics can contribute to the realization of the general aims of education and Mathematics education in particular by:

1. Developing habits of effective critical thinking. This means developing logical reasoning both individually and deductively.
2. Providing competence in the basic skills and understandings for dealing with number and form.
3. Fostering the ability to communicate thought through symbolic expressions.
4. Developing the ability to differentiate between relevant and irrelevant data and to make relevant judgment through the discrimination of values.
5. Developing intellectual independence and aesthetic appreciation and expression.
6. Advancing the cultural and social heritage through its own total physical and social structure.

From the above, it is obvious that Mathematics is very important as envisaged by the National Policy on Education. Hence, Mathematics is seen by society as the foundation of scientific and technological knowledge that is vital in socio-economic development of the nation, (Mbugua, Kibet, Muthaa&Nkonke, 2012). In addition to the economic importance accruable from Mathematics, it better prepares young people for the numeracy demands of modern work place ruled by Information and Communication Technology, (ICT). It also raises the overall skill levels of the workforce. Again, there are social benefits that are tied to Mathematics such as improving access for larger number of secondary school students to tertiary education and training opportunities and laying stronger foundation to skills for lifelong learning.

However, despite the importance of Mathematics in human development, there has been consistent poor achievement of secondary school students in Mathematics. The students' poor achievement in Mathematics is not just a concern for particular countries but has become a global concern over the years (Siringi, 2010). Mathematics achievement of secondary school students has been very low over the years in the past. For example, according to Malaysian Ministry of Education, only 28.4% of students who have participated in GCE O'level Cambridge examination in 2007 have passed above "C" grade. The results of 2008 also showed similar kind of trend where 66.8% of students getting grades below the expected level (Ministry of Education, 2011). In Kenya, Mathematics and Science at the Kenya Certificate of Secondary Education (KCSE) examinations has not been satisfactory for quite a long time as can be seen in the table below:

Table 1: Kisumu East District KCSE Mathematics Mean score by year

Year	Mean Score
2006	3.2282
2007	3.3691
2008	4.0660

(Republic of Kenya, 2009)

In Nigeria, the situation is the same. According to WACE Chief Examiners' Report (2016), 27% of the students passed Mathematics with "C" grade and above. According to Ramari (2014), achievement in Mathematics has been generally poor due to various factors. Njoroge (2014) also decries the poor achievement in Mathematics despite the fact that it is one of the key subjects expected to turn Nigeria into an industrialized country. Several reasons have been given to account for these variations in achievement in Mathematics. Some authors like Dugger (2014) attribute it to unfair distribution of qualified teachers in the country; while Odhiambo (2010) states that the root cause of poor achievement in Mathematics, is that Mathematics teachers are poorly prepared. Maliki, Ngban and Ibu (2009) have attributed the poor achievement of students in Mathematics to the fact that the subject is difficult. Some other researches (Ma &Kishor, 2017; Bramlett& Herron, 2019; Papanastasiou, 2016; Nicolaidou&Philippou, 2013; Mohd, Mahmood, & Ismail, 2011), have attributed students' attitude towards Mathematics as a major factor that might influence the achievement of the students.

Attitude is a central part of human identity. Everyday people love, hate, like, dislike, favour, oppose, agree, disagree, argue, persuade etc. All these are evaluative responses to an object. Hence attitudes can be defined as "a summary evaluation of an object of thought" (Bohner&Wänke, 2012). They are inclinations and predispositions that guide an individual'sbehaviour (Mohamed and Waheed, 2011). According to Multi-component model of Attitude (Eagly&Chaiken, 1993), attitudetowards Mathematics can be measured bybeliefs, thoughts, attributes; towards Mathematics (cognitive); feelings and emotions about Mathematics (affective), as well as behavioural information (past events, experiences).There are several factors influencing students' attitude as revealed by available literature. These factors had been classified into three, viz: students relatedfactors;school, teacher &teaching related factors; and home environment & society-related factors.

The students' related factors include students' mathematical achievement score (Köðce et al, 2009), anxiety towards Mathematics, students'self-efficacy and self-concept, extrinsic motivation (Tahar et al, 2010) and experiences at high school (Klein, 2014; Bobis&Cusworth, 2013). Secondly, the school, teacher & teaching related factors, which include teaching materials used by teacher, teachers' classroom management, teachers' content knowledge and personality, teaching topics with real life enriched examples, other students' opinions about Mathematics courses (Yilmaz, Altun&Olkun, 2010), teaching methods, reinforcement (Papanastasiou, 2012), receiving private tuition (Köðce et al, 2009), teachers' beliefs towards Mathematics (Cater & Norwood, 2009) and teachers' attitude toward Mathematics (Ford, 2014, Karp, 2011). Finally, factors from the home environment & society which can affect students' attitude towards Mathematics include: educational background of parents, occupation of parents (Köðce et al, 2009) and parental expectations (Tobias, 1993). These factors play crucial roles in influencing students' attitude towards Mathematics

According to Yara (2019), attitude of students towards Mathematics has been considered to be a very significant factor underlying their school experience and achievement. That is to say that the attitude students hold towards Mathematics determines how they approach the subject. In many cases, students have been found to approach Mathematics as procedural and rule-oriented.

This kind of attitude prevents them from experiencing the importance of Mathematics and the many other approaches that could be used to develop competence in the subject.Clarke, Thomas, and Vidakovic (2019) postulate that attitudes and practices towards the learning of Mathematics are complexly affected by beliefs, emotions, social context and content knowledge. Studies confirm that emotional responses toward Mathematics that are found in students include like and dislike of Mathematics, anxiety associated with Mathematics and self-confidence in relation to learning of Mathematics (Henderson & Rodrigues, 2018). These emotional factors have been found to have an impact on students' performance. That is to say that many students see Mathematics as an uphill task. They learn Mathematics with low enthusiasm and just for the sake of the grade for the next level in their studies.

Students' attitude towards Mathematics and Mathematics learning and their implications for Mathematics instruction have long been a common interest among Mathematics educators (Manoah, Indoshi and Othuon, 2011). Attitude towards Mathematics has been considered an important factor in influencing participation and success in Mathematics. Weidmann and Humphrey (2012) state that investigation into students' Mathematics attitude and perspective not only inform teachers, parents, and administrators about students' needs, but also serves as a catalyst for reform in Mathematics education. There is research evidence showing that students' high achievement in Mathematics is not necessarily positively associated with their attitudes about Mathematics and Mathematics learning. For instance, the results of Third International Mathematics and Science Study (TIMSS) showed that while Japanese students outperformed students from many other countries in Mathematics, they displayed relatively negative attitudes towards Mathematics (Mullis, 2010). The reported gender difference in attitude towards Mathematics influenced some researchers to study some affective variables (feelings, emotions, etc.) as mediators of gender differences in Mathematics achievement (Casey, Nuttal, &Pezaris, 2011).

However, little consensus existed among researchers regarding the influence of affective variables on gender and Mathematics achievement. Some studies reported statistically significant effects of affective variables on the learning of Mathematics (Casey, Nuttal, &Pezaris, 2011; Ho et al 2013, Ma and Kishor, 2017), while others indicated no relationship between attitude variables and Mathematics achievement (Papanastasious, 2016). Even among those studies that found a significant relationship, there was still a controversy regarding the educational implications of the results. Tymm (2011) investigated 21,000 students' attitude towards Mathematics and found out that the most important factors were the teachers' and students' academic level, while age, gender and language were weakly associated with attitudes. The students' attitude towards an academic subject is a crucial factor in learning and achievement in that subject. Whether a student views himself or herself as a strong or weak person in a specific subject may be an important factor in his or her academic achievement (Manoah, Indoshi and Othuon, 2011).

To the best of the researchers' knowledge and based on the available literature, there is limited research on gender difference about secondary schoolstudents' attitude towards Mathematics in secondary school students in Enugu East. This limitedness has left much to imagination and speculation as to whether there is significant gender difference on

the students' attitude towards the study of Mathematics. This study considered it important to determine the students' attitude about Mathematics and if there is a significant gender difference in students' attitude about the study of Mathematics. This was done with specific reference to personal confidence of studentsto do Mathematics and perceived usefulness of Mathematics in Enugu East L G.A Enugu State.

Purpose of the study

The main purpose of this study was to determine **secondary school students' attitude towards Mathematics in schools in Enugu East L.G.A of Enugu State.** Specifically, the study sought to determine:

1. Secondary school students' personal confidence towardsMathematics.
2. Secondary school students' perceived usefulness ofMathematics.

Research Questions

The researchers formulated the following research questions for the study:

1. How is secondary school students' personal confidence towards learning ofMathematics?
2. What is secondary school students' perceived usefulness of Mathematics?

Hypothesis

The researchers formulated this hypothesis to guide the study:

1. There is no significant difference between male and female students' personal confidence towards Mathematics.
2. There is no significant difference between male and female students' perceived usefulness of Mathematics.

Methods

The study was a quantitative study which adopted a descriptive survey research design. According to Engwa and Ozofor (2015), descriptive survey research design involves samples of different sub-groups of a population to look at similarities or differences between them at any particular time. Based on this, a descriptive survey research design was considered appropriate for this study since the study sought for the attitude of students towards Mathematics.Attitudes cannot be directly observed, so to measure attitudes one can simply ask the person or use indirect methods of inferring cues to measure implicit attitudes. Usually, direct methods are used in both academic and applied research (Bohner & Wänke, 2012). The population of the study was 4,368public senior school students (SSS) which comprised 1,693 males and 2,675 female students in Enugu East L.G.A., Enugu state. A purposive sampling technique was used to sample five coeducational schools out of the 10 public secondary schools in the area. In each of the five coeducational schools sampled, a balloting simple random sampling technique was used to sample eight males and 12 females from each of the three classes (SS1, SS2 and SS3). This gave a sample size of 300, made up of 120 males and 180 females. This sample size was considered appropriate since it is in line with Densel (2014) which asserted that if the population of a study is in several thousands, a 30% percent or less sample size is adequate.

The researchers adapted the mostly and widely used attitude scale called Fennema-ShermanMathematics Attitude Scales(FSMAS),which was developed in (1976), with a group of nine instruments to measure attitude towards Mathematics. For the sake of this study, two instruments, out of the nine, were used. They are personal confidence of the students to do Mathematics and

usefulness of Mathematics as perceived by the students. The questionnaire used was adapted from "A Modified Fennema-Sherman Mathematics Attitude scale" (Mohamed &Waheed, 2011).The FSMAS was on a four-point Likert scale. Decision was taken on the scale given by Jamil (2001) as cited by Mohd,**Mahmood, & Ismail** (2011). That is, 1.00 – 2.33 (low), 2.34 – 3.66 (medium) and 3.67 – 4.00 (high).

The reliability of the instrument was ensured by administering the instrument to 50 SSS students in Agbani Education zone, who were not part of the study area but have the characteristics of the study population. Data collected in the trial-testing was analyzed using the Cronbach Alpha. The reliability coefficient of the instrumentwas found to be 0.84. This reliability index is a positively high reliability index. This is an indication that the instrument was reliable for the study.

The researchers visited the various sampled schools to give the questionnaire to SSSstudents through their teachers. The researchers distributed the FSMAS, through the assistance of the various class teachers in order to avoid Hawthorne's effects. This was done with the permission of the principal and the copies of the instruments were distributed a period before the break period. The researchers stayed there until the last person finished answering the questions. This gave the researchers the opportunity to attend to issues that required their attention, through the teachers. More so, the researchers had an opportunity of ensuring 100 percent completion and submission of the instrument.

Analysis of Data

The two research questions were answered using mean and standard deviation while the hypotheses were tested with t-test statistic at .05 probability level of significance. The *t-test was* used to show the statistical significant difference between male and female students' attitude towards Mathematics.

Results

The data collected with FSMAS were summarized, analyzed and then presented as follows.

Research Question 1: How is secondary school students' personal confidence towards learning of Mathematics?

Table 2: Mean and standard deviation of students' personal confidence towards learning of Mathematics

		Males			Female		
S/N	**Variables**	**Mean scores**	**Std.Dev**	**Decision**	**Mean score**	**Std. Dev**	**Decision**
1	Most subjects I can handle but I have a tendencyto mess up Mathematics	2.98	0.34	Medium	1.65	0.13	Low
2	I am sure that I can learn Mathematics.	3.76	1.01	High	3.05	0.16	Medium
3	I'm not the type to do well in Mathematics	2.54	0.98	Medium	2.56	0.21	Medium
4	Generally I have felt secure about attempting Mathematics.	3.05	0.17	Medium	1.19	0.01	Low
5	Mathematics was my worst subject	1.56	0.12	Low	1.78	0.34	Low
6	I have a lot of self - confidence when it comes to Mathematics	3.89	1.04	High	3.32	0.45	Medium
7	I think I could handle more difficult Mathematics	3.06	0.43	Medium	2.23	0.12	Low
8	I'm no good at Mathematics	1.64	0.40	Low	2.14	0.33	Low
9	For some reason even though I study, Mathematics seems unusually hard for me	3.98	0.56	High	2.56	0.67	Medium
	Overall	**2.94**	**0.56**	**Medium**	**2.28**	**0.27**	**Low**

Table 2 shows that the grand mean of male students' personal confidence to do Mathematics has a mean score of 2.94 with a standard deviation of 0.56. This represents medium confidence to do Mathematics. On the other hand, the grand mean of the female students is 2.28 with a standard deviation of 0.27. this implies a low confidence to do Mathematics.

Research Question 2: What is secondary school students' perceived usefulness of Mathematics?

Table 3: Mean and standard deviation on students' perceived usefulness of Mathematics

		Males			Female		
S/N	**Variables**	**Mean scores**	**Std.Dev**	**Decision**	**Mean score**	**Std. Dev**	**Decision**
1	Mathematics helps me to be self-reliant	2.98	1.31	Medium	1.65	1.11	Low
2	Mathematics makes me more employable	3.76	1.04	High	3.05	1.14	Medium
3	Mathematics increases critical thinking needed in any force place	3.54	0.89	Medium	3.56	1.21	Medium
4	Day-to-day transactions do not need Mathematics	3.05	1.17	Medium	2.19	1.43	Low
5	Mathematics increases my self -esteem as a student	1.56	1.10	Low	2.28	1.33	Low
6	The knowledge of Mathematics does not help me in other subjects	3.89	1.12	High	3.98	1.61	High
7	I think I could handle more difficult task with the help of Mathematics	3.06	1.43	Medium	2.45	1.13	Low
8	Mathematics is needed for admission into higher institution	1.64	1.40	Low	3.45	1.43	Low
9	For some reason even though I study, Mathematics, it is just to fulfil curriculum requirement for graduation	3.98	1.26	High	2.98	1.57	Medium
	Overall	**3.05**	**1.19**	**Medium**	**2.84**	**1.33**	**Medium**

From table 3 above, male students' perceived usefulness of Mathematics has a grand mean of 3.05 with a standard deviation of 1.19. This represents medium perception of the usefulness of Mathematics. On the other hand, female students'perceived usefulness of Mathematics has a grand mean of 2.84 with a standard deviation of 1.33. This rates their perceived usefulness of Mathematics as medium.

Personal Confidence towards Mathematics with Respect to Gender

There is no significant difference between male and female students' personal confidence towards Mathematics.

Table 4: t-test Result of male and female students' personal confidence towards Mathematics

	Mean	Score	Standard	deviation	T	Df	P	Decision
Gender	**Male (120)**	**Female (180)**	**Male**	**Female**				
Personal confidence	2.9404	2.2804	.56324	.27309	.342	298	.001	**S**

Table 4 shows that there is statistically significant difference between the male and female students'personal confidence towards Mathematics. The t (298) = .342, p = .001, á = .05. Since the p < .05, the hypothesis is rejected; hence, there is a significant difference in male and female student's personal confidence towards Mathematics.

Table 5: t-test Result of male and female students' perceived usefulness of Mathematics

	Mean	Score	Standard	deviation	T	Df	P	Decision
Gender	**Male (120)**	**Female (180)**	**Male**	**Female**				
Overall students' attitude	3.0501	2.8449	1.1944	1.3309	.232	298	.816	**NS**

Table 5 shows that there isno statistically significant difference between the male and female students'perceived usefulness of Mathematics. The t (298) = .232, p = .816, á = .05. Since the p < .05, the hypothesis is retained, hence, there is no significant difference in male and female student's perceived usefulness of Mathematics.

Discussion of the Findings

The study established that there is significant difference between male and female students' personal confidence to do Mathematics. With the males' higher mean scoreof 2.94, it can be concluded that male students have more personal confidence towards Mathematics than the female students whose mean score is 2.28.On the whole, the study establishedthatboth male and female students do not have high personal confidence to do Mathematics. While the males have medium personal confidence, the females have low personal confidence. This lack of high personal confidence might be one of the reasons why they achieve poorly in many Mathematics examinations, (Areelu, 2014). Buttressing this point, Poopola and Ajani, (2011) opined that Mathematics has always been perceived as the most difficult subject in the school curriculum. This has resulted in learners having a negative attitude towards the subject and this attitude seems to have existed from one generation to another.

Furthermore, the study discovered that students' perception of the usefulness of Mathematics is on a medium scale. This was confirmed on table 5 which shows that there is no significant difference between male and female students' perceived usefulness of Mathematics. This was supported by the similar studies done by Mohamed &Waheed, (2011)

and **Manoah, Indoshi, &Othuon (2011).**This may not be too surprising, since every student knows that, at least, a credit pass is requiredof any student for admission into any higher institution. However, the variation in the mean of the items, notwithstanding, the overall students' perceived usefulness of Mathematics was fairly positive. This agrees with the findings of Mohamed &Waheed, (2011) on similar study.

Conclusions of the Findings

Based on the analyses made above, the following findings were made:

1. There is significant difference between male and female students' personal confidence to do Mathematics. That is, male students have more personal confidence to do Mathematics, with medium rating, than the female students whose rating was low.
2. There is no gender difference on the perceived usefulness of Mathematics. Though the perception of the students on the usefulness of Mathematics was on a medium scale.

Recommendation

Based on the above conclusions, the researchers recommend that:

1. There is need to encourage students, by all those who come in contact with students, todevelop positive attitude towards Mathematics.

2. Teachers of Mathematics should be mindful of their personality, especially when in contact with the students. That is, they should not behave in a way perceived as abnormal by the students, as behaving this way might make the students to develop negative attitude towards Mathematics.

3. he usefulness of every topic in Mathematics and/or Mathematics as a whole, should be related to the students by the teachers while teaching them.

4. Parents and all other adults should desist from telling students that Mathematics is a very difficult subject for them.

References

Areelu, F. (2014).Effects of Tiered Lesson and Group Personalization Instructional on Senior Secondary School Students' Interest and Achievement in Mathematics in Lagos State.Unpublished Ph.D. Thesis, University of Ibadan, Ibadan.

Bobis, J., &Cusworth, R. (2013). Teacher education: A watershedfor preserves'teachers?attitudes toward mathematics. *Challenges in mathematics education: Constraints on construction* (Proceedings of the 17th annual conference of the Mathematics Education Research Group of Australasia, Vol. 1, pp. 113-120). Lismore: MERGA

Bohner, G., &Wänke, M. (2012).*Attitudes and attitude change*. Psychology Press.

Bramlett, D. C. & Herron, S. (2019). A study of African-American College students' attitude towards mathematics.*Journal of Mathematical Sciences & Mathematics Education, 4*(2), 43-51

Cater, G. S., & Norwood, K. S. (1997). The relationship between teacher and students? belief about mathematics.*School science and mathematics, 97*(2), 62-67

Casey, M. B, Nuttal, R. L, &Pezaris E. (2011).Spatial-mechanical reasoning skills verses mathematical self-confidence as mediators of gender differences on mathematical subtest using cross-national gender-based items. *Journalof Research in MathematicsEducation.* 32(1):28-57.

Clarke, P. A. J., Thomas, C. D. and Vidakovic, D. (2009). Pre-service Mathematics teachers' attitudes and developing practices in urban classroom:*Research and Practice in Social Science, 5(1): 22-43.*

Dugger C (2014). In Africa, Free Schools Feed a Different Hunger. Retrieved from http://www.Kenyaeducation.und.org/articles-newsletters/in-africa-free-schools-feed-a-different-hunger.html

Eagly and Chaiken, (1993).*The Psychology of Attitudes*, Fort Worth, NY: Harcourt Brace Jovanovich

Engwa, A. G. & Ozofor, N. (2015).*Fundamentals of research methodology: A holistic guide for research completion, management, validation and ethics*. USA: Nova Science publishers, Inc.

Federal Government of Nigeria. (2014). *National Policy on Education* Lagos: NERDC press.

Ford, M. I. (2014). Teachers' beliefs about mathematical problem solving in the elementary school.*School Science and Mathematics, 94*(6), 314-322

Henderson, S and Rodrigues, S. (2018). Scottish Student Primary Teachers' Levels of Mathematics Competence and Confidence for Teaching Mathematics: Some implication for national qualifications and initial teacher education. *Journal of Education for Teaching: International Research and Pedagogy,* 34 (2):93-107.

Karp, K. (2011). Elementary school Teachers? Attitude toward mathematics: The impact on students? autonomous learning skills. *School Science and mathematics, 9*(16), 265-270

Klein, M. (2014). The premise and promise of inquiry based mathematics in pre-service t eacher education: A poststructuralist analysis. *Asia-Pacific Journal of Teacher Education, 32*(1), 35-47.

Köðce, D., Yýldýz, C., Aydýn, M. &Altýndað, R., (2009).Examining Elementary School Students? Attitudes towards Mathematics in Terms of Some Variables, *Procedia Social and Behavioral Sciences, 1*(1), 291-295.

Maliki, A.E., Ngban, A.N., &Ibu, J.E. (2009).Analysis of students' performance in junior secondary school mathematics examination in Bayelsa State of Nigeria.*Studies Home Community Science, 3(2), 131-134.*

Manoah, S. A., Indoshi' F. C. &Othuon' L. O. A. (2011). Influence of attitude on performance of students' in Mathematics curriculum.*Educational Research*. 2(3) pp. 965-981

Ma X, &Kishor, N. (2017).Assessing the relationship between Attitude towards mathematics and achievement in

mathematics: A meta-analysis . *Journalof Research in Mathematics Education*28 (1):27-47.

Mbugua, Z. K., Kibet, K., Muthaa, G. M. &Nkonke, G. R. (2012). Factors contributing to students' poor performance in mathematics at Kenya certificate of secondary education in Kenya: A Case of Baringo County, Kenya. *American International Journal of Contemporary Research, 2, (6), 87-91*

Mohamed, L. and Waheed, H. (2011).Secondary students' attitude towards Mathematics in a selected school of Maldives.*International Journal of Humanities and Social Science.1(15), 24-25.*

Mohd, N., Mahmood, T. F. P. T., & Ismail, M. N. (2011).Factors that influence students in mathematics achievement.*International Journal of Academic Research*, 3(3),49-54

Mullis I. S. (2010).*TIMSS 1999 international Mathematics report*: Findings from IEA's repeat of the Third International Mathematics and Science Study at eighth grade. Chestnut Hill, MA: Boston College.

Njoroge K. N. (2014). *MathsStill Hard Nut to Crack in the East African Standard.* March 2nd,2004.

Nicolaidou, M. &Philippou, G. (2013).Attitudes towards mathematics, self-efficacy and achievement in problem solving.*European Research in Mathematics III.*

Obodo, G.O. (2004). *Principles and Practice of Mathematics Education in Nigeria.* Enugu: General Studies division ESUT, Enugu.

Odhiambo H. (2010). Education Reforms.*Daily Nation February, 26th, 2010*. Nairobi: A publication of Nation Media Group.

Papanastasiou C. (2016). The effect of attitudes on Mathematics outcome presented at the 9th International Congress of Mathematics Education (ICME-9). Tokyo. Retrieved on 10th November, 2016 from http:// doc. google.com /viewer

Papanastasiou C. (2012). Effects of background and school factors on Mathematics achievement.*Educational Research in Evaluation* 8(1):55-70

Poopola, B. A. and Ajani, T. O. (2011). Influence of Pupils' Gender, Environment and School Ownership Status on Mathematics Performance of Secondary School Students in Yewa-North, Ogun State" *Journal of the Mathematical Association of Nigeria, Vol 36, No I, Pp 56 – 6.*N

Ramari K (2014). *Fifty Thousand Score Varsity Entry Marks.*In East Africa Standard March 2nd, 2004.

Republic of Kenya (2009). Totally Integrated Quality Education and Training: *Report of the Presidential Enquiry in the Evaluation System of Kenya.* Nairobi: Government Printer.

Siringi S. (2010). Girls still losing out in education. In the *Daily Nation, Nairobi, March 3rd,2010.*

Tahar, N. F., Ismail, Z., Zamani, N. D., & Adnan, N. (2010). Students? Attitude Toward Mathematics: The Use of Factor Analysis in Determining the Criteria. *Procedia-Social and Behavioral Sciences, 8(2):* 476–481.

Tobias, S. (1993). *Overcoming math anxiety: Revised and expanded*. New York: W. W. Norton.

Tymm P (2011). A Test of the Big Fish in a Little Pond Hypothesis: An investigation into the Feelings of seven- year- old pupils in school. *Sch. Effective and sch. Improvement* 12 (2): 161-181.

WAEC, (2016).*Examiners' Report 2015/2016*, West African Examination Council, p. 4-5.

WeidmannD,& Humphrey S. (2012). Students' Attitude and perspectives involving Mathematics in schools.*Journal of Educational Psychology*, 74(30), 234-256. Retrieved on 29th March, 2012 from *http://* www.allacademic.com/meta/p11175-in.

Yara, P. O. (2019). Relationship between teachers' attitude and students' academic achievement in Mathematics in some selected Senior Secondary Schools in South western Nigeria. *European Journal of Social Sciences*, 11(3):364-369.

Yilmaz, C., Altun, S. A. &Ollkun, S. (2010). Factors affecting students? attitude towards math: ABC theory and its reflection on practice. *Procedia Social Science and Behavioural Sciences, 2(4),* 4502-4506.

ASSESSMENT OF PHYSICAL FITNESS INDICES FOR EXERCISE READINESS AMONG UNDERGRADUATE STUDENTS IN ENUGU STATE UNIVERSITY OF SCIENCE AND TECHNOLOGY (ESUT), ENUGU, ENUGU STATE.

By

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Abstract

Readiness to change plays a significant role in people adherence to an exercise regimen and accurate assessment of it is necessary to direct interventions. The study assessed physical fitness indices among undergraduate students in the Department Human Kinetics and Health Education (HKE),Enugu State University of Science and Technology. The study adoptedevaluative design method. Three research questions guided the study. The population comprised 112 male and female undergraduate students in the Department of Human Kinetics and Health Education, ESUT. 112 (39 males and 73 females) male and female undergraduate students in the Department of HKE served as research participants hence there was no sampling. The materials used in the measurement of the parameters for the study include; sphygmomanometer, weighing scale and stadiometer. The measurement of the variables all followed established principles and procedures. The analysis of data was done with x and t-test. Findings showed that undergraduate students of HKE, ESUT had normal values recorded for resting blood pressure, resting heart rate and body mass index. Furthermore, gender is not a factor of variance regarding systolic/diastolic blood pressure and BMI status (P<0,05) but was for RHR(P>0.05).Conclusively, the undergraduate students of HKE had a good measure of physical fitness. It is recommended that coaches/trainers as well as the university sports administrators should begin talent hunt in HKE Department during major competitions like NUGA and WAUG while the fitness and wellness programme be made comprehensive and practiced on regular basis to sustain athletic fitness required of competitive sports.

Key words: Assessment, Physical Fitness, Exercise, Exercise Readiness.

Introduction

One of the several ways of achieving desirable health outcome is beginning, continuing and sustaining active and healthy lifestyle behaviours. Positive lifestyle behaviours promote health and general wellness of the general population as observed by scholars in movement science (World Health Organization, 2009; Nigg, 2011). Regular participation in exercise attracts a wide range of short term benefits such as healthy heart, muscles, bones and joints and long term benefits of delayed onset of premature death, developing type 2 diabetes, high blood pressure (HBP) and certain kinds of cancers (Otinwa 2014, Okuneye, 2013). There are other benefits of exercise

participation which include economic, school, environmental and mental health benefits such as better capability to cope with concentration, enhanced memory, productivity, psychological wellbeing and mentalalertness (Awopetu, 2016).

The benefits of regular exercise participation are no longer news. Perhaps what makes the news around is that large preponderance of individuals including the adolescents due to die hard altitude and other reasons do not take part in it (Emiola, 2008). Conversely, physical inactivity and sedentary living have been identified as major independent modifiable risk facts for chronic diseases, the fourth leading risk factor for global mortality associated with mental health injuries, falls and obesity (WHO, 2009). Specifically, it was estimated that 60% of the world population fail short of the recommended amount of physical activity to induce health benefits (WHO 2010). Technological innovations have contributed substantially to inactive life among the youths especially the undergraduate students.

The undergraduate students in the Department of Human Kinetics & Health Education,Enugu State University of Science and Technology, ESUT, Enugu is currently undergoing rebranding by the leadership of the Department.As part of the rebrandingprocess, a keep fit programme tagged "Fitness and Wellness'has just been introduced. However, the readiness of the students in the Department in terms of physical fitness status has not been determined. According to Dangu(2010), readiness for any exercise programme requires comprehensive assessment in order to reveal areas of deficits so that adequate attention could be paid to them and possibly minimize injuries andor mortality.

Exercise readiness requires assessment of certain physicalfitness indices especially among beginners in any exercise programme. To be exercise ready means relative functional capabilities of cardiovascular fitness and variables such as age and body composition, safe equipment and environmental bodyconditioning, first aid and constant form (Prezi,2013). Assessment of energy level of the participants has been identified as a strong marker of exercise readiness. This is may be considered a potential means of condensing interactions with the trainee, injury status, hydration, mental/physical fatigue ratings, performance of a physical task for example, vertical jump and initial performance of the assigned training workload (Strohacker, Boyer, Smitherman&Fazzino, 2017).

It is reasonable to speculate that an individual's energy level would influence or be influenced by each of these components with respect to resistance training but doubtful for aerobic exercise behavior (Strohacker, Boyer, Smtherman, Fazzino, et al, 2017). Thus, while energy levels are a recognized marker of exercise readiness, more empirical evidence is necessary to demonstrate the ratings as being productive of relevant psychological and behavioral aspects of aerobic exercise.In this study, energy level wasnot inclusive of the proposed fitness and wellness programme but blood pressure (BP), heart rate/pulse measure and body mass index (BMI) were assessed. The choice of these indices is based on the fact that they provide useful information regarding performance index in aerobics as well as other physical fitness related activities.

Readiness to change plays a significant role in group adherence to an exercise regimen, thus accurate assessment of readiness to change is necessary to direct interventions. When exploring exercise as a self management approach for students, it is important to consider the concept of readiness as it relates to health behavior change. Readiness can be understood as an individual's predisposition to engage in a health behavior change or the indication of a

control motivating force (Reid & Osborn, 2008). Exercise readiness assessment is vital in order to identify possible physical physiological and psychological readiness of the participants so that the fitness and wellness exercise programme in-view can be appropriately programmed to suit the fitness status of the participants and possibly minimize injuries or mortality. The fitness & wellness programme of HKE Department could result in the development of fitness and wellness policy in the entire university community for possible academic performance and improved health status. In the light of this, attention was focused on physiological variables such as resting systolic and diastolic blood pressure, heart rate/pulse measure as well as body mass index (BMI).

Blood pressure refers to a text of pressure required for a drop of blood to pass through the artery; which translates to the amount of force required for the blood to flow through the artery (Okuneye, 2013 ; & British & Irish Hypertension Society, 2018). For each heart beat, there are two phase; systolic and diastolic blood pressure. Both are necessary in physical fitness monitoring especially among beginners in any exerciseprogramme. The resting blood pressure (that is blood pressure taken at rest) may present an estimate of an individual's physical fitness status and a strong indicative of readiness for exercise (Sciconolfi, Lasater, Mchinlay,Boggia&Carieton 2005).The average blood pressure for an adult is 120/80 mm Hg. However, this is only an average and the healthcare provider needs to consider acceptable ranges for individual clients. For example, in adults, normal blood pressure can range from 95-145/60-90 mm Hg. The healthcare provider considers the clients baseline blood pressure and the client's current health state in conjunction with subjective data and other objective data. For example, a blood pressure of 90/50 mmHg may be normal for a healthy, asymptomatic 20-years-old adult. Below is a table showing classifications of BP in adolescents and adults.

Table 1: Classifications of Blood Pressure in Adolescent and Adults

Normal BP	Systolic BP	Diastolic BP	Recommendations
Optimal	120	80	Keep it up
Normal	130	85	Check every 2 years
High normal	130-139	85	Check yearly
High Blood Pressure			
Grade 1	140-159	90-99	Confirm within 2 month
Grade 2	160-179	100-109	Start treatment within a month
Grade 3	180	110	For therapy urgently

Source: Aroye, 2005; In Okuneye, 2014.

The table classifications of BP in adolescents and adults above will present the current fitness status of the participants in the proposed programme so that recommendations could be made for safety. This is due to the relationship that exists between BP and physical fitness. In that regard,Boggia and Carleton (2008), found on inverse relationship between resting blood pressure and usual levels of physical fitness or activity. The inference here is

that fitness lowers blood pressure. Consequently, it has been observed that adolescents who undergo systematic physical training show improvement in resistance and physical fitness, body composition and decreased inflammatory markers (Ruiz, Castilo, Ortega &Sjostrom, 2008b). However, the effect of physical training on blood pressure of a population remains controversial (Tijomma, Stolen, Bye, Volden, Slordahl&Ordegard, 2009; Wong, Chia, Tson, Wansaicheong, Tan & Wang, 2008 and Kelley & Tran, 2003). Despite the criticism blood pressure and heart rate remain recognized vital signs for preliminary health status investigation.

The heart rates of the undergraduate students wereestimated with Omron digital Sphygmomanometer to reveal the current fitness status likely to affect performance in the programme and possibly avert possible occurrence of injuries. Heart rate also known as pulse rate is the number of times the heart beats per minute which translates to how efficient the heart and lungs are at pumping blood and getting oxygen to the cells (Sheshials&Geetenela, 2014). According to National Institute of Health & Care Excellence (2014), the athletic heart rate range is 40-60 beats per minute. The report states that heart rate gets progressively slower as a person moves through childhood toward adolescence. The normal resting heart rate for adolescence including older adults is between 60-100 beats (BPM) per minutes. Highly trained athletes may have a resting heart rate below 60 BPM, sometimes reaching 40 BPM while an apparently well adult records about 60-90 BPM (Andrea, 2019).

A low resting heart rate (RHR) indicates better fitness in people who engage themselves in training such as aerobics and resistance training. It has been observed that adults with high level of fitness may have a resting heart rate below 60 (Shashials&Gectanala, 2014). Resting heart rate varies by gender as women tend to have smaller hearts and lower blood volume and hemoglobin hence women's heart beat more frequently to nourish the tissues (Andrea, 2009).A strong healthy heart beats more slowly because it delivers a greater volume of blood with each beat. If an individual lives a sedentary lifestyle and is out of shape, the heart, which is also muscle, may be weakened from inactivity. To compensate for its weakened state, it must beat more frequently to meet the body's oxygen demands results in increased adipose accumulate in the muscles which may increase the BMImeasures.

Body mass index (BMI) is a recognized measure of body composition which also defines the fitness level of an individual. BMI is a calculation of the ratio of body weight in kilograms to body height in meters that indicates whether an individual has a healthy amount of the body fat or not (Woodward, Webster, Murakami &Barai 2014; Emiola, 2008 &Okuneye, 2013 and National Obesity Observatory, 2009). BMI could be used to search for both overweight and obesity in adults. The undergraduate students used as research participants could be showing deficits in blood pressure, pulse rates as well as body mass index hence the need assessment for assessment prior to participation in the proposed fitness and wellness programme.

The researchers have observed with keen interest low dispositions to practical lessons and most times the undergraduate show signs of fatigue taking part. This perhaps negates the general perceptions of other Departments who look up to students in Department of Human Kinetics & Health Education (HKE) Department on issues relating to sports and exercise. Besides, aerobic exercise will be utilized as one of the body conditioning exercises before retiring to main activities.Aerobics require plenty of oxygen for sustenance and demands that the body should be properly assessed on hand prior participation. It

has not been successfully established if the undergraduate students in the Department of Human Kinetics & Health Education (HKE) possess sufficient aerobic power required of fitness and wellness programme which the present study sought to examine. This will allow for affective programming in terms of mode, intensity and duration. To the best knowledge of the researchers, no assessment on systolic/diastolic, pulse and BMI have been conducted among the undergraduate students in ESUT to determine areas of deficits which was the major concern of this study.

The main purpose of this study was to assess physical fitness indices for exercise readiness among undergraduate students in the Department of Human Kinetics and Health Education, ESUT, Enugu. The study specifically assessed.

1. status systolic and diastolic blood pressure of the undergraduate students
2. Pulse rate measures of the undergraduate students
3. BMI status of the undergraduate students based on sex.

The following research questions guided the study.

1. What is the status of systolic and diastolic blood pressure of the undergraduate students?
2. What is the status of resting pulse rate of the undergraduate student?
3. What is the status of BMI of undergraduate students?

Hypotheses

Ho_1 There is no significant difference between the mean ratings of male and female undergraduate students' systolic and diastolic blood pressure.

Ho_2 There is no significant difference between the mean ratings of male and female undergraduate students' resting pulse rate.

Ho_3 There is no significant difference between the mean ratings of male and female undergraduate students' BMI status.

The study will sensitize the handlers of the proposed fitness and wellness programme and the students on their current physical fitness status with a view to develop a programme of activities that may unlikely result in occurrence of injuries. This may eventually lead to improvement upon the fitness of the students for the possible inclusion in the university teams for various sports during competitions such as Nigeria Universities Games NUGA, West African Universities Games (WAUG) as well as other competitions within and outside the university.

Method:

The study was evaluative design. The population consisted of 112male and female undergraduate students in the Department of Human Kinetics and Health Education, ESUT, Enugu.A total of 112 male and female undergraduate from all the different levels served as research participants hence there was no sampling. Participants were invited for an orientation sessionprior to measurements. Informed consent and activity readiness forms were issued to them. The following materials were used in the measurement of parameters for the study. They include; weighing scale-SECA 770 digital, Stadiometer-M120 with measuring range of 20-205cm, digital Sphygmomanometer-Omron. Measurement of variables in the study followed established standard. The data obtained from the participants were analyzed with mean and standard deviation while the only hypotheses were tested with t-test statistic. The decision rule for the research questions followed the

established norms for all the variables investigated.

Results

The results of the analysis on assessment of physical fitness for exercise readiness are presented in Tables according to research questions as follows:

Research Question One

What is the status of systolic and diastolic blood pressure of the undergraduate students

Table2: Sore of the Participants'Blood Pressure

n= 112

Dependent Variable	Bench Mark	Mean(X)	Dec
Blood pressure (Sys/Dia B.P)	120 / 80	116.67/78.67	Normal

Key: Sys/Dia B.P-Systolic/Diastolic Blood Pressure.

From the data presented in table 2 with respect to the status of participants'blood pressure, it indicates normal. This means that the undergraduate students in the Department of Human Kinetics and Health Education have normal blood pressure status.

Research Question Two

What is the status of resting heart rate of undergraduate students of HKE, ESUT?

Table 3: Mean Score of the Participants' Resting Heart Rate

n= 112

Dependent Variable	Bench Mark	Mean X	Dec
(RHR)	70-75 BPM	73.06	Normal/Strong

Key: RHR-Resting Heart Rate. BPM-Beat per Minute.

Data presented in the table 3 regarding the status of undergraduate students resting heart rate indicate total mean value of 73.06. This indicates normal/strong. This means that the RHR of undergraduate students in the Department of HKE, ESUT fall within normal/strong for day to day activities but however, below athletic fitness.

Research Question Three

What is the status of Body Mass Index (BMI) of the undergraduate Students based on sex?

Table 4: Pretest Mean Distributions of BMI of Male Participants.

n=39

Height	Heightrange	Weight	Weight range	BMI Interpretation
X	1.66	1.55-1.82	61.25	48.8-81.4
SD	1.015	84.9368	3.2278323.84	Normal
S.E	.01528		1.60515	.61000

Key: BMI-Body Mass Index. S.E-Standard Error

Table5: Pretest Mean Distributions of BMI Status of Female Participants

n=73

Height	Height range	Weight	Weight range	BMI Interpretation
X	1.64	1.50-1.86	63.68	48.0-81.6
SD	.9877.76602	2.56007	25.25	overweight
S.E	.03373 2.24186 .73903			

Hypotheses

Ho$_{1:}$ There is no significant difference in the mean ratings of male and female undergraduate students'resting systolic/diastolic BP status.

Table 6: t–test of Difference Regarding the Resting Systolic/Diastolic BP Status of the Participants

Sex	Dia/Sys BP X	SD	t- cal	t- crit	df	Dec.
Male	121/80	.913	1.250	1.658	110	
Female	118/78	.872				do not Reject Ho

Table 6 shows that the males had mean (x) score of 121/80 with SD .913 while the females had x score of 118/78 with SD .872 respectively. The calculated t-value was 1.250 while the t-critical value was 1.658. Hence the calculated value is less than the critical value, the null hypothesis is not rejected. This means that there is no significant difference between the male and female undergraduate students' systolic diastolic BP status.

Ho$_{2:}$ There is no significant difference in the mean ratings of male and female undergraduate students' resting heart rate status.

Table 7: t–test of Difference Regarding the Resting Heart Rate Status of the Participants

Sex	RHRSD X	t- cal	t- critdf	Dec.	
Male	71.3	.771	1.681	1.658	110
Female	69.4	.866	Reject Ho		

Data as presented in Table 7 shows that the males had x score of 71.3 with SD .771 while the females had 69.4 with SD .866 respectively. The Calculated t-value was 1.681 while the t-critical was 1.658. Therefore, since the calculated t-value is greater than the t-critical, the null hypothesis stands rejected. This means that there is a difference between male and female undergraduate students' RHR status in HKE Department.

$Ho_{3:}$ There is no significant difference in the mean ratings of male and female undergraduate students' BMI status.

Table 8 t–test of Difference Regarding the BMI Status of the Participants

Sex	BMI x	SD	t-calt-critdfDec.			
Male	23.84	1.015	1.110	1.7011	110	
Female	25.25	.987				do not Reject Ho

Table 8 shows that the males had mean (X) score of 23.84 with S.D of 1.015 while the females had mean (x) score of 25.25 with S.D of .987 respectively.The calculated t-value was 1.110 while the t-critical value was 1.7011. Therefore, since the calculated t-value is less than the t-critical value, the null hypothesis stands not rejected. This means that there is no difference between male and female undergraduate students regarding their BMI status.

Discussions

The discussion of findings of the study is presented as follows: the finding of the study showed that the blood pressure measures of undergraduate students in the Department of HKE, ESUT falls within normal range. The hypothesis shows that there is no difference between the male and female undergraduate students' systolic/diastolic BP status in HKE Department. This finding follows the recommendations of Tjonna Stolen, Bye, Volden, Shoddahi, Odegardet al, (2003); Wong, Chia, Tsou, Wansaicheory, Tar, Wong, Wansaicheory, Tar, Wong, et al (2002) and Kelley, Kelly, Tran, et al (2001), which state that the average systolic/diastolic blood pressure for an adult is 120/80mmhg. The finding is also in line with Okuneye (2013), report which recommended normal systolic/diastolic blood pressure in adults within the range of 95 to 145/60mmHg. The finding also agrees with Araoye (2005), recommendations which state that systolic/diastolic blood pressure of 90/50 mmHg may be normal for a healthy, asymptomtic 20 years-old adult. Some of the undergraduate students are within this age range. The agreement of the finding with expert recommendations regarding normal blood

pressure in adults is quite expected. The undergraduate students are young adults who rarely present blood pressure outsidenormal values. It could also be as a result of sports and games and other physical fitness related activities which they engage themselves in the course of going through their course work which may have enhanced their fitness status including blood pressure.

The finding also showed that the resting heart rate of undergraduate students in the Department of HKE falls within normal/ strong range. The hypothesis also shows that there is a difference between male and female undergraduate students' RHR status in HKE Department. This finding however, falls short of National Institute of Health and Care Excellence (2014), report which states that an active person should record 40-60BPM, but agrees with Andrea(2018), report which recommended that adults over the age of 10 years including older adults should have RHR between 60 and 100 beats per minutes.The RHR value which is below 60 BPM is generally regarded as athletic fitness.

The undergraduate students' RHR values of normal/strong range could be as a result of their regular involvement sporting activities during their practical lessons which may have provided them with reasonable fitness. This value recorded however, did not meet the approved athletic fitness and also suggests that students should be started slowly during the fitness and wellness programme in focus.

Another finding of the study showed that the body mass index (BMI) of the male undergraduate students fall within normal range. The hypothesis shows that there is no difference between male and female undergraduate students in HKE Department regarding their BMI status. This finding is consistent with the recommendations of National Institute of Health (2008), which states that a fairly active person should have his or her BMI fall within the normal range on the BMI scale (18.50-24.99). The finding also agrees with Okuneye(2013), recommendations regarding BMI values expected of individuals undergoing some forms of exercise programmes which should be within the normal range of BMI scale of 18.50 to 24.99. The major reasons for this are quite obvious. The undergraduates' regular involvement in sports and games as well as other physical fitness related activities may have substantially contributed to their keeping reduced values. Besides, physical walking within the campus environment when attending lectures in other areas outside their Departments also may provide some forms of physical exercises capable of reducing their fat content. It could also be the desire to keep good body form (aesthetics) which is one of the cardinal objectives of physical education. The female undergraduatesBMI values were found to be outside range which suggests overweight status. This may be on the account of activity levels of the female undergraduate. It could be that some of them avoid participating in sports when they are in school because they do not want to sweat and wet their clothes. It could also be on the account of physiological differences that exist between male and female hence the females having low metabolism than their male counterparts. The BMI of the female undergraduate students in HKE Department falling outside normal range suggests low fitness status. This also means that the proposed fitness and wellness programme should be structured to carry them along slowly during the preliminary stages.

Conclusions

The study in the light of the findings of the study concludes as follows: The undergraduate students in the Department of HKE, ESUT showsome measure of fitness status. However, their physical fitness level falls

outside athletic fitness which may affect their successes in competitive sports. The undergraduate students are all trainable athletes for competitive sports which the university trainers and sports administrators could catch on during competitions.

It could result in higher academic achievements and low attendance at the medical centre for medical attention by students as fitness is health. This also means that the health centre facilities will not be overstretched and conserves funds for the university for other purposes.

Recommendations

Arising from the findings and conclusions of the study, the following recommendations were made:

1. The organizers of the proposed fitness and wellness programme should structure it to carry the participants slowly within the first four weeks especially the opposite sex (females) in line with their exercise readiness status.
2. Monitoring physical fitness indices should be on-going as part of the programme content for continued assessment of participants' readiness.
3. The Department should ensure thatthe materials for the measurement of body parameters are in place for continued assessment of undergraduate students' exercise readiness.
4. The Human Performance and Health laboratory of the Department of HKE be equipped with test instruments for regular assessment of certain physical fitness indices required for sports and general wellness

References

American Council on Sports & Medicine Philadelphia (ACSM), (2014).Physical Activity Readiness self-Assessment guidance.fromhttps://www.nasm-par-q(pdf21k)pdf,accessedon27thJanuary,2020.

Andrea, L. (2009). Comparison of Lifestyle and structured inventions to increase and cardio respiratory fitness.A randomized trial.*Journal of the American Medical Association5(10):213-221*.

Araoye, S. (2005), In R.O. Okuneye (2013), "Human body, Human wellness: The perpetual antidote. " LASU inaugural lecture series (5th Edition), Lagos State University.

Awopetu, A.R. (2016). A review of the physiological effects of exercise duration and intensity during walking and jogging: *Journal Behaviour, 8(1)1-10*

British and Irish Hypertension Society(2018). How to measure blood pressure. London, Retrieved from https://bihsoc.org/resource/bp-measurement/measure-blood-pressure, accessed on 20th November, 2019.

Boggia, P. & Carleton.R.A., (2008). Physical fitness and blood pressure: the role of age. *Am J.Epidemiol,* 122(3):452-457.

Daskapan, A., Tuzuan, E.H., & Eke I, (2006). Perceived barriers to physical activity in University Students.*Journal of Sports Science and Medicine* 5(8): 615-620

De Bourdeaudhuij, I., Philippaerts, R., Crombes, G., Mahon, I., Wijodaele, K., Balduck A., &Lefevre, J., (2005). Stages

of change for PA in community sample of adolescents. *Health Education Research,* 20(3):116-124.

Emiola.M.L(2008) " All work and all play: The health assurance in exercise". The eighty-sixth inaugural lectures. Illorin: University ofIllorin.

Kelley, G.A. Kelly, K. S. & Tran, Z. V. (2003). The effects of exercise on resting blood in children and adolescents: a meta-analysis of randomized controlled trials. *PrevCardiol, 6:8-16.*

Lindsay-Reid, E & Osborn, R.W., (2008).Readiness for exercise adoption.*SocSci Med Psychol Med Sociol 2008*, 14:139-146

National Institute for Health (NIH, 2014). Hypertension: clinical management of primary hypertension in adults (clinical guideline 127). http://guidance.nice.org.uk/CG127.Accessed19June2014.

Nigg, C.R., (2011). Theories of exercise behaviours.*International Journal of Sports Psychology, 17*(2):290-304.

Okuneye, R.O., (2013). "Human body, Human wellness: The perpetual antidote" LASU inaugural lecture series (50th Edition), Lagos State University.

Ostojic, S.M. (2003). Seasonal alterations in body composition and spirit performance of elite soccer players.*Journal of Exercise,15(35): 1423-1432.*

Otinwa, G.O. (2008). *Achieving wellness lifestyle.Institute of Security*. Lagos: Intergrity Press Ltd. 09/09638288.2013.

Otinwa, G.0., (2014). One cause, many crises, the kinetic interpretation of wellness. *University of Lagos Inaugural Lecture Series*, 2014, Lagos, University ofLagos press.

Prezi User, (2013). Assessing the body's readiness for exercise. Available from https://prezi.com/18hdq-q2/assessing-the-body-readiness,accessedon27thJanuray,2020.

Reid, E., Osborn, R.W., (2008). Readiness for exercise adoption society.Bangkok, Tana Press publisher.Retrieved fromhttps://www.wasset.org-publication-predictive-factors-of-exercise-behaviourof-a-populationaccessedon20thDecember2019.

Ruiz, J.R., Castillo, M.J., Ortega, F.B., &Sjostrom, M. (2008). Physical fitness in childhood and adolescence: a powerful marker of health. *International Journal of Obesity, 32*, 1-11.

Shashiala L., Geetanjali H. (2014): Efficiency of Recovery pulse rate as an index of physical fitness. *Indian Journal of fundamental and applied life science* .vol 4(2), april-june, pp 216-219(8) Edward L. Fox. Charle

Siconolfi, S.F.lasater, F.M., McKinlay, S.,,Boggia, P.& Carleton, R.A. (2005). Physical Fitness and blood pressure: the Role of Age..*Am J Epidemiol, 122*(3):452-457.

Stroliacker, K. Boyer, W.R, Smitherman, E.C., &Fazzino, D.,(2017). Assessing energy level as a marker of aerobic exercise

readiness: A pilot investigation. *International Journal of Exercise Science, 10(1):62-7.*

Tjonna, A.E., Stolen, T. O., Bye, A., Volden, M., Shoddahi, S. A., &Odegard, R., (2009). Approach in Overweight Adolescents Aerobic Interval Training Readiness, Cardiovascular Risk Factors more than multitreatment.*ClinSci (London), 116:317-326.*

Wong, P. C., Chia, M. Y., Tsou, I. Y.Wansaicheory, G. K., Tar, B. & Wong, I.,C.(2008). Effects of a 12- Week exercise training programmeon Aerobic Fitness, Body composition, blood pressure, blood lipids and C-reactive Protein in Adolescents with Obesity. *Ann Acad Med Singapore,* 37:286-293.

Woodward M, Webster R, Murakami Y, Barzi, F, Lam T.H, Fang X, (2014).The association between resting heart rate, cardiovascular disease and mortality: evidence from 112, 680 men and women in 12 cohorts. Eur J Pre Cardiol; 21(6):719-26.doi: 10. 1177/2047487312452501

World Health Organizations (WHO 2009). Awareness on Physical Fitness Activities for Improved Health: *Journal of Recent Health Challenges. 8(11):87- 89.*

INQUIRY-BASED TEACHING AS AN APPROACHTO ENHANCING STUDENTS' INTEREST IN SECONDARY SCHOOL BIOLOGY

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Abstract
The study investigated the effects of two inquiry methods of teaching: guided and unguided on secondary school Biology students' interest in Nsukka Local Government Area of Enugu State, Nigeria. Three research questions and three hypotheses guided the study. Design of the study is quasi-experimental non-equivalentgroups. Population for the study comprised of 2,636 senior secondary one (SSI) students in 30 senior secondary schools excluding Technical schools in the area.Using multi-stage sampling comprising of purposive and simple random samplingtwo co-educational schools were purposively selected out of 23 co-educational schools in the area and throughsimple random sampling one intact class of 40 students was selected from each of the two schools to obtain a sample size of eighty (80) SSI Biology students.The intact classeswere randomly assigned to experimental groups I&II respectively and were taught a Biology content "Nutrition in Animals" using guided inquiry and unguided inquiry methods respectively. The treatment lasted for four weeks.The two groups controlled each other groups. The researchinstrument Biology Interest Inventory (BII)developed by the researcher and was face validatedby three lecturers in the Department of Science Education, University of Nigeria, Nsukka. The construct validity of the 30 BII items was ensured through factor analysis while the internal reliability coefficient of 0.81 was established usingCronbach Alpha.Data for the study was collected through pre and post tests using the BII. The data were analyzed using mean and standard deviation for the research questions and analysis of covariance (ANCOVA) for the hypotheses tested at 0.5level of significance. Result obtainedfrom the study indicated that guided inquiry enhanced students' interest in Biology more than unguided inquiry.The result revealed that gender had no significant effect on students' interest in Biology. The study therefore recommends for the use of guided inquiry methods of teaching since it enhanced students' interest more that unguided inquiry method irrespective ofgender.

Key words: Biology, Guided and unguided inquiry, interest and Gender.

Introduction

Biology is a branch of natural science that is devoted to the study of living organisms, their structures, functions, evolution distributions and interrelationships in the environment. The study of Biology in secondary schools offers learners a wide range of knowledge about all aspects of life and life processes in living organisms.The study of Biology helps to shape the interest of learners to undertake careers in many fields of learning such as Medicine, Pharmacy, Nursing,Teaching, Biochemistry and Agriculture; which are very important for national and economic development of a country. To study these afore-mentioned courses in the tertiary institutions, learners must have at least a credit pass (C6) in Biology in the senior school certificate examination conducted by either from West African Examination Council (WAEC) or National Examination Council (NECO).

Unfortunately, reports from researchers and educators (Ige, 2010; Opara, 2011; Cimer, 2012; Araoye, 2013; Ezenwosu&Nworgu, 2013; Osuafor&Okigbo, 2013 and Agboghoroma&Oyovwi, 2015), indicate poor students' achievement in Biology in these examinations. The students' poor achievement is majorly attributed to lack as of interest on the part of students due to methods employed by teachers in teaching Biology in the classroom.Researchers such as Ogundiwin, Asaaju, Adegoke and Ojo(2015) noted that Biology teaching in most schools is carried out throughthe traditional/expository method of teaching or lecture method. The lecture method of teaching is a method of instruction in which the teacher has full responsibility for presenting facts and principles to learners: orally, using projectors or by writing on the board (Ezenwosu&Nworgu, 2013). The lecture methodis more ofa unidirectional transmission of knowledge from teacher to learners thus; it encourages memorization and rote learning due to little or no active involvement of learners in the learning process. The lecture method may not promote students' interest since the students are passive in the learning process. It is therefore considered inappropriate for teaching inquiry-oriented subjects like Biology which requires active interaction of students with contents and materials resources within the learning environment (Opara, 2011).

To enhance students' interest in a subject, there is need for their active participationinthelearning process.Cimer(2012) indicated that involving learners actively in the learning process awakens interest and motivation. In view, of the contemporary education emphasizes for a shift from teacher- centered approach to a more nuance innovative methods of teaching that advocate for learner-centered approach (European Education Commission, 2015),thispresent study investigated an innovative method that could enhancestudents interest in Biology. Innovative methods of teaching are those methods of teaching that are learner-centered. They have common elements of introducing activities into the teaching and make learnersmajor components in the learning process. These methods of teaching enable learners to have some degree of responsibility for making decision in the learning process. Some examples of the innovative methods of teachinginclude: collaborative learning, concept mapping, peer-led teaching and inquiry- based learning among others (Cimer, 2012 andAgboghoroma&Oyovwi, 2015). Among these innovative methods,the inquiry method of teaching was considered appropriate for this study because of it encourages students to use scientific process of investigation to construct meaningful knowledge.Onan (2012)defined inquiry method of teachingas a student learning approach that encourages creation of personal knowledge through questioning and use of scientific process.

Isiugo-abanihe, LongJohn&Ibiene (2010) noted that inquiry teaching creates opportunity that encourages active participation of learners in the learning process and development of interest for a subject.

There are many types of inquiry methods of teaching each emphasizing on different level of students' participation in the teaching/learning process. Guisti (2008)identified two major types of inquiry teaching: guided and unguided. This study investigated the effect of these two methods: guided and unguided inquiry on Biology students' interest to determine which of the methods that has greater effect in enhancing students' interest.

Inquiry method or inquiry-based teaching is a method of teaching that emphasizes on understanding of concepts rather than memorizing of information. European commission (2015) noted that inquiry method of teaching increases learners' interest in science learning since it provides room for active classroom interaction between the teacher and the learners and among learners also. Inquiry method of teaching is a pedagogy which helps students to acquire self-knowledge through self-effort which includes questioning (Kirshiner, Sweller & Clark, 2006). It involves asking questions that stimulate students to think critically and develop authentic investigative scientific skills such as curiosity, creativity, objectivity, open-mindedness among others (Educational Broadcasting Corporation, 2004). The philosophy of inquiry teaching finds its antecedents in the works of some of cognitive and social cognitive theorist such as John Piaget, John Dewey, and Vygotsky among others (Kirshiner, Sweller & Clark, 2006). These theorists advocated for child-centered learning approach with the view that learners are the architects of their own idiosyncratic meanings of concepts and ideas which when provided enabling environment, construct knowledge, think critically and develop meaningful ideas. When learners are provided with the opportunity to develop ideas, their interest is awakened. Inquiry methods of teaching provide students with content-related problems that enable students to generate hypothesis or solution to a problem by gathering data that are relevant to the hypothesis and evaluating the data to arrive at a meaningful conclusion. Since Biology is inquiry in nature inquiry methods(guided or unguided) is therefore considered as a valuable tool in developing and promoting Biology students' interest.

Guided inquiry method is a type of inquiry teaching where the teacher provides the students with instructional guidance such as the concepts and procedures required for arriving at a solution. The teacher in guided inquiry chooses a question for investigation, develops a working plan while the students in large or small groups, work with the guidelines, gather data and draw conclusions. On the other hand, in the unguided inquiry method the students initiate problems or questions and independently investigate into the problems using a generalized principle with minimal or no assistance from the teacher or facilitator. In this type of inquiry, the students state the problems for identification, formulate hypothesis, and develop the working plan in line with the stated hypothesis (students identify problems, pose questions, discover specifics and construct essential information with reference to the generalized principle provided by the teacher. The rift in these two methods of inquiry teaching therefore rests on the structure of the learning procedure, the assistance provided by the teacher and the level of students' participation in the classroom activities. This study therefore determined the effect of these two types of inquiry teaching on secondary school Biology students' interest.

Interest is a motivational component characterized by increased attention and

concentration in an activity. It is a feeling of wanting to learn and the zeal or willingness to participate in an activity (Okoro, 2011). It also includes "choice" or preference for a particular activity to the other(Iweka, 2006). Student's success in any academic activity depends on the preference for such activity as students tend to participate in learning activities that interest them more than the ones they lack interest in.Araoye, (2013) noted that effective methods of teaching promote learners' interest and act as a motivation tool in the teaching process irrespective of gender. Hence the study investigated the effect of the two inquiry methods: guided and unguided on students interest, to determine which among the methods will promote students interest in Biology irrespectiveof gender.

Gender is another variable which the study. Gender is a socially constructed attributes,attitudes, responsibilities, roles and values assigned to individuals because they are males or females (Okeke, 20007).It is the socio-cultural stereotyping of roles to male and females rather than biologically sex determined roles.In the Nigeria, for instance there is stereotyping biasof assigning perceived difficult tasks to males andless difficult tasks to femaleshence courses like Medicine, Engineering, Mathematics, Architecture etc.which are perceived as difficult or hard to study are regarded as "male" domain while subjects such aslanguages and vocational studies Catering, Secretarial studies, Home management to mention but a few, are females (Oludipe, 2012).). The socialization of learners over theyearsbased on these misconceptions results to sex stereotyping of roles and careers. This may also influence the interest of male and female learners in Biology. The issue of sex stereotype of subjects is of great concern in the academic enterpriseas there are controversial reports among educators and researchers. Studies byOkoro, (2011) and Onan, (2012) indicated that there exist no difference in the mean interest scores of male and female students in Biology while Yong, (2009) and Nasr and Asghar, (2011) reported a significant difference in the mean interest scores of male and female students in Biology. Hence, to contribute to the educational debate and add to the existing literature on the influence of gender on students' interest in Biology this study investigated the effect of two methods of inquiry teaching:guided or unguided on students' interest in secondary school Biology.

Research Questions

The following research questions were posed to guide the study:

1. What are the relative effects of guided and unguided inquiry methods of teaching on students' interest in Biology?
2. What is the influence of gender on the mean interest scores of students taught Biology using guided and unguided inquiry methods of teaching?
3. What is the interaction effect of instructional methods and gender on students' means interest scores in Biology?

Hypotheses

The following null hypotheses guided the study and were tested at a probability level of 0.05.

1. There is no significant difference in the mean interest scores of students taught Biology using guided inquiry method and those taught using unguided inquiry method.

2. There is no significant difference in the mean interest scores of male and female students taught Biology using guided inquiry method and those taught using unguided inquiry method.

3. There is no significant interaction effect of instructional methods and gender on students' means interest scores in Biology.

Methods

Design for the study is quasi-experimental. Specifically the study applied pre-test, post-test non-equivalent group design. Quasi-experimental design was used for the study because intact classes were used to avoid disruption of normal class lessons. The pre-test was used to determine the interest level in the two groups and also to control selection bias which is a threat to internal validity.

The study was carried out in Nsukka Local Government Area in Enugu State. Population for the study comprised of 2,636 senior secondary one (SSI) students in 30 senior secondary schools excluding Technical schools, out of which two co-educational schools were purposively selected. Sample size of eighty (80) SSI Biology students drawn from two intact classes of 40 each was randomly selected. The choice of co-education schools was because gender was one of the variables. The two intact classes of forty (40) students each were randomly assigned to experimental group I and II respectively. The students in group I were taught using guided inquiry teaching method while those in group II were taught using unguided inquiry method. Both groups were exposed to the same Biology content Nutrition in Animals using lesson notes prepared by the researcher. The lesson notes were prepared based on the methods. The two groups controlled each other

Experimental Procedure

The experiment commenced with one week training of research assistants (regular Biology teachers in sampled schools). The research assistants were trained on how to teach the students using the two inquiry methods (guided & unguided) and were provided with lesson notes prepared based on the different methods. After the training the BII was administered to the two groups as a pretest to ascertain their interest level. The students were the exposed to the Biology content "Nutrition in Animals" in their different schools by the research assistants. The treatment lasted for a period of four weeks after which the BII items were rearranged and administered a week after as a post test to the different groups of students

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Control of Extraneous variables

Somme variable that could adversely affect the study were controlled.

To control experimenter's bias only the regular Biology teachers were used as research assistants.

To control differences due to school effect and instructional variable two set of lesson notes on the same Biology content were prepared by the researcher and given to the research assistants. Variations in the lesson notes were only on the method (guided and unguided).

To control contamination of experiments, two different schools were used for the study.

Research instrument for the study was Biology Interest Inventory (BII) that consisted of thirty (30) positive and negative interest statements measured on a four-point Likert-type interest rating scale and two set of lesson notes all developed by the researcher . The BII item statements and the lesson notes were face validated by three lecturers in the department of Science Education University of Nigeria, Nsukka (two in Biology/ Education and one Measurement and Evaluation). The BII was trial tested in a school with the same demographic characteristics with sampled schools but not sampled. Students' responses in the trial tested instrument were subjected to construct validity because the items are psychological trait. Out of 40 item statements initially developed only 30 items that loaded on one factor survived and

used as the research instrument. The internal reliability coefficient of the BII items was determined usingCronbach alpha because the items were dichotomously scored. Reliability index of 0.812 was obtained.Data for the study was collected using the BII. Scores obtained from the pre and post-tests were analyzed using mean, standard deviation and ANCOVA statistics.

Results:

Research Question I: What are the mean interest scores of students taught Biology using Guided inquiry and Unguided inquiry instructional methods?

Table1: Mean and standard deviation of interest scores of students taught Biology using Guided inquiry and unguided inquirymethods of teaching.

Group		Pre-test		Post-test		
	N	Mean	SD	Mean	SD	Mean Gain
Guided inquiry Method	40	36.67	9.48	50.51	12.63	13.84
Unguided inquiry Method	40	34.09	10.75	45.97	6.18	11.88

Table 1 shows that the students who were taught Biology using guided inquiry teaching method had mean interest score of 36.67 with a standard deviation of 9.48 at the pre-test and a post-test mean interest score of 50.51 and standard deviation of 12.63. Students who were taught Biology using unguided inquiry method had mean interest score of 34.09 with a standard deviation of 10.75 at pre-test, and a post-test mean interest score of 45.97 with a standard deviation of 6.18. The mean gain scores of 13.84 and 11.88 for the two groups of students respectively indicated that the students who were taught Biology using guided inquiry method had higher post-test mean interest score than their counterparts who were taught using unguided inquirymethod. However, the post-test standard deviations of 12.63 and 6.18 for the two groups respectively implied that students who were exposed to guided teachingmethod varied much in their individual interest scores than students exposed to unguided inquiry method ofteaching.

Research Question II: What are the mean interest scores of male and female students in Biology?

Table 2: Mean and standard deviation of interest rating scores of male and female students in Biology

Gender		Pre-test		Post-test		
	N	Mean	SD	Mean	SD	Mean Gain
Male	38	35.00	9.85	47.33	10.32	12.33
Female	42	35.72	10.53	46.16	10.09	10.44

Table 2 shows that the male students had mean interest score of 35.00 with a standard deviation of 9.85 at the pre-test and a post-test mean interest score of 47.33 and standard deviation of 10.32 while female students had mean interest score of 35.72 with a standard deviation of 10.53 at the pre-test and a post-test mean interest score of 46.16 with a standard deviation of 10.09. Mean gain scores of 12.33 and 10.44 for male and female students respectively, indicated that the male students had higher post-test mean interest score than their female counterparts. However, the post-test standard deviations of 10.32 and 10.09 for male and female students respectively implied that male students varied much in their individual interest scores than female students.

Research Question III: What is the interaction effect ofmethods and gender on students' meansinterest scores in Biology?

Table 3: Mean and standard deviation of interest scores of students for the interaction effect ofmethods and gender

			Pre-test		Post-test	
Group	**Gender**	**N**	**Mean**	**SD**	**Mean**	**SD**
Guided inquiry Method	Male	61	36.21	9.22	50.39	12.45
	Female	59	37.15	9.80	50.64	12.93
Unguided inquiry Method	Male	53	33.62	10.45	45.96	6.48
	Female	67	34.46	11.05	45.98	5.97

Table 3 shows that male students who were taught Biology using guided inquiry method had a post test mean interest score of 50.39 with a standard deviation of 12.45 while the male students who were taught Biology using unguided inquiry method had a post test mean interest score of 45.96 with a standard deviation of 6.48. Similarly, the female students who were taught Biology using guided inquiry method had a post test mean interest score of 50.64 with a standard deviation of 12.93 while the female students who were taught Biology using unguided inquiry method had a post test mean interest score of 45.98 with a standard deviation of 5.97. This shows that both male and female students who were taught Biology using guided inquiry method had higher post test mean interest score than the male and female students taught using unguided inquiry method. The post test standard deviations of 12.45 and 12.93 for the male and female exposed to guided inquiry instructional method and post test standard deviations of 6.48 and 5.97 for the male and female students exposed to unguided inquiry instructional method implied that both male and female students exposed to guided inquiry method varied much in their individual interest scores than the male and female students exposed to unguided inquiry method

1. There is no significant difference in the mean interest scores of students taught Biology using guided inquiry method and those taught using unguided inquiry method.

Table 4: Analysis of Covariance of the effect of instructional methods on the interest of students in Biology

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	1360.014[a]	4	340.004	3.410	.010	.055
Intercept	46524.735	1	46524.735	466.668	.000	.665
Pre-interest	120.511	1	120.511	1.209	.273	.005
Treatment	1113.493	1	1113.493	11.169	.001	.450
Gender	.328	1	.328	.003	.954	.000
Treatment * Gender	.726	1	.726	.007	.932	.000
Error	23428.481	75	99.696			
Total	705217.000	80				
Corrected Total	24788.496	79				

a. R Squared = .055 (Adjusted R Squared = .039)

Table 4 shows that the probability associated with the calculated value of F (11.169) for the effect of instructional methods on students' interest in Biology, is 0.001. Since the probability value of 0.000 is less than the .05 level of significance ($p < .05$), the null hypothesis was rejected. Thus, there is a significant difference in the mean interest scores of students taught Biology using guided inquiry and unguided inquiry methodsin favour of those taught using guided inquiry instructional method. Besides, the partial Eta Square value (effect size) of 0.450 shows that guided inquiry instructional method had low effect on the interest of students in Biology.

Ho_2: There is no significant difference in mean interest scores of male and female students in Biology.

Table 4 shows that the probability associated with the calculated value of F (.003) for the influence of gender on students' interest in Biology is 0.954. Since the probability value of 0.954 is greater than 0.05 level of significance ($p > .05$), the null hypothesis was accepted, implying that there is no significant difference in the mean interest scores of male and female students in Biology. Also, the partial Eta Square value (effect size) of 0.000 shows that gender had no influence on the interest of students in Biology.

Ho_3: There is no significant interaction effect of methods and gender on students'mean interest rating scores in Biology.

Table 4 shows that the probability associated with the calculated value of F (0.007) for the interaction effect of instructional methods and gender on interest of students in Biology is 0.932. Since the probability value of 0.932 is greater than 0.05 level of significance ($p > .05$), the null hypothesis was accepted. Hence, there is no significant interaction effect of methods of teaching and gender on students' interest in Biology.

Summary of the Findings

The following are the findings of the study;

1. Students who were taught Biology using guided inquiry had higher post-test mean interest score than their counterparts who were taught using Un-

guided inquiry instructional method. Further analysis showed that there is a significant difference in the mean interest scores of students taught Biology using guided inquiry and unguided inquiry methods in favour of those taught using Guided inquiry instructional method.

2. Male students had higher post-test mean interest score than their female counterparts. However, further analysis revealed that there is no significant difference in the mean interest scores of male and female students in Biology.

3. Both male and female students who were taught Biology using guided inquiry instructional method had higher post test mean interest score than the male and female students taught using Un-guided inquiry instructional method. Indicating that there is no significant interaction effect of the instructional method and gender on students' interest in Biology.

DISCUSSIONS,

Effect of guided and unguided inquiry methods on students' interest in Biology

Finding of the study as revealed by tables I and 4 indicate that guided inquiry promoted students' interest more than unguided inquiry. The superiority of guided inquiry could be attributed to the class teacher's guidance and assistance that enabled the students to remain focused and developed interest in the subject. Teacher's assistance also helps to reduce stress that may frustrate the interest of learners when they are not assisted. Finding of this study strengthens Vygotsky (1978) social-cultural theory which indicates that the assistance provided by a more experienced adult such as the teacher promotes learning beyond the zone of proximal development. The study corroborates with Kulthau, Maniotes and Aspary (2007) who revealed that guided inquiry fosters motivation that promotes interest in learners.

Effect of guided and unguided inquiry on male and female students' interest in Biology

Result on tables 2 indicates that male students had higher post test interest rating scores than the females. However, the corresponding analysis on table 4 indicated that there is no significant difference in the interest of both male and female students. The insignificant influence of gender in the use of inquiry methods could be attributed to the interactive nature of the method which encouraged active participation of the students and enhanced interest irrespective of gender. The finding of the study corroborates with Okoro (2011) who revealed that activity-oriented methods of teaching promotes learners interest.

Interactive effect of guided and unguided inquiry and gender on students' interest in Biology

The result on table 3 and the analysis on table 4 indicate that both male and female students exposed to guided inquiry method outperformed their counterparts that were exposed to unguided inquiry, indicating no interaction effect between the method and gender.

The absence of interaction effect could be attributed to the superiority of guided inquiry due to the teachers' assistance and guidance during the learning process that enhanced the interest. The teacher's guidance made the students to focus attention and develop interest.

CONCLUSIONS

- Guided inquiry method promotes students' interest in Biology more than unguided inquiry method.
- Gender has no significant influence on students' interest in Biology.
- There is no significant interaction effect of inquiry methods and gender on students' interest in Biology.

RECOMMENDATIONS

Guided inquiry methods should be adopted by teachers to promote students interest in Biology and bridge up gender differences that exist among students in academics.

References

Agboghoroma, T. E. & Oyovwi, E (2015).Evaluating effects of students' academic achievement on identified difficult concepts in senior sec. school Biology in Delta State.*Journal of Educational Practice,* 6 (30), 2222-2288. Retrieved online. 05/06/16.

Araoye, M.I. (3013).Redressing students' motivation and academic achievement in Biology Education: Unpublished PhD Thesis Federal College of Education (Special) Oyo, Oyo State Retrieved online. 03/12/16.

Cimer, A. (2012). What makes Biology learning difficult and effective: Students views *Educational Research and Reviews,* 7(3):61-71. Retrieved online@http://www.acadmeicjorunals.org/ERR. 04/5/16.

Education Broadcasting Corporation, (2004). Concepts of classroom workshop: constructivism as a paradigm for teaching and learning. Retrieved online 07/05/13 @ http://www.thirteen.org/eduonline/concept2class/constructivism/index.

European Education Commission, (2015).“Developing the teaching of Science” Science Education for Responsible Citizenship online @ec –europa-eu 15/10/16.

Ezenwosu, S. U. & Nworgu, L. N. (2013).Efficacy of peer tutoring and gender on students' achievement in Biology.*International Journal of Scientific and Engineering Research,* 4(21)944-950. Retrieved online.http://www.userorg. 20/5/16.

Guisti, B.M, (2008).Comparison of guided and open inquiry instruction in a high school Physics classroom. Unpublished Thesis School of Technology Brigham Young University.Retrieved online 21/5/10.

Ige, A. (2010). Strategies for improving Biology teachers for optimum performance. [online] available, @http://en.oboulo.com/strategies-forimproving-biology-teachersforopt.

Isiugo-Abanihe, M. Long John, I&Tandi, I. (2010).Evaluation of the methodology aspect of science teacher education curriculum in Nigeria.*Pakistan Journal of Social Sciences,* 17(2) 170-176. [Online] available, @http://www.medwelljournals.com/fulltext/?doi=pjSsci.2010.170.170.

Iweka, S. (2006) Effects of inquiry and laboratory approaches of teaching Geometry ion students' achievement and

interest. Unpublished M.Ed thesis U.N.N.

Kirshner, P.A, Sweller, J. &Clark, R. E (2006). "Why minimal guidance during instruction doesn't work: An analysis of the failure of constructivist, discovery, problem-based, experimental and inquiry-based teaching. *Educational Psychologist,* 41 (2) 75-86 online @(http;//www.cogtech.usc.edu/publication/ Kirshner- Sweller- Clarkpdf) 08/06/12.

Kulthau, C. C., Maniotes, L. K. &Aspray, A. K (2007). Guided inquiry learning in the 21st century: Retrieved online @ http://ciss/rutger.edu/guided~inquiry/introductionhtml.

Nasr, A.R. &Asghar, S.K. (2011) Atttitude towards Biology and its effects on students' achievement.*International Journal of Biology,* 3(4), 100.

Ogundiwin, O.A., Asaaju, O.A. Adegoke, &Ojo, A.I. (2015).Effects of group investigative laboratory strategies on students' achievement in Biology.*Pyrex Journals of Research in Environmental Studies,* 1 (4),035-041. Retrieved online 2 / 6 / 1 6 http://wwwpyrexjournals.org/pyrex.

Okeke, Eunice A.C. (2007). Making science education accessible to all.23rd inaugural Lecture of the University of Nigeria, Nsukka.

Okoro, A.U. (2011). Effects of Interaction Patterns on achievement and interest in Biology among Secondary School Students in Enugu State Nigeria.Unpublished Thesis Department of Science Education U.N.N.

Oludipe, O.I. (2012). Gender difference in Nigerian junior secondary students' academic achievement in Basic Science.*Journal of Education and social research,* 2(1), 93-99.

Onan, F. (2012).Inquiry-based learning and language teaching.Retrieved online 01/04/12 @ file://E./inquiry-based-leaerning-and-language-teaching-1080813.html.

Opara, J.A. (2011). Inquiry method and students' academic achievement in Biology: Lessons and Policy Implications: *American-Eurasian Journal of Scientific Research,* 6(1), 28-31.

Osuafor, A.M. &Okigbo, E.C. (2013).Effects of differentiated instruction on the academic achievements of Nigeria secondaryschool Biology students.*International and Research journals, 4(7),*555-560.

Yong, B.C.S (2009). Students' motivational orientations and their association with achievement in Biology. *Brunei International Journalof Science and mathematics Education,*1(1), 52-6

DEVELOPING APPROPRIATE TEACHING SKILLS IN STUDENT TEACHERS: CO-OPERATING TEACHER'S ROLE.

BY

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Abstract

Teaching practice (TP) is the only practical component of training given to prospective teachers towards their qualifying as professional teachers. It is likened to an internship programme, where an intern is immersed into real field experience of his profession. The paper discussed the relevance of TP to student teachers as well as the duties of participants in the programme. It also identified the cooperating teacher as the pivot of the whole exercise. The success of the exercise depends on his accomplishment through modeling, mentoring and guided reflection. While stressing the crucial role of the cooperating teacher, the paper recommended that cooperating schools must always plan for the development of student teachers, and that assisting teachers be given some compensation as well as training for the role.

Keywords: Teaching practice, student teachers, cooperating teacher, modeling, mentoring, guided reflection.

Introduction

Teaching practice is a period in teacher educationprogramme when a trainee teacher is sent to a school to experience the art of teaching. Deville (2010) defined teaching practice as an internship experience, a part of formative training process for pre-service teachers in skill exploration and enhancement. According to Uwameiye and Ogunbamelu (2012), teaching practice (TP) may be seen as a:

- Vocational course which is competency and performance based
- A form of internship mandatory professional requirement
- Skill development exercise
- Designed as a feedback channel to generate information on the effectiveness or otherwise of a teacher education programme and
- Data gathering on student teachers (STs) practicum assessment.

Student teachers through teaching practice assess their subject matter mastery and ability to put into practice educational theories and principles. Deville (2010) also asserted that experiential learning which practical teaching affords; empowers the STs meaningful understanding of concept of teaching and ability to construct their own theories of teaching. It affords the teacher trainees the opportunity to make personal observation of teaching and learning, formulate hypothesis, test their hypothesis and form their own theories of teaching and learning.

For TP to yield the much desired fruit of producing a highly efficient classroom teacher (Federal Republic of Nigeria, 2013), the training institution has the duty of preparing the trainees theoretically and practically (in micro teaching). The level of mastery of specific subject matter and general education courses prepares the STs cognitively and otherwise for teaching practice. The institution is expected to make an on-site visitation before the practice. The institution's second role lies in making on-site visitations during the practice. This encourages the STs both emotionally and professionally. It is pertinent to point out that the institutional contact with STs on practice teaching is minimal and periodical. Most of the period is spent with the class teacher in the practice school. The day to day encounters, challenges, fears, failures or successes of the ST is generally before the class teacher. It is therefore no gain saying that the ST depends more on the class teacher in order to gain the professional skills required for teaching. According to Amadi and Udu (2016) the cooperating teachers the most important companion of student teachers with respect to professional preparation and growth and that student teachers rely heavily on them as they instruct, guide, mark lesson notes, observe, advice, supervise and assess student teachers at all times.

According to Robert, Horder and Brasheers (2016) cooperating teachers and cooperating centers impart the teaching experience the most. Cooperating teachers foster unique teaching concepts and give support and encouragement to pre-service teachers, similarly the centers foster general supervisory climate and leadership abilities in the pre-service teachers. They can achieve these through three major processes:

- Modeling
- Mentoring
- Guided Reflection

Cooperating Teachers Modeling Role

Cooperating teachers model instructional processes to teacher trainees. They provide the first- hand real teaching experience to be witnessed by student teachers. They are the student teachers model in the three components of teaching:

- Preparation
- Execution and
- Evaluation

In preparation for teaching, the cooperating teacher (CT) selects the specific objectives, the content, and the teaching material(s) and writes the lesson plan. Under execution, he/she teaches the selected content, and the teaching materials with proper classroom management. In evaluation, the teacher administers questions, quizzes/ tests, examinations and makes educational decisions.

Before taking up teaching, the ST observes the model teacher through these processes in a number of lessons. He/she also observes other teachers in his/her subject area teaching in other classes. It is only after the observation phase that the ST teaches part of a lesson, assists with routine class activities and plans for future lessons with the guidance of the cooperating teacher. By the third week he/she assumes more teaching responsibilities till he takes the full class. The teacher's decision regarding teaching method and material is final. If students are exposed to poor models, they too become poor in the teaching skills as student teachers experiences during teaching practice influence their future careers as educators.

Cooperating Teachers (CT) Mentoring Role

Mentoring is defined as a sustained relationship between a youth and an adult in which the adult offers support, guidance and assistance as the

younger person goes through a difficult period, faces new challenges or works to correct earlier problems (Educational Consumer Guide, 2011). Cooperating Teachers as mentors volunteer to share their knowledge, skill, and experiences with the STs, thereby leading them into the demands of their profession. On the value of mentoring to teaching profession, Rainkeri in Uwameiye and Ogunbameru(2012) stated that mentorship deeply imprints a model of professional practice that has life-long learning and professional development.

Mentor Qualities of Cooperating Teachers

At the foundation of any effective mentoring relationship is empathy. The ST is a developing person that needs to be accepted without prejudice about his person and accomplishment. Their problems need to be appreciated and treated with understanding. In other words STs must be accepted by CTs as they are.

A good mentor an example of continuous learner.They are open about their own search for better answers and more effective solutions to problems. They show this by his readiness to learn from colleagues including STs and his willingness to pursue professional growth through variety of means. According to Rowley (2010) beginning teachers appreciate mentors who have right answers to every question and best solutions for every problem.

A good mentor communicates hope and optimism. Daresh and Playko in Eze and Obiekezie(2019) argued that a crucial characteristic of mentors is the desire to see their mentees go beyond their present level of performance, even if it might mean that they are able to do some things better than the mentors themselves. Good mentor teachers seize every opportunity toaffirm the human potentials of their mentees. They do so both in private (class) and in public setting.

Mentoring strategies of CTs:
Instructional Support
Mentor teachers provide quality instructional support. They are willing to coach the trainees to improve their performance wherever their skill levels are. They are ready to observe the student teacher and to offer support to student teachers in:

- Planning, organizing and managing instruction.
- Maintaining a positive learning environment.
- Obtaining instructional resources/materials.
- Assessing and evaluating learning.
- Motivating learners.
- Using effective teaching strategies.
- Working with students of diverse abilities.
- Acquiring information about the school.
- Communicating with fellow teachers and parents.
- Developing reflective practice.
- Keeping and using class/school records.(*Rowley, 2010; Educational Consumer Guide, 2011)*

Shared Experience
Instructional support does not end in classroom conversations but discussions based on shared experiences are equally effective. Rowley (2010) held that such shared experiences can promote collegial dialogue focused on enhancing teacher performance and student learning. Such experience can take the form of conducting activities like assembly/match past together, organizing picnics/excursions together, searching for materials together, engaging in team teaching, team planning, observing another teacher together, CT observing ST and vice versa. A mentor CT can also share his/her own difficulties and

frustrations and how he/she overcame them in a caring way. This engenders trust.

Guided Reflection:
Reflection is careful consideration/thought. Deville (2010) stated that reflection is a learning method which fosters meaningful learning through questioning and investigation. The purpose is to improve future actions. In teaching, the mentor teacher helps the trainee to reflect on his/her teaching actions through questions. He/she does not normally condemn outright but through questions leads the student teacher to evaluate his/her teaching/learning actions or in-actions from the beginning to the end. With time the ST reflects on his/her own processes or in group with others as thus:
How have I prepared for teaching this topic? Was the introduction the best? Could it have been done differently? Was I too quick in my reaction? Was the teaching material adequate? Introduced properly? Did I end too early? etc.

Norsworthy in Uwameiye and Ogunbameru (2012) on reflection held that it orientates learners towards self-focus and self-evaluation; whileself-focus and self-evaluation create in STs awareness of their personal cognition, emotional and behavioral states. Through reflection, STs identify learning/teaching impediments and devise or adopt appropriate improvement strategies.

Conclusions
Teaching practice is the practice component of teacher education programme in Nigeria. Through it, teacher trainees are expected to acquire the practical teaching skills that will strike a balance between the theories learnt in training institutions. As a skill development practice, STs must be led through the exercise in such a way that the requisite skills are acquired by them. A very effective way of doing this is by involving the master teachers to model, mentor and help to evaluate their efforts.
From the experiences of the writer as a college teaching practice coordinator and supervisor over the years, it seems that the cooperating teachers are unaware of their responsibilities towards STs and teacher education in general. To that end, the following recommendations are made:

1. Cooperating schools must make plans for teachers that will serve as support to Sts.

2. Cooperating teachers need training on how to assist student teachers. Such t raining will provide specific descriptions of the roles and responsibilities of the cooperating teachers. This is the prerogative of the training institution. They can achieve this through workshops or through their teaching supervisors and monitors that interact with cooperating teachers.

3. There is a strong relationship between compensation and commitment. Provisions of stipends, release from extra duties or additional opportunities for professional growth, giving of merit award or certification are forms of compensation to the cooperating teachers, which the practice schools may adopt for effectiveness in mentoring of student teachers.

References

Deville, P. (2010). Mentoring Reflective Practice in Pre-Service Teachers. EABR andETLC Conference Proceeding. *The Voice of Australian Science Teachers Reconstructing the Mentoring Provided Pre-Service Lecturers, especially in the Development of Professional Reflective Practice*. Retrieved fromhttp://ww.ascd.org/publications/educational-leadership/may99/vol.56.

Educational Consumer Guide: Mentoring Retrieved 1st February, 2011.

Eze, P. C. &Obiekezie, N. P. (2019), Mentoring of student-teachers: A strategy for improving professional t eacher development. Teaching Excellence (2), 20-24.

Federal Republic of Nigeria (2012).Curriculum *Implementation Frame Work Nigeria Certificate in Education.* Abuja: TETF Project

Federal Republic of Nigeria (2013).National *Policy on Education*. Abuja: NERDC

Roberts T. G. &Horder, A &Brasheers, M. T. (Eds) (2016).Student Teachers Perception of the Characteristics of Effective Cooperating Teachers.*Proceedings of the Southern Agricultural Education Research conference*. Retrieved from http://aaaeonling.org/resources/documents/AAAE_National_Research_Agenda_2016-2020.pdf

Rowley, J. B. (2010).Educational leadership (El) http://ww.ascd.org/publications/educational-leadership/may99/vol.56.Retrieved 7th October, 2012.

Uwameiye, R. &Ogunbameru, M. T. (2012). Reflective Practice: A Strategy for Improving Teaching Practice in Nigerian Colleges of Education. *International Journal of Academic Research in progressive Education*

CHALLENGES CONFRONTING THE USE OF COMPUTER SYSTEMS AND LEARNING OF COMPUTER SCIENCE IN SENIOR SECONDARY SCHOOLS IN ENUGU EAST LOCAL GOVERNMENT AREA, ENUGU STATE.

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Abstract

The objective of the study was to determine the challenges that confront the use of computer systems and teaching and learning of computer science in Enugu East L.G.A secondary Schools. One research question and one hypothesis guided the study. The research design was survey. The population was 52 respondents -13 principals and 39 computer science teachers. Data was gathered using questionnaire. The reliability coefficient of the questionnaire was 0.80. Mean and standard deviation was used to answer the research questions while t -test was used to test the hypothesis at 0.05 significant level. The results indicated that there were 12 challenges that confront teachers in using computer systems. The state government should make sure that all secondary schools in the state have regular power supply.

Introduction

Thecomputer is a device for storing large amounts of information (data) and for processing these data in specified ways in very short period of time (Albert, 2016), It is a machine that is specifically designed to manipulate coded information, an automatic electronic machine made to carry out simple and complex operations that are far beyond that capacities of man. The computer accepts data in one form and process it to provide data as information in (computer systems) and store information, is process data and to output information. Computer Education or computer science is currently, in Nigeria, a school subject that is taught at pre-primary, secondary and tertiary levels of education. The subject has enlightened many Nigerian about the importance of computer and it is capable of enhancing the rapid development in some sphere of life- such as science, technology, economics, accountancy, artshurmaties, language, e.t.c.

Okoli and Anamezi (2017) defined computer education as the process of acquiring basic computer knowledge, ideas, skills and other competencies so as to understand the basic t echniques, weakness of computer, potentialities of computer and how computer education as the inculcation of computer literacy that is both informal and formal to the leaner. Computer education is important in

order to ensure the fastening and transmission of computer knowledge of basic computer concepts or terminologies and how it can be used to solve problems. Computer literacy is the ability to use computer and related technology efficiently, with a range of skills covering levels from elementary use to programming and advanced problem solving.

Teaching Computer Science in secondary schools is besought with a lot of challenges. Some of these challenges are shortage of computer teachers, absence of computer laboratory in schools, poorly furnished computer laboratories, inexperienced computer teachers, lack of maintenance funds for the laboratories, lack of funds to establish new computer laboratories and furnish them properly, lack of space in schools for a computer laboratory, insignificant lesson time table, lack of power supply, irregular power supply, lack of alternative power supply such as the generator high cost of computer systems and peripherals, etc. Enugu state LGA is one of the LGA in Enugu Urban but it has both Urban and Rural Areas taking cognizance of the whole situation, the researcher decided to investigate into the challenges confronting the use of computer systems and peripherals in teaching and learning of computer science in secondary schools.

The purpose of the study was to examine the challenges confronting the use of computer systems and learning of computer science in Enugu East L.G.A secondary schools.

Research Questions

Two research questions guided the study as follows.

What are the challenges confronting the use of computer system in Enugu East LGA secondary schools?

What are the peripheral in the process of teaching and learning computer science in Enugu East LGA secondary schools?

Two hypothesis guided the study as follows

1. There is no significant different between the mean scores of principals and computer science teacher with respect to challenging confronting the use of computer systems.
2. There is no significant different in learning of computer science in Enugu East L.G.A secondary schools.

Method

The researcher used a survey research design. The study was carried out in Enugu East L.G.A. The population consisted of 13 principals and 39 computer teachers giving a total of 52 respondents. Due to the factthe sample size is manageable ,the researcher use , the entire population of 52 respondents for the study. Hence, no sampling was carried out. A questionnaire was employed for data collection, which was constructed by the researcher A modified four point liker scale was used strongly agree (SA), Agree (A), Disagree (D), and strongly disagree (SD) these were weighed 4, 3, 2 and 1 points respectively. The reliability coefficient of the questionnaire was computed using crookback Alpa and it was found to be 0.80 this is interpreted as very highly reliable with regards to the questionnaire. The questionnaire was validated using three experts –two in computer science education and one in measurement and evaluation. Mean and standard deviation were used to answer the research question; T-test was utilized in testing the hypothesis at 0.05 level of significance.

Results

The results of the study were presented in the table below.

Table 1: Means and standard deviation on challenges confronting the use of computer systems and peripherals.

S/N	CHALLENGES	Principals			Computers teachers			Overall		
		X	SD	Dec	X	SD	Dec	X	SD	Dec
1	Absence Of Power Supply	2.66	0.76	A	2.78	0.89	A	2.72	0.82	A
2	Irregular power supply.	3.28	0.51	A	3.06	0.76	A	3.17	0.66	A
3	Absence of alternative power supply e.gGenerator.	3.00	0.51	A	3.29	0.62	A	3.15	0.79	A
4	Lack of money to fuel generator always.	2.86	0.92	A	3.00	0.84	A	2.93	0.88	A
5	Lack of money to pay school electric bills.	2.96	0.72	A	2.74	0.83	A	2.85	0.77	A
6	Lack of properly trained computer teachers.	3.66	0.21	A	3.71	0.16	A	3.69	0.18	A
7	Insufficient number of trained computer teachers									
8	Lack of interest by students in using the computer systems	2.76	0.81	A	2.88	0.76	A	2.82	0.78	A
9	The use of computer systems and peripherals is not emphasized in computer syllabus.	2.58	0.69	A	2.51	0.78	A	2.55	0.74	A
10	Students do not have opportunity to practice what they learnt in computer systems and accessories.	2.91	0.80	A	3.01	0.48	A	2.96	0.68	A
11	Student do not have access to computer	2.86	0.66	A	2.76	0.58	A	2.81	0.61	A
12	High cost of computer systems and peripheral	3.04	0.79	A	3.06	0.71	A	3.05	0.76	A

Table 1 shows that the respondents (SS2 students) agreed that peripherals in teaching and learning of a computer science in senior secondary schools in Enugu East LGA. In other words, they all agreed with all the 12 items.

The result of the hypothesis is presented in table 2

Table 2: t-test results on challenges.

Respondents	Mean	SD	N	df	t-cal	t-cret	Dec
Principals	3.04	0.79	13	51	0.07	2.39	NS
Computer science teachers	3.06	0.71	39				

Tables 2 shows that the t-calculated value of 0.07 is less than that critical value of 2.39. Hence, the null hypothesis is not rejected. These indicated that there are no significant differences between the mean scores of principals and computer science teachers with respect to challenges confronting the use of computer systems and peripherals in teaching and learning of computer science in Enugu East LGA Secondary Schools.

Discussions

Table 1 shows that the respondents agreed with all the 12 challenges that militate against the effective use of computer systems and peripherals in the process of teaching and learning of computer science in Senior Secondary schools in Enugu East LGA.

Further principals and computer science teachers equally agreed that that 12 listed items in table 1 are challenging.

Table 2 shows that there is no significant differences between mean scores of principals and computer science teachers with respect to challenges confronting the use of computer science systems and peripherals in teaching and learning of computer science in secondary school. This means that both the principals and computers science teachers with respect to challenges confronting the use of computer systems and peripherals in secondary schools.
Where I shows that the respondents agreed with all the 12 challenges that militates against the effective use of computer systems and peripherals in the process of teaching and learning of computer science in senior schools in Enugu East L.G.A.

Further, principals and computers science teachers equally agreed that the 12 listed items in table 1 are challenges. Table 2 shows that there is no significant difference between mean score of principals and computer science teachers with respect to challenges confronting the use of computer science systems peripherals in teaching and learning of computer science in secondary school. This means that both principals and computer science teachers equally accept that these 12 items are challenges indeed. In the presence of these challenges, there is no way computer science can be taught effectively in secondary schools. The only way out to obtain succers in effectively teaching and learning of computer science to find solutions to these challenges. If effective solutions are not found, teaching and learning of computers science in secondary schools will continue to deteriorate. If their determination on teaching and learning is continued, students offering computer science will continue to achieve poorer and poorer in the subject. Consequently, Nigeria will not be in a position to achieve the goals aims and objectives of education as enshrined in the national policy on education and also the goals aims and objectives of science and technology in general and Information and Communication Technology (ICT) in Particular.

Conclusions

From the findings of the study, the conclusion that there are 12 challenges confronting the utilization of computer systems and peripherals in teaching and learning of computers science. There's no significant difference between the mean scores of principals and computer science teachers with regards to challenge that continent the use of computer systems and peripherals in teaching and learning of computer science.

Recommendations

The following recommendations are made based on the findings. The state government should do it to supply power to all secondary schools in the state and make sure that there is regular power supply.

The state government orbit agency for education should give some money for impress so that principals can fuel and maintain the school generator.

The state government should give scholarships or bursary awards to all students reading computer science education in all tertiary students. This will enable the state to have enough computers science teachers in the state.

Principals of schools should ensure that computer science students do enough practical in the computer science laboratories.

The state government should establish standard computer science laboratories in each secondary school.

References

Albert, L.N. (2016). International Journal of Studies in Education Vol. x No. 1 January, pp. 38-48

Onoh, D.O and Albert, L.N. (2017) Effect of computer Game on Student's Retentions in Trigonometry: A pivotal Tool for Scientific and Technological Development in Nigeria. Journal of General Studies. Vol. V No. 1, November, pp. 133-138.

Okoli, T.O and Anamezie, R.C. (2017), Using Information and communication Technology.(ICT) Tools in Teaching and Learning of Physics/ Agricultural Science in Secondary Schools in Enugu East L.G.A International Journal of Studies in Education, Vol. xi No. 1, January, pp 128-133.

Eze, G.U. (2011). Computer and Digital system Fundamentals.Effurum, Delta State: Macony Publishers.

Ezeugwu, J.A (2015) Computer Based Training and Web-Based learning strategies needed for Effective Teaching and Learning of Physical Education in Secondary schools in Nsukka L.G.A Journal of Science and Computer Education. Vol. 3 Vo.3, pp 165-172.

BARRIERS TO PHYSICAL EXERCISE PARTICIPATION AMONG ACADEMIC STAFF OF ENUGU STATE COLLEGE OF EDUCATION (TECHNICAL) (ESCET), ENUGU STATE.

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Abstract

Physical exercise participation is generally recognized as one of the indices of health and longevity in all categories of individuals including academic staff in higher institutions of learning. Despite the numerous benefits derived from regular participation in exercise a significant proportions of adults do not take part in it due to certain reasons. The need for an insight into barriers to physical exercise participation among academic staff of Enugu State College of Education (Technical), Enugu which recorded seven (7) academic staff deaths between January to July, 2019 is therefore necessary. Descriptive survey design was adopted. Three research questions in line with the purpose of the study guided the study. The hypothesis of the study was tested at 0.05 level of significance. Researcher's made; structured and validated questionnaire titled "Barriers to physical Exercise Participation Questionnaire (BPEPQ)" was used as instrument for data collection while data analysis was done with mean (x), standard deviation (SD) and t-test statistic. Findings revealed that physical exercise participation by academic staff of ESCET, Enugu is adversely affected by personal, social and environmental barriers. Furthermore, it was found that gender is not a factor of variance regarding personal barriers to physical exercise participation by academic staff of ESCET (P=0.190). The study in the light of this concludes that ESCET academic staff have low dispositions to physical exercise participation. Based on the findings and conclusions, it was recommended that the management of ESCET, Enugu should as a matter of urgency institute a keep fit arena in the Department of Health and Physical Education of the college to provide additional motivation to the academic staff. The Human performance laboratory can be upgraded with excellent modern exercise machines to achieve this goal. Government especially the Enugu capital territory should include walkways and cycling trails during road rehabilitation to enable exercisers undertake road walk. The monthly keep fit programme by civil servants in the state should be extended to higher institutions of higher learning and made compulsory.

Key words: Barrier, Physical Exercise, Participation.

Introduction

Physical exercise participation is one of the recognized indices of health and longevity especially in adult population living in the urban setting. People generally engage themselves in physical exercise due to the numerous health benefits accrue from it. Exercise is a form of physical activity planned and programmed to achieve one or more different forms of physical fitness components (Okuneye, 2013). Documented evidence showed that regular physical exercise participation contributes to decrease fat weight and improving the body mass index (BMI) of cardiac patients when well supervised. Besides there are general decreased in the occurrences of diseases and conditions associated with sedentary lifestyle such as high blood pressure, diabetes, arthritis and certain kinds of cancers (Centre for Disease Control and Prevention, 2011 &Otinwa,2014). Exercise is beneficial to people especially in adults.

Experts in movement science have generally recognized exercise as one of the effective strategies for health and general well being. Exercise is defined as any activity requiring physical effort, carried out especially to sustain or improve health and fitness, a task or activity done to practice or test a skill (Awopetu, 2016). According to Otinwa (2014), exercise is a subset of physical activity that is planned structured and repetitive and has final or intermediate objective on the improvement or maintenance of physical fitness. The definitions of exercise point to the fact that adults in the metropolis stand a chance of improving upon their physical fitness and avert weight gain if they regularly engage themselves in exercise.

The benefits of exercise have been highlighted in literature reports. Engaging in 30minutes of moderate exercise per week is excellent in weight reduction (Academy of Nutrition and Diabetic, 2014). One study in 2012 Journal of Strength and Conditioning Research shows that participants who walk one mile burned 89 calories (fat) during their exercise ;110 calories over the next few hours after the play out ; while the participants who ran one mile burned 112calories as the day progressed (Academy of Nutrition and Diabetics, 2014). A later report by Kramer, McDonald (2016), observes that regular aerobic exercise improve or maintain physical fitness. However, a contrast report by Franklin, Vander, Wrisely & Rubenfire (2013), submit that physical exercise especially during pregnancy does not appear to decrease the risk of Caesarean Section (C.S).

Despite the criticisms surrounding the use of exercise to manage weight gain, the Chemical Practice Obstetrics Committee of Canada (2010), recommends that "All adults without contradictions should be encouraged to participate in aerobic and strength-conditioningactivities. Although, an upper level of safe exercise intensity has not been established, adults who are regular exercisers without uncomplicated health conditions should be able to engage in high intensity exercise programmes (Davies, 2003). These benefits accrue from regular exercise participation especially when combined with dietary control could be an effective intervention for overweight among adults in the metropolis.

Physical exercise, when performed on regular basis is one of the important components of health. This stems from the fact that exercise is an important physiological adjustment to attaining fitness and overall well being (Neiman, 2003 &Ikulayo, 2006). From the submissions of authors, lack of participation in physical exercise (inactivity) impacts negatively on health and longevity. Results from epidemiological studies suggests that physical inactivity is one of the risk factors of

hypertension which is one of the chronic diseases of lifestyle (Awopetu, 2007). This may suggest that adults especially those residing in the metropolis may stand a chance of avoiding diseases associated with inactivity if they could regularly engage in physical exercise.

It has been observed that despite, documented evidence suggesting numerous benefits of
physical exercise, a lot of people including adults living in the metropolis do not regularly take part in it. This may probably suggest that physical exercise participation is a critical health issue. According to World Health Organization (2011), the benefits of physical exercise are no longer news around us that a large number of urban populations do not take part in it. The inability of some adults to regularly engage themselves in exercise has been linked to certain barriers.

People experience a variety of personal and environmental/social barriers to engaging in regular physical exercise. According to Salis and Hovell (2002), personal reasons or explanations for being inactive includes: insufficient time to exercise, inconvenience of exercise, lack of self motivation, non enjoyment of exercise, boredom with exercise, lack of confidence in their ability to be physically active (low self efficacy). Furthermore, Salis and Hovell (2009), add that fearof being injured or having been injured recently, lack of self management skills, such as the ability to set personal goals monitor progress or reward progress toward such goals are all potential barriers. The list also include lack of encouragement, support or companionship from family and friends, non availability of parks, sidewalks, bicycle trails, safe and pleasant walking, paths close to home or the workplace (Manaf, 2013).

The top three barriers to engaging in physical exercise across adult life span are time, energy and motivation (Centre for Disease Control and Prevention (CDC), 2017). In 2013, one study by Manaf examined the external and internal barriers to physical exercise participation among middle aged and reported that the most common external barriers among the middle aged and elderly respondents were not enough time, no one to exercise with and lack of facilities. Findings further revealed that the most common internal barriers among middle aged respondents were too tired, already active enough, do not know how to do it and too lazy while those for elderly respondents were too tired, lack of motivation and already active enough (Manaf, 2013). Adults in Enugu metropolis including ESCET academic staff may be experiencing similar barriers to exercise participation which may be hindering the attainment of their exercise goals.

There is abundant body of literature on barriers to physical exercise participation. According to Scott (2017), notable barriers to exercise participation includes: lost facilities, illnesses or injury, transportation, partner issues, skill to exercise, safety consideration, childcare, uneasiness with change and unsuitable programmes. Adults living in the metropolis such as ESCET academic staff could be experiencing time constraints, tiredness from work, insecurity challenges, getting exercise partners and absence of exercise facilities in certain areas. This may pose some barriers to their regular physical exercise participation.

The environmental barriers to exercise participation include the accessibility of walking paths, cycling trails and recreation facilities. Factors such as traffic, availability of public transportation, crime, and pollution may also have an effect (Scott, 2017). Other social factors include; the social environment such as support from family and friends and community

spirit (Okuneye, 2014). In most urban setting, the road network do not favour open field exercise and most importantly the security challenges like banditry, kidnapping and armed robbery pose serious barriers to regular exercise participation. These challenges however could be overcome in several ways.

Overcoming barriers to regular physical exercise participation have been highlighted by experts. The Centre for Disease Control (2017), has made suggestions on how to overcome exercise barriers. The identified steps and possible solutions include:

Lack of Time
Solutions
- Identify available time slots monitor your daily activities for one week.
- Identify at least 30 minutes slots you could use for physical activity.
- Add physical exercise to your daily routine for example, walk or ride your bicycle to work or shopping, organize school activities around physical activity, walk the dog, exercise while you watch television, park farther away from your destination and so on.
- Select activities requiring minimum time, such as walking, jogging or stair climbing.

Social Influences
Solutions:
- Explain your interest in physical exercise to friends and family. Ask them to support your efforts.
- Invite friends and family members to exercise with you. Plan social activities involving exercise.
- Develop new friendships with physically active people. Join a group such as Young Men Christian Association (YMCA).

Lack of Energy:
Solutions:
- Schedule physical exercise for times in the day or week when you feel energetic.
- Convenience yourself that if you give it a chance, physical activity will increase your energy level, and then try it.

Lack of Motivation
Solutions:
- Plan ahead, make physical exercise a regular part of your daily or weekly schedule and write it on your calendar.
- Invite a friend to exercise with you on a regular basis and write it on your calendars.
- Join an exercise group or class.

Fear of Injury
Solutions:
- Learn how to warm up and cool down to prevent injury.
- Learn how to exercise appropriately considering your age, fitness level, skill level andhealth status.
- Choose activities involving minimum risk.

Lack of Skill
Solutions
- Select activities requiring no new skills such as walking, climbing stairs, or jogging.
- Take a class to develop new skills.

Lack of resources
Solutions:
- Select activities that require minimal facilities or equipment such as walking,

jogging, jumping rope or calisthenics.
- Identify inexpensive convenient resources available in your community or community education programmes, park and recreation programmes, work site programmes and others.

Weather conditions
Solutions:
- Develop a set of regular activities that are always available regardless of weather (indoor cycling) aerobic dance, indoor swimming, calisthenics, stair climbing, rope skipping, mall walking, Dancing, gymnasium games.

Travel
Solutions:
- Put a jump rope.
- Walk the halls and climb the stairs in hotels.
- Stay in places with swimming pools or exercise facilities.
- Join the YMCA or Young Women Association (YWCA).
- Visit the local shopping mall and walk for half an hour or more.
- Bring your mp3 player for your favourite aerobic exercise music.

Family Obligations
Solutions:
- Trade babysitting time with a friend, neighbour or family member who also has small children.
- Exercise with the kids, go for a walk together; play tag or other running games; get anaerobic dance or exercise tape for kids.
- Jump rope, do calisthenics, ride a stationary bicycle egometer or use other home gymnasium equipment while the kids are busy playing or sleeping.
- Try to exercise when the kids are not around (example, during school hours or their naptime).

Retirement Years
Solutions
- Look upon your retirement as an opportunity to become more active instead of less. Spend more time gardening, walking the dog and playing with your grand children. Children with short legs and grandparents with slower gaits are often great walking partners.
- Learn a new skill you have always been interested in such as ballroom dancing, square dancing or swimming.
- Now that you have the time make regular physical exercise a part of your everyday. Go for a walk every morning or every evening before dinner.
- Treat yourself to a bicycle egometer and ride everyday while reading a favourite book or magazine (Okuneye, 2014 & CDC, 2017)

The researchers have observed with keen interest consistent sudden death of academic staff in ESCET, Enugu between January to July, 2019. Specifically, five members of academic staff; two in January, one in April and two in June – July were recorded during the period under review. It is also recorded that the victims were never admitted to any hospital before their deaths. This may probably suggest that they are preventable deaths which could have been avoided through regular participation in physical exercise. Besides, the campus ground is compact with little or no space for sporting activities to provide additional motivational which further predisposes the academic staff members to inactivity. Also the college is close to major

eateries in the metropolis where the academic staff of the college may be eating from on regular basis during the week which may result in weight gains with its attendant consequences. To the best knowledge of the researchers, no study has been conducted on barriers to physical exercise participation amongacademic staff in ESCET which was the major concern of this study.

Purpose of the Study

The specific purposes of the study was to:

i. ascertain the personal barriers to physical exercise participation by academic staff in ESCET
ii. find out the social barriers to physical exercise participation by the academic staff.
iii. determine the environmental barriers to physical exercise participation by academic staff.

Research Questions

The following research questions guided the study

1. What are the personal barriers to physical exercise participation by academic staff in ESCET?
2. What are the social barriers to physical exercise participation by the academic staff inESCET?
3. What are the environmental barriers to physical exercise participation by the academic staff in ESCET?

Hypothesis

Gender is not a factorsof variance regarding personal barriers to physical exercise participation by academic staff in ESCET.

Method

The study adopted descriptive survey design. The population for the study consisted 176 (79malesand 97 females) academic staff from the Six Schools of Education of the college. 176 male and female academic staff from 28 departments of the college formed research respondents hence there was no sampling. Researchers' developed and validated questionnaire titled “Barriers to physical exercise participation Questionnaire (BPEPQ)” was used as instrument for data collection. The instrument was administered to the academic staff members with the help of three briefed research assistants in their respective offices and collected the following day. The analysis of data was done with mean (X) and standard deviation (SD) while the only hypothesis formulated was tested with t-test statistic.

Results

Table 1: Mean Response Distributions of the Respondents on Personal Barriers to Physical Exercise Participation

n=176

S/N	Item	Response Options SAA	DSD	X	SD	Dec.	—
		4	3	2	1		
2.	I do not have sufficient time to exercise	46	49	36	45	2.56	0.02A
3.	I lack energy to exercise	45	47	41	43	2.53	0.62 A
4.	Fear of injury prevent me from exercising	49	46	33	48	2.55	0.18A
5	I lack the skills to participate in exercise	51	50	29	46	2.60	0.04A
6.	I cannot afford gymnasium	56	60	34	14	2.76	0.02A
7.	Travelling does not allow me participate in exercise	33	43	56	44	2.37	0.01D
8.	It is difficult for me to set exercise goals And monitor it.	63	57	26	30	2.87	0.03A
9.	Exercise is boring and as such I do not enjoy it.	48	53	41	34	2.65	0.01A
10.	I lack confidence in the ability to be physically active	44	47	43	42	2.53	0.17 A
Grand mean 2.60A							

Key: A-Agree. D-Disagree.

From the data presented on Table 1, out of 58 academic staff that responded to items 2-10 that deal with personal barriers to physical exercise participation, items 2,3,4,5,6,8,9, and 10 received agree responses. However, item 7 received disagree responses. The grand mean of 2.60 signifies agree. This means that physical exercise participation of the academic staff of ESCET is affected by personal barriers such as time constraints, fear of injury, low skills and attitude.

Table 2: Mean Response Distributions of the Respondents on Social Barriers to Physical Exercise Participation n=176

S/N	Item	Response Options SA	A	D	SD	X	SDDec.
		4	3	2	1		
11.	Facilities and equipment are not provided in my vicinity to provide additional motivation.	46	45	44	41	2.55	0.16A
12.	I am not mobile to access the nearby gymnasium for my exercise.	34	41	53	48	2.35	0.04 D
13.	I do not enjoy support from my family and friends to participate.	44	57	39	36	2.62	0.06A
14.	My community (office) has no provisions forFitness and wellness pursuit.	43	59	31	43	2.58	0.03A
Grand mean 2.52A							

Data presented on Table 2 shows that out of 176 academic staff of ESCET that responded to items 11-14 that deal with social barriers to physical exercise participation, items 11, 13 and 14 received agree responses while item 12 received disagree responses. The grand mean of 2.52signifies agree. This means that physical exercise participation of academic staff of ESCET is affected by social barriers such as equipment and facilities for exercise, lack of fitness arena and motivation from family and friends.

Table 3:Mean Response Distributions of the Respondents on Environmental Barriers to Physical Exercise Participation

n=176

S/N	Item	Response Options SA	A	D	SD	X	SD	Dec.
		4	3	2	1			
15.	The traffic situation in my area does not allow me participate in physical exercise	48	46	38	44	2.56	0.15	A
16.	My area is heavily polluted for me to participate in open field exercise	47	54	33	42	2.60	0.04	A
17.	The crime rate and banditry in my area are high for open air exercise participation	53	51	34	38	2.66	0.02	A
18.	My area lacks recreational arena to provide additional motivation for exercise participation	52	47	40	37	2.65	0.61	A
19.	Walking paths and cycling trails are non existent in my area to offer protection during open air exercise	57	49	37	33	2.70	0.15	A
20.	There are no qualified exercise trainers for consultations.	55	51	39	31	2.74	0.02	A

Grand mean 2.65A

Data presented in Table 3 shows that out of176 academic staff of ESCET that responded to items 15- 20 that deal with environmental barriers to physical exercise participation, all the items received agree responses. The total grand mean of 2.65 by signifies agree. This means that physical exercise participation of academic staff of ECET is affected by certain environmental barriers such as traffic, pollution, insecurity, lack of walkways and cycling trails and qualified exercise personnel.

Table 4t-test of Difference Between Male and Female Respondents on Personal Barriers to Physical Exercise Participation

Gender	X	SD	n	df	t-cal	t-value	Dec
Male	2.15	0.59	79	174	1.590	1.960	Do not Reject
Female	2.07	0.39	97				H_o

Data as presented on Table 4 shows that the calculated t-value at 174 degree of freedom was 1.590 while the value of the significance was 1.960. Therefore, since the t-value is less than the critical/table value, the null hypothesis was not rejected. This means that there is no difference between male and female academic staff of ESCET regarding personal barriers to physical exercise participation.

Discussion

The discussion of findings of the study are presented thus: The finding as presented in Table 1revealed that personal barriers to physical exercise participation such as time constraints, lack of energy, skills, affordability of exercise subscriptions, lack of goals and confidence affect academic staff of ESCET from physical exercise participation. The hypothesis states that there is no difference between male and female academic staff of ESCET regarding personal barriers to physical exercise participation. This finding affirms the earlier observations by CDC (2017), which identified time constraints, energy and motivation as top three barriers to engaging in physical exercise across adult life span. The finding is also consistent with Scott (2017), which noted that illness or injury as well as skill to exercise as potential barriers to physical exercise participation. Academic staff of ESCET by virtue of their job description is time consuming and sedentary in nature which may be hindering their regular participation in exercise. Besides there is no visible exercise arena within the college to provide additional motivation to the academic staff or it could just be attitudinal. Perhaps the no difference between male and female academic staff of ESCET could be that both have similar job description and most likely may experience similar personal barriers to physical exercise participation.

The finding as presented in Table 2 also shows that physical exercise participation by academic staff of ESCET is affected by certain social barriers such as provision of facilities and equipment for exercise, lack of support from family and friends as well as motivation. This finding agrees with the observations raised by Manaf (2013), which identifies lack of encouragement support or companionship from family and friends, non-availability of parks, sidewalks, bicycle trails, walking paths as barriers to exercise participation in adults. A more recent study by Okuneye (2014), identifies lack of community spirit, support from family and friends as social barriers to exercise participation in the metropolis. It could be that the ESCET community lack recreational supports for the academic staff keep fit programme or lack of walkways for road walk that is hindering them from participation or some other barriers yet to be unveiled.

Another finding of the study as presented in Table 3 shows that participation in physical exercise by academic staff of ESCET is being hindered by environmental factors such as traffic gridlock, air pollution, banditry, armed robbery and kidnapping, lack of recreational arena, walking paths and qualified exercise personnel. This finding is consistent with Scott (2017), report which implicated accessibility of walking paths, cycling trails and recreational facilities, traffic, security and pollution. Majority of the academic staff of ESCET live in Enugu metropolis and most of roads apart from the express roads do not have walkways for road walk. Besides grid lock in Enugu urban in the early hours of the day could result in air pollution which may be hindering some of them with respiratory challenges such as asthma and others from stepping out to exercise.

Conclusions

The study in the light of these findings concludes as follows: academic staff in the institutions of higher learning show low dispositions to exercise participation due to certain personal social and environmental barriers which ought to be reversed in order to ensure quality academic delivery to the undergraduate students. There are gender differentials regarding personal barriers to physical exercise participation in ESCET, Enugu. As the long term consequences of physical inactivity can lead to serious secondary health problems among people especially in adults like the academic staff of ESCET living in the metropolis, understanding the factors that influence participation in physical exercise is important to help design successful interventions and strategies that may increase their level of engagement in it.

The perspectives gathered in this study are relevant to many stakeholders involved in the design and implementation of effective interventions strategies and policies to promoteparticipation in physical exercise by academic staff in higher institutions of learning. The activities of these adults expose them to numerous healthhazards. These hazards emanate from their dietary habits, exposure to polluted environments inform of refuse and sewage, noise pollution and exhaust fumes from automobiles. Breaking the barriers to regular physical exercise participation is perhaps one good step aims at improving upon life expectancy of these individuals in ESCET, Enugu.

Recommendations

Arising from the findings and conclusions of the study, the following recommendations were made:

1. The authorities of ESCET to immediately establish recreation centre within the college ground to deal with personal, social and environmental barriers of academic staff participation in physical exercise. The College Human Performance Laboratory in the Department of Physical and Health Education should be enlarged and equipped with excellent modern gymnasium equipment to provide additional motivation.

2. The health budget of the academic staff could be channeled to the centre for future improvement and maintenance of the exercise machines.

3. Government should include construction of walkways and cycling trails during road rehabilitation in Enugu metropolis and its environment to guarantee the safety of exercisers that walk along the road.

4. The monthly keep fit programme of the staff of state ministries should be made compulsory and extended to academic and non academic staff of institutions of higher learning in the state.

References

Academy of Nutrition and Diabetics (2014).Nutrition and life style for healthy pregnancy outcome available from Determinants of exercise behaviour. *Exercise and. Sport sciencesreviews*, 18(1):307- 330.

Awopetu, A. R., (2007). *Illustrated book of fitness and aerobic exercise.* Lagos: print solutionsLtd.

Awopetu, A. R. (2016). A review of the physiological effects of exercise duration and intensityduring walking and jogging.*Journal of Health and movement Behaviour*(*JOHAMB*),8(I): 1-10

Centre for Disease Control and Prevention, (2007). Barriers to participation in physical activity. Physical activity for everyone, 22 may, 2007.

Franklin, B.A., Vander, L., Wrisley, D &Rubenfire, M., (2013). Aerobic requirements of arm ergometry: Implications for exercise testing and training. Physiology of Sports Medicine, 11(1): 103-108

Ikulayo, P. B., (2006) psycho-social skills and effects on performance of footballers; A paperpresented at the 22nd annual national conference of sports psychology association ofNigeria (SPAN), 17th -20th October, 2006.

Live Strong, L., (2016). Exercise, walking versus running.Available from www. Living strong.Com accessed on January 5, 2016.

Manaf, H, (2013). Barriers to participation in physical activity and exercise among middleagedandelderly individuals.*Singapore med* j, 54(10):581-586.

Neiman, D.C., (2003). Exercise fasting and prescription: A health - Related approach. Mcgraw -hill New York, 6th edition 8,138

Okuneye, R. O., (2013). Human body, human wellness, the perpetual antidotes; *LASUinaugural lecture series* (50th edition) Lagos State University.

Otinwa, G. O., (2014) One cause, many crisis, the kinetic interpretation of wellness & University of Lagos inaugural lecture series, 2014, Lagos, University of Lagos press.

World Health Organization, (2011).Global strategy on diet, physical activity and health.Retrieved from http://www sepho. UK / download / public 9835/1/ sephno % 20 physical%20 jan%. Accessed on 18th July, 2018.

Sallis, J. F. &Hovell, M. F, (2009). Determinants of exercise behavior, Exercise and Sports*Sciences Reviews*, 18 (1): 307-330.

Sallis, J. F and Hovell, M. F; (2002).Predictors of adoption and maintenance of vigorous physicalactivity in men and women. *Preventive Medicine*21(2): 237-251.

Scott, W. M, (2017). Barriers to physical activity, retrieved from https://www. Physio- pedia. Physical- activity, accessed on 10th May, 2019.

EFFECTS OF CUEING QUESTIONS AS INSTRUCTIONAL SCAFFOLDING OF STUDENTS' ACHIEVEMENT IN BIOLOGY

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ABSTRACT

This study investigated the effects of Cueing questions as instructional scaffolding on Secondary school students' achievement in biology in Udi Education Zone, Enugu State. Quasi-experimental design, specifically the Pre-test, Post-test, Non-equivalent control group design was adopted. Three research questions and three null hypotheses guided the study. A sample of 140 students from four intact classes purposively selected from government co-educational secondary schools in Udi Education Zone, were used for the study. The instrument for data collection is Biology Achievement Test (BAT) which was developed by the researcher and validated. The data collected with BAT was trail tested for reliability using Kuder-Richardson (K-R20) formular. The Reliability index of 0.89 was obtained which indicated that it is reliable. The treatment group was taught selected biology concepts using cueing questions as instructional scaffolding while the control group was taught with conventional method. The study lasted for 6 weeks. Data wasanalysedusing mean and standard deviation to answer the research questions while analysis of covariance(ANCOVA) was used to test the null hypotheses at 0.05% level of significance ($P < 0.05$). The findings are that cueing questions used as scaffold was more effective than the one with conventional method in enhancing achievement in Biology. The finding is that there was no significant interaction effect of gender and strategies on students' mean achievement scores in Biology. Based on the findings, it was recommended among others that the Ministries of Education should through seminars, workshops, and conferences equip Biology teachers with requisite knowledge, skills, and competences on the use of cueing questions as instructional scaffolding strategies for teaching and learning. This could promote effective teaching and learning towards a better academic achievement of students in biology.

Key Word: Effect, cueing questions, achievement, strategies, instructional scaffolding.

Introduction:

Biology is a branch of natural science that deals with the study of living organisms, their structures, functions, evolution, distribution and interrelationships. Biology occupies a unique position in the secondary school curriculum because of its importance as science of life. In Nigeria, the secondary school biology curriculum is designed to continue students' investigation into natural phenomena, deepen students understanding and interest in biological sciences and to encourage students' ability to apply scientific knowledge to everyday life. Biology is one of the science subjects taught at the senior secondary school levels in all Nigerian secondary schools today which attracts the greatest patronage of both science oriented and arts-based students (Nwachukwu &Nwosu, 2007).

Nwagbo (2008) pointed out that the structure of the Nigeria secondary school requires a student to do one science subject and biology is the science subject most of the science students opt for on the false premise that it is the easiest of the sciences. For this reason, Biology has a very high enrolment of students in the external examination (West African Examination Council, 2015), Biology as a school subject is expected to help students understand and deal with their natural environment and the organisms living within it. Biology also deals with the interactions between living and non-living components of the environment (Nwagbo, 2008). A sound knowledge of Biology is pre-requisite for entrance into such professions like Medicine, Pharmacy, Nursery, Biochemistry, Genetics and Agriculture that are of great importance to the nation.

Despite the importance of biology as a school subject, available statistics from the West African Examinations Council (WAEC, 2009-2015) revealed that most candidates scored below credit level or failed to obtain the grades AI-C6. By implication, most students cannot gain admission into institutions of higher learning to study biology or its related disciplines. This leaves one in doubt about the effectiveness of instructional strategies employed by the biology teachers for the teaching and learning of biology.

Researchers have shown that biology teachers do not always employ effective instructional strategies in teaching the subject (Nwosu, 2007, Nwagbo, 2011 and Nwosu 2011). This has led to situations where students cannot apply the knowledge of biology in real life situations. Classroom observations in many Nigerian secondary schools during teacher supervisions showed that the majority of the teachers do not apply appropriate instructional strategies identified and recommended as effective for science instruction (Norom, 2009). Biology classroom activities are still dominated by teacher-centered instruction which has been found to be ineffective in promoting biology learning at senior secondary school level. Njoku (2010) observed that such teacher-centered approach, which places the teacher as the sole possessor of knowledge and the students as passive recipients of knowledge, may not enhance interest or promote positive attitude to science in general. Learning is a process requiring effort in which the learner actively constructs his own meaning that is consistent which prior ideas. The ability of a learner to learn well depends in his/her ability to connect or integrate previous knowledge with new ones and also apply it to real life situations. Cueing questions as instructional scaffolding hinges on this idea and it is one of the innovative teaching strategy.

Olatunbosun& Monica (2013) described instructional Scaffolding as the support and assistance given during the learning process which is tailored to the needs of the students with the intention of helping the student achieve his/her learning goals. Such support structures will assist the learner to develop new

understanding, skills, abilities and concepts to achieve new learning. As the learner gains control of these new learning, the teacher withdraws the support gradually as the learner becomes increasingly able to complete the task alone. The teacher then plans and provides further support on new learning. Such support structures could be helping the learner to complete a task by using cueing questions. Cueing from the researchers point of view is giving somebody a hint that will enable him grasp/understand the idea the teacher is trying to convey or cueing is a kind that offers additional useful information to the students in a way that pushes the student to follow the correct thinking process. Cueing still from the researchers view is giving somebody a signal so that the person is reminded of something that aids correct responses. Mayer (2009) defined cueing as the addition of cues to the verbal or visual content to direct the learners' attention to the essential elements of the presentation. Cueing questions are questions posed as a hint to direct the learners' attention to what they are expected to learn or series of questions that will help the teacher to elucidate or throw light in the subject matter with a view of assisting the students to have a better understanding. Each question takes the learner a step further towards the realization of stated objectives. For example, a teacher can begin the teaching of the circulatory system in man by asking the students to first touch their heart, from this single exercise, the teacher cues in the following questions: what do you notice when you touched your heart?, what makes the heart beat? Why do you think the heart is important?, where do you think the heart is located?, presenting a visual cue of the human circulatory system, the teacher continues the cueing by still asking the students to mention the part of the heart chamber where the entrance and exist of blood occur. Concerning the thickness of their walls how different are the heart chambers? What is vena cava? Which type of blood circulates in the vena cava? Which is the first human heart chamber into which blood enters? The teacher acknowledges the answers when the students give the right answer. Other questions and answers may follow till the end of the lesson. In the course of the interaction, the teacher identifies the fast learners who then act as a scaffold to the slow learners. The teacher's role here is just like a mentor, facilitator and guide. Cues play an important role in directing students attention towards the most critical information, and away from less critical information. The essential factor in Scaffolding is active participation of the learner, which can be encouraged by the teacher as early as at the planning stage of a new unit of work to enhance achievement.

Students' academic achievement deals with the extent to which students have gained from a particular course of instruction. From the researcher's view achievement can be viewed as the extent to which knowledge has been grasped by a student or the extent to which a student has internalized what has been taught and this can be indicated by his score when he is tested. According to Johnson, (2002) and Shaibu and Usman, 2002) student's achievement refers to student's intellectual attainment or performance in a subject. Omachi (2000) defined achievement as the scholastic standing of a student's performance at a given moment. It has to do with the successful accomplishment of goals. The purpose of testing is to help the teacher and the students evaluate and estimate the degree of success attained in learning a given concept. It is also useful in testing the extent of students' achievement in the teaching – learning process. It is equally appropriate in determining the efficiency of instruction. One of the issues at stake in education today is students' achievement measure in relation to teaching and the overall success of learning outcome. Hassan, (2006) pointed out that effective learning and sound academic achievement contributes to

national development. It is something of great importance to parents, teachers and students themselves. Even the larger society is aware of the long term effects of high and low academic achievement since the products of schools are expected to shape the destiny of the society.

Nwagbo (2006) states, that students' achievement in Biology is jeopardized by the teacher's authoritarian and introverted styles. Nwagbo advocated the use of self-learning devices as a way of getting students interested in Biology so as to enhance achievement. There is need therefore to teach Biology in an inspiring manner in order to achieve meaningful learning. Achievement is an important variable in learning because when one has shown some degree of achievement in anything she/he is involved in, one is likely to be deeply inspired to learn. Hence there is need to investigate if the use of cueing questions as scaffolding could lead to changes in students' achievements in Biology. There is need equally to investigate whether the strategy could engage both male and female students actively and streamline gender differences in science. The problem of this study posed as a question is: Will cueing questions used as instructional scaffolding improve the achievement of students in biology?

An issue of contention in Nigeria today is the issue of gender in the society including the educational system. From the researchers view, gender roles are roles which society assigns to a man or woman in accordance with the culture and tradition of that society. Gender is a set of characteristics distinguishing between males and females, particularly in the case of man and woman which, depending on the context, may vary from sex to social role to gender identity (Bland, 2003). According to Okeke (2007), gender is a social or cultural construct, characteristics, behaviour and roles that vary from place to place or culture to culture. It is not like sex, which is biologically determined and universal too. The issue of closing gender gap in sciences has remained elusive. In recent times gender related issues in science education have continued to receive serious attention judging from the number of studies done to that effect. Babajide (2010) opined that science subjects which include Physics and Chemistry are given masculine outlook by educational practitioners. In addition to this, studies by Ogunleye (2002), Ezirim (2006), Okwo and Otuba (2007), show that academic achievement in science subjects depends on gender. However, Nwosu (2011) found out that students' acquisition of science process skills is not gender specific. In addition, studies by Ogunleye and Babajide (2011) and Agomuoh and Nzewi (2003) lend credence to significant gender differences in science achievement. Madu (2004) and Agomuoh (2010) found out that gender influences students' conceptual shift in favour of male students. Therefore, the issue of gender and students' academic achievement has been inconclusive.

- While there are some views that male students perform better than females, others disagree with this view, arguing that achievement is a factor dependent on several factors such as socio-economic background, cognitive ability, type of exposure and appropriate teaching strategies, among others. Therefore, one sees that the issue of gender has not yet been resolved particularly in relation to students' achievement in Biology, hence the need for further study in that regard, especially when trying out new teaching strategies which include cueing questions as instructional scaffolding.

Researchers over the years, have developed or employed several teaching methods or strategies to improve students'

learning. Most of the methods or strategies have been empirically proven to enhance learning and in turn, improve achievement. But the reality on ground indicates that students' achievement in most subjects especially Biology needs urgent attention. Therefore, a strategy that will help students to correctly answer any question asked by their instructors/teachers is very pertinent. Thus, this study intends to investigate the effect of cueing questions as instructional scaffolding on senior secondary school students' achievement in Biology.

Purpose of the study:

The main purpose of this study is to investigate the effects of cueing questions as instructional Scaffolding on secondary school students' achievement in Biology.

This study specifically sought to determine the:

1. Effects of cueing questions as instructional scaffolding on students' mean achievement scores in Biology.

2. Influences of gender on students' mean achievement scores in Biology when taught using cueing questions and conventional method.

3. Interaction effect of gender and teaching strategies on the mean achievement scores of students in Biology when taught using cueing questions and conventional method.

Research questions:

The following research questions guided the study:

1. What is the effect of cueing questions as instructional scaffolding and conventional method on students mean achievement scores in Biology?
2. What is the influence of gender on students' mean achievement scores in Biology when taught using cueing questions and conventional method?
3. What is the interaction effect of gender and teaching strategies on the mean achievement scores of students in Biology when taught using cueing questions and conventional method?

Hypotheses:

The following null hypotheses guided the study and were tested at 0.05 level of significance.

1 There is no significant difference in the mean achievement scores of students taught Biology using cueing questions as Instructional scaffold and those taught using conventional method only.

HO_2: There is no significant difference in the mean achievement scores of male and female students in Biology when taught using cueing questions and conventional method in Biology.

2 There is no significant interaction effect of gender and instructional strategies on the mean achievement scores of students in Biology when taught using cueing questions and conventional method.

Method:

The design of this study was quasi-experimental. The specific design was Pre-test, Post-test, Non-Equivalent control Group Design. The design was adopted because intact classes were used as it was not possible to have complete randomization of the subjects. The population of the study comprised all the senior secondary class two (SS2). Biology students in the government owned Secondary Schools in Udi Education Zone of Enugu State which is made up of two thousand six hundred and twenty four (2624). (Post primary School

Management Board (PPSMB), record and Statistics Unit, 2012/2013). There are two Local Government Areas in Udi Education Zone namely: Udi and Ezeagu Local Government Areas. Co-educational schools are considered because gender is a variable under study. This comprise of 62 students from School I made up of 30 males and 32 females, and 78 students from School 2 made up of 35 males and 43 females. The two Co-educational Secondary schools were drawn from 15 Co-educational governments owned Senior Secondary Schools in Udi education zone of Enugu State using Purposive Sampling technique. Purposive Sampling was used because the researcher wanted Schools that will lend themselves to the experiment and for proximity for easy monitoring. The two sampled Schools have well qualified Biology teachers with at least Master degree in education, and the two schools have two streams of SS 2 Classes. The researcher used two intact classes from one school as the experimental/treatment and two intact classes from the other school as the control group. The instrument used for the study isBiology Achievement Test (BAT) developed by the researcher.The BAT consists of 40 multiple choice objective test items developed by the researcher following WAEC question format, The 40 items in BAT were spread over five topics levels as follows: respiratory system in animals, 20%; respiratory system in plants, 10%; transport mechanisms (diffusion and osmosis etc.) and the principles behind them, 28%; transport system in plants, 15%; transport system, circulatory system in animals 28%. The weights along the topic dimension were based on how voluminous the content scopes are. Thus, a topic with larger content scope is assigned more weight than the one with lower volume of content scope. The cognitive levels were also weighed as follows: knowledge, 33%; Comprehension, 49%; Application, 10%; and analysis, 8%. The weights along the cognitive level were assigned based on the fact that the study emphasizes guiding students to answer questions and understand the flow of knowledge from simple to complex. In Biology, emphasis is on whether the students have understood and can apply what had been learned and subsequently use such ideas in analyzing Biological tasks. This is why higher weights were assigned to knowledge and comprehension. The numbers of questions for each topic in conjunction with each of the cognitive levels were calculated to arrive at the 40 multiple choice objective test items.

The following procedures were adopted while establishing the validity of the instruments, which refers to the extent to which an instrument measures what it is designed to measure (Nworgu, 2006).The instruments were subjected to both content and face validity. In the content validity; the researcher carefully prepared a test blue-print or table of specification where both the cognitive levels as well as the subject content were aligned on a two grid table. The test blueprint or table of specification shows the number of items per topic and cognitive level. This was enhanced by the assignment of percentages to both the cognitive and content dimensions. In the second stage of ensuring that the instrument is valid, the researcher consulted three experts in the Department of Science Education from the University of Nigeria, Nsukka and one from the Department of Science Education, Enugu State University of Science and Technology. Two experienced Biology teachers from schools in Udi Education Zone of Enugu State were given the BAT for both face and content validation. A marking scheme was prepared by the researcher and was equally validated by two Biology teachers from Udi Education Zone of Enugu State and four specialists from the University of Nigeria, Nsukka.

The specialist were requested to

examine the instruments based on the scope of coverage, c l arity of the questions, relevance/appropriateness of the questions to the students' level of understanding, ambiguity and vagueness of expression as well as agreement in addressing the purpose of the study. After the validation, the 40 items survived with some little modifications. The observations and comments of the specialists were used in the final modification and selection of items for the study. Content validity was established for the BAT using the table of specification/ test blue print. This specifies the distribution of the items according to the Bloom's taxonomy of educational objectives. Although the lesson notes were not part of the instrument for data collection, samples of the notes were given along with the BAT, with a photocopy of the relevant parts of the SS II Biology curriculum for vetting. The experts were required to indicate whether the items of the instrument adequately cover the content areas in the lesson plan/curriculum. They were also required to add any other items they considered applicable but were inadvertently omitted in the instrument. The topics taught during the study comprised: respiratory system in animals, respiratory system in plants, transport system in plants, transport system in animals, circulatory system in animals. The items were trial tested on thirty (30) SS 2 Biology Students inNsukka Local Government Area of Enugu State which is outside the study area but has similar characteristics with the area of the study. The data obtained from the trial testing was used to determine the reliability of the instrument.

The reliability was determined by trial testing the instruments on thirty (30) SS2 Biology students in Nsukka local government area of Enugu State which is outside the study area but have similar character with students from the area of study. The data obtained from the trial testing was used to determine the reliability of the instrument. For the Biology Achievement Test, the reliability was determined using Kudder- Richardson formular 20 (KR-20). KR20 was used because the items were scored dichotomously. An internal consistency reliability index of 0.89was arrived at.

Any correct answer item in BAT was awarded one mark giving a maximum of 40marks. The total score of each student was calculated and recorded for each male and female student.

Experimental procedure:

To account for possible pre-existing differences in achievement between the groups, the BAT was administered as pre-test to the students and the results were used as covariate measures. The regular biology class teachers were used for the study in both experimental and control groups. Training was given to the biology teachers who took the experimental group on the application of the instructional strategy. Prior to this, the biology teacher was given the validated lesson plan to enable her get used to the lesson plan. The control group was taught by their own biology teachers without advance organizer (cueing questions). Both experimental and control groups were taught the same topics for six weeks. The biology achievement test was administered to the two groups after the treatment as post-test.

Results

Research Question 1:

What are the effects of cueing questions as instructional scaffolding and conventional method on students mean achievement scores in Biology?

Table 1: **Mean and Standard deviation of Biology students' scores when taught with Cueing Questions (CQ) and Conventional method(CM)**

Variable Strategies	N	Pretest ?1	Pretest SD_2	Posttest ?1	Posttest SD_2	Adjusted Mean
CQ (Experimental group	62	11.44	2.05	30.40	4.83	30.47
CM (Control group)	78	11.46	2.06	24.36	5.74	24.47

CQ = Cueing question, CM = Conventional method

Table 1 shows that the group taught Biology using Cueing Questions strategy had a pretest mean achievement score of 11.44 with a standard deviation of 2.05 and a posttest mean of 30.40 with a standard deviation of 4.83. The group taught Biology using Conventional method had a pretest mean of 11.46 with a standard deviation of 2.06 and a posttest mean of 24.36 with a standard deviation of 5.74. Table 1 also shows that the group taught Biology using Cueing Questions strategy had an adjusted mean score of 30.47 while the group taught Biology using Conventional method had an adjusted mean score of 24.47. For each of the groups, the posttest and adjusted means were greater than the pretest means with the group taught using Cueing Questions strategy having a higher adjusted mean achievement. This is an indication that Cueing Questions strategy has more positive effect on students' mean achievement scores in Biology than the Conventional method.

Research Question 2:
What is the influence of gender on students' mean achievement scores in Biology?

Table 2: **Mean and Standard deviation of the influence of gender on students' mean achievement scores in Biology**

Variable Gender	N	Pretest ?1	Pretest SD_1	Posttest ?2	Posttest SD_2	Adjusted Mean
Male	65	11.85	2.15	28.77	6.07	28.95
Female	75	11.11	1.90	25.53	5.82	25.98

Data in Table 2 show the mean achievement score of male and female students in Biology. Result showed that male students had a pretest mean achievement score of 11.85 with a standard deviation of 2.15 and a posttest mean achievement score of 28.77 with a standard deviation of 6.07. The female students taught Biology had a pretest mean achievement score of 11.11 with a standard deviation of 1.90 and a posttest mean achievement score of 25.53 with a standard deviation of 5.82. The result also show that male students had an adjusted mean score of 28.95 while their female counterparts had an adjusted mean score of 25.98. For each of the groups, the posttest and adjusted means achievement scores were greater than the pretest mean achievement scores with the male students having higher adjusted mean score than their female counterparts. The result showed that male students performed better than their female counterparts.

Research Question 3:
What is the interaction effect of gender and strategies on the mean achievement scores of students in Biology?

Table 3: **Mean and Standard deviation of the interaction effect of gender and methods on the mean achievement scores of students in Biology**

Variable			Pretest		Posttest		Adjusted Mean
Strategies	**Gender**	**N**	?	**SD**	?	**SD**	
CQ	Male	30	11.90	2.09	32.40	5.56	32.32
	Female	32	11.00	1.93	28.53	3.10	28.62
CM	Male	35	11.80	2.23	25.66	4.63	25.59
	Female	43	11.19	1.89	23.30	6.37	23.36

CQ = Cueing question, CM = Conventional method

Results in Table 3 show the interaction effect of gender and methods on the mean achievement scores of students in Biology. Result showed that the male students under Cueing Questions strategy had a pretest achievement mean of 11.90 with a standard deviation of 2.09 and a post test achievement mean of 32.40 with a standard deviation of 5.56. The female students under Cueing Questions strategy had a pretest achievement mean of 11.00 with a standard deviation of 1.93 and a post test achievement mean of 28.53 with a standard deviation of 3.10.

Result in Table 3 also shows that the male students taught Biology using conventional method had a pretest achievement mean of 11.80 with a standard deviation of 2.23 and a post test achievement mean of 25.66 with a standard deviation of 4.63. The female students under conventional method had a pretest achievement mean of 11.19 with a standard deviation of 1.89 and a post test achievement mean of 23.30 with a standard deviation of 6.37. The results in Table 3 equally revealed a higher adjusted mean score of 32.32 for male students taught biology using cueing question while their female counterparts had adjusted mean score of 28.62. Male students who were taught biology with conventional method had adjusted mean score of 25.59 while their female counterpart had adjusted mean score of 23.36. The result in Table 3 is indicative that there is interaction effect of gender and methods on students mean achievement score in biology.

Hypothesis 1:

HO_1:Thereis no significant difference between the mean achievement scores of students taught Biology topics using cueing questions as instructional scaffolding and those taught using conventional method.

Table 4:Analysis of Covariance (ANCOVA) of the effect of cueing questions as instructional scaffolding and conventional method on students' mean achievement in Biology

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	1620.056[a]	4	405.014	15.160	.000
Intercept	2664.421	1	2664.421	99.728	.000
Pretest	19.359	1	19.359	.725	.396
Strategies	1234.335	1	1234.335	46.201	.000
Gender	293.126	1	293.126	10.972	.001
Strategies * Gender	18.310	1	18.310	.685	.409
Error	3606.765	135	26.717		
Total	107557.000	140			
Corrected Total	5226.821	139			

á = 0.05

Data in Table 4 showed a statistical significant main effect of instructional strategies on mean achievement scores of students in biology. The result showed that an F – ratio of 46.20 with associated probability value of 0.00 was obtained with respect to the achievement of students taught biology using cueing questions and conventional method. Sincethe associated probability value of 0.00 was less than 0.05 set as level of significance, the null hypothesis (HO,) therefore, was rejected, indicating that there was significant difference in the mean achievement score of students taught biology using cueing question as instructional scaffolding.

Hypothesis 2

There is no significant difference in the mean achievement scores of male and female students in Biology.

Table 5:Analysis of Covariance (ANCOVA) of the significant difference in the mean achievement scores of male and female students in Biology

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	1620.056[a]	4	405.014	15.160	.000
Intercept	2664.421	1	2664.421	99.728	.000
Pretest	19.359	1	19.359	.725	.396
Strategies	1234.335	1	1234.335	46.201	.000
Gender	293.126	1	293.126	10.972	.001
Strategies * Gender	18.310	1	18.310	.685	.409
Error	3606.765	135	26.717		
Total	107557.000	140			
Corrected Total	5226.821	139			

á = 0.05

Data in table 5 showed a statistical significance differences in mean achievement scores of male and female student in biology. The result shows that an F-ratio of 10.97 with associated probability value of 0.01 was obtained with respect to male and female students' achievement in biology. Since the associated probability of 0.01 was less than 0.005 set as level of significance of null hypothesis (Ho_2), therefore was rejected indicating that there was a significant differences between the mean achievement scores of male and female student in biology (in favour of male)

Hypothesis 3

There is no significant interaction effect of gender and strategies on the mean achievement scores of students in Biology.

Table 6:Analysis of Covariance (ANCOVA) of the interaction effect of gender and strategies on the mean achievement scores of students in Biology

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	1620.056[a]	4	405.014	15.160	.000
Intercept	2664.421	1	2664.421	99.728	.000
Pretest	19.359	1	19.359	.725	.396
Strategies	1234.335	1	1234.335	46.201	.000
Gender	293.126	1	293.126	10.972	.001
Strategies * Gender	18.310	1	18.310	.685	.409
Error	3606.765	135	26.717		
Total	107557.000	140			
Corrected Total	5226.821	139			

á = 0.05

Data in table 6 shows a statistical significant interaction effect of gender and strategies on the mean achievement scores of student in biology. The result showed that an F – ratio of 0.69 with associated probability value of 0.41 was obtained. Since the associated probability value of 0.41 was greater than 0.05 set as level of significant, the null hypothesis (Ho_5) therefore was not rejected indicating there was no significant interaction effect of gender and strategies on the mean achievement scores of students in biology.

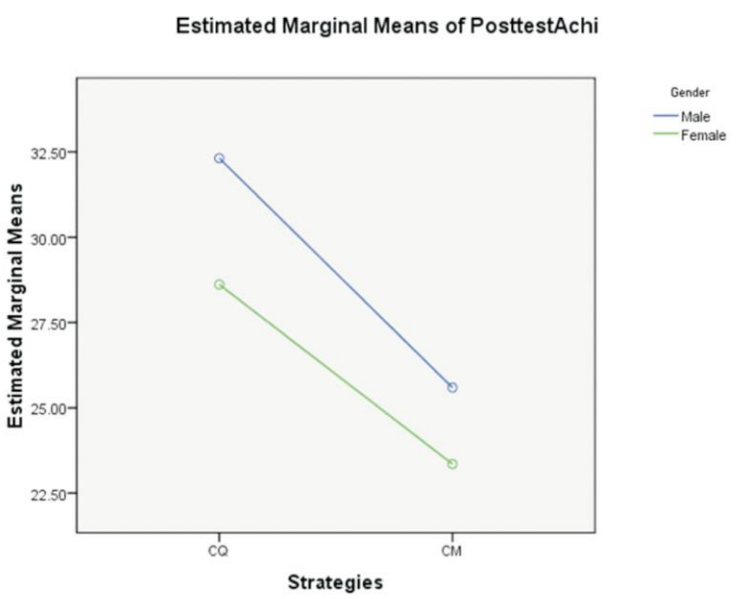

Figure 2: **Interaction effect of gender and strategies on student's mean achievement score in Biology**

The result in Table 5 and 11 is indicative that there is interaction effect of gender and strategies on student's mean achievement score in Biology but the interaction was not significant. Figure 2 shows no point of intersection between the levels of strategies and gender. Therefore since the lines in figure 2 did not intersect, it means there exist an "ordinal interaction".

Discussions:

Cueing questions as instructional scaffolding and conventional method on students' mean achievement scores in Biology:

The findings of the study in table 1 showed that cueing questions strategy has better effect on students' mean achievement scores in Biology than the conventional method. This revealed the relative more efficacious nature of the cueing questions instructional scaffolding over the conventional method in promoting students' achievement in Biology. The reason for this finding on the strength of cueing questions could be because cueing questions help to motivate and sustain students' interest and attention, and therefore reduces boredom (Chimezie, 2000). Also, data in Table 4 indicated that there is a significant difference in the mean interest scores of students taught Biology using cueing questions and those taught using conventional method in favour of Cueing question strategy. The findings of this study is consistent with Wambugu, Chageiywo&Ndiritu (2014) who found out that there was a statistically significant difference between the motivation to learn of students who were taught through experiential cooperative concept mapping and those taught through regular teaching methods in favour of cooperative concept mapping. The ability of cueing questions as Scaffolding to enhance students' interest in learning Biology more than the conventional method could be attributed to its capacity to arouse students morale to learn through the use of a variety of questioning skills such as the higher, middle and lower order questions. Questioning and answering makes classroom interaction participatory, interactive, spicy and interesting. Students seem to like teaching and learning process that enhance their involvement and is less boring but activity oriented.

Also, Table 4 showed that there was a significant difference in the mean achievement scores of students taught biology using cueing questions as instructional scaffolding and those taught using conventional method in favour of Cueing Questions strategy. Cueing Questions might then have provided a more active role or viable opportunities than conventional method for students to build their understanding of the concepts on their existing knowledge structures.

The finding of this study has shown that instruction which includes cueing questions during lessons is more effective in producing achievement gains among students than instruction carried out without cueing questions.

The cueing questions strategy group in this study had higher adjusted mean probably because oral questions with cues posed during classroom instruction foster learning which in turn enhanced achievement. It is also possible that cueing questions strategy may have helped to focus student attention on salient elements in the lesson resulting in better comprehension than the conventional method group. Asking questions frequently with cues during class discussions may have helped students to positively relate learning facts which in turn, increases student-student interactions.

Gender and students' achievement in Biology when cueing questions as instructional scaffolding and conventional method were used

The finding of this study is that male students had higher achievement scores in Biology than their female Counterparts. This is

evident in the adjusted mean score of 28.95 male group and of 25.98 for the female group. Also, the posttest mean achievement score of (28.77) for the male group and the posttest mean achievement score of (25.53) for the female group further revealed that male students outperformed their female counterparts in Biology. The findings of this study are consistent with Aiyedum (2000) who found that male students' average achievement was slightly higher in mathematics. However, the findings of this study are not consistent with Ezeudu (2013) who found that male and female students have equal achievement in organic chemistry.

Finding also indicated that there was a significant difference between the mean achievement scores of male and female students in Biology in favour of male. This finding is in line with Ogunleye (2002), Ogunneye (2003), Ezirim (2006), Okwo&Otubar (2007) who observed that gender has significant influence on science achievement. However, inconsistent with the findings of the study are Agommuoh&Nzewi (2003) and Babajide (2010) who documented that gender has no significant influence on achievement in science. It is also not in corroboration with Feng, Zhang and Chen (2008) who found that there was no significant difference in the performance of boys and girls as systematic scaffold strategies were essential for a variety of students to have effective cross-regional online collaborative learning experiences. Thus, it appears that the existence of difference in achievements of the male and female students taught with Cueing Questions and Conventional method as instructional scaffolding strategies in favour of males could be attributed to the fact that some female were shying away from actively participating in the experiments. The male students achieving more than their female counterparts could be as a result of distraction by males within or outside the school which may have impeded their concentrations. Cueing Questions strategy seem to promote male students' achievement more than the female students.

Interaction effect of gender and strategy on achievement and interest scores of students in Biology

The interaction effect of gender and strategies on the mean achievement scores of students in biology was not significant. Although the adjusted mean score of male students in both Cueing Questions and conventional method were higher than that of their female counterparts, interaction was not observed. This suggests that the combined effect of gender and methods did influence differential achievement among students. In other words, the effectiveness of the interaction was the same for both male and female students. This finding is coherent with Azih and Nwosu (2011) who found no significant interaction between gender and teaching approaches on the achievement of students in Accounting.

It is also in line with Okonkwo (2014) who reported that there is no significant interaction effect of treatment and gender on students' achievement in Government. The no significant interaction effect between the instructional strategies and gender on students' achievement could be attributed to the fact that instructional strategies are school factors and teacher moderated while gender is biological and social factor.**Conclusions**

From the discussions, the following conclusions were made:

- Cueing questions strategy was superior to conventional method. There was a significant effect of cueing questions and conventional method as instructional scaffolding on students' achievement in Biology in favour of

Cueing Questions group.

- Gender influence students' achievement scores in Biology. There was a significant difference between the mean achievement scores of male and female students in Biology in favour of male
- There was no significant interaction effect of gender and strategies on the mean achievement scores of students in Biology
- Cueing questions as instructional scaffolding when appropriately utilized in teaching and learning in secondary school could promote students interest in Biology.

Recommendations:

From the findings of the study, the following recommendations are made:

1) The Ministries of Education should through seminars, workshops, and conferences equip Biology teachers with requisite knowledge, skills, and competences on the use of cueing questions as instructional scaffolding strategies for teaching and learning. This could promote effective teaching and learning towards a better academic achievement of students in biology.
2) Teacher training institutions like faculties of Education, Colleges of Education should include cueing question among the modern participatory instructional strategies in teacher preparation. This would promote teaching and learning of Biology towards enhanced students' academic achievement.

References

Agomuoh, P. C. and Nzewi U. M. (2003) Effects of Video – taped instruction on secondary school students' Achievement in physics, *Journal of the science Teachers Association of Nigeria* J. S. AN 38 (132) 88 – 93

Agomuoh, P.C. (2010). Effect of prior knowledge, exploration, discussion, dissatisfaction with prior *knowledge* and application (PEDDA) and the learning cycle (TLC) constructivist instructional models on students 'conceptual change and retention. *An unpublished Ph. D. Thesis, University of Nigeria, Nsukka*.

Aiyedun, J.O (2000). Influence of sex differences of students on their achievement in secondary school mathematics. *Journal of the mathematics Association of Nigeria*, 25 (1), 109-113.Azih, N &Nwosu, B.O. (2011). Effect of instructional scaffolding on the achievement of male and female students in financial accouting in secondary schools in Abakaliki urban, Ebonyi State, Nigeria. *Journal of Social Sciences, 3(2), 56-70.*

Babajide, V.F.T. (2010). Generative and Predict observe-Explain Instructional Strategies as Determinants of Senior Secondary School Students' Achievement and Practical Skills in physics.*UnpublishedPh.D Thesis, University of Ibadan. Nigeria.*

Bland, J. (2003). About gender: differences. http://www.gender.org.uk/about/oo diffs.htm

Chimezie, O.S. (2000). *A practical guide to microteaching and teaching practice.*Owerri: Grace of God.

Ezeudu, S, A, (2013).Classroom environment as correlate of students' cognitive achievement in senior secondary school Geography.*The Journal of WCCI Nigeria chapter. 4(2) 65-73*

Ezirim, M.U. (2006). Scaling up girls participation in Science education: Towards a score card on quality education. E. Okeke and M. Opara (Eds) Science Teachers Association of Nigeria. *Gender and STM Education series* (1).

Ezeh, D.N. (2013). *Science without women: A paradox. 75th Inaugural lecture of the University of Nigeria, Nsukka.* Delivered on May 30, 2013, Nsukka: University of Nigeria Press Ltd.

Federal Ministry of Education (2004).*National Curriculum for Senior Secondary School Biology Lagos:* Government Press.

Federal Republic of Nigeria (2004).*National Policy on Education*, Abuja: NERDC Press.

Feng, X, Zhang, W. & Chen, L. (2008).Applications of scaffolding education strategy to distance inter-Universitycollaboration learning.*Journal of Beijing Radio and Television University*, 1, 20-30.

Hassan, J.E. (2006). *Human Learning.* Englewood Cliffs, NJ: Prentice Hall.

Johnson, D. W. & Johnson, R. T (2002).*The Cooperative Learning Research Works:College of Education and Human Development*, University of Minnesota. Online 31/10/2008,

Mayer, (2009).*Multimedia Learning.* New York: Cambridge University Press.

Madu, B.C. (2004). Effectofa constructivist.Based instructional model on students' conceptual change and retention in physics.*Unpublished Thesis University of Nigeria Nsukka*.

Nwagbo, C.R. (2006). Effects of two Teaching Methods on the Achievement in and Attitude to Biology of students of Different level of scientific Literacy. *International Journal of Educational Research* 45 (2006) 216-229.

Nworgu, B.G. (2006). *Educational research: Basic issues and methodology (2nd Ed.)*. Enugu: University Trust Publishers.

Nwosu, A.A. (2011). Gender and acquisition of science process skills among secondary school students: Implications for science teaching. *42nd Annual conference proceedings of STAN.Women in science, technology and mathematics education in Nigeria*, 206-209.

Njoku, Z.C. (2010). Strategies for meeting school-base challenge in gender and STM education.Z.C. *Science Teachers Association of Nigeria.Gender and STM Education series 1 (1) 12-18.*

Norom, R.N. (2009). Developing Entreprenur skills through STM Education: Focus on Wealth Creation through the Biology

Curriculum.Udofia N.A. (Ed) *Annual Conference of Science Teachers Association of Nigeria.50th Annual Conference Proceeding of Science* T*eachers Association of Nigeria 138-141*.

Nwachukwu, J.N. and Nwosu, A.A. (2007). Effect of demonstration method on different levels of students' cognitive achievement in Senior secondary Biology *Journal of the Science Teachers Association of Nigeria, 42 (1& 2), 50-59.*

Nwagbo, C.R. (2006). Effects of two teaching methods on the Achievement in and attitude to biology of students of different level of scientific literacy. *International journal of educational research*45,216-229.

Nwagbo, C.R. (2008). Science technology and mathematics (STM) Curriculum Development; focus on problems and prospects of biology curriculum delivery. In Nzewi (Ed), *Proceedings of the49th Annual Conference of science teachers association of Nigeria,* Pp. 99-104. Nigeria: Heinemann Education Books.

Nwagbo, C.R. (2011). Effect of biology practical activities on secondary school students process skills acquisition. Journal of the science Teachers Association in Abuja Municipal Area Council, *Journal of the science Teachers Association of Nigeria(JSTAN)* 46(1) 58-70.

Nwosu, A.A. (2007). Effects of demonstration method on different levels of students cognitive achievement in senior secondary school biology. *Journal of science Teachers association of* Nigeria, 42(1), 50-59.

Nwosu, A.A.(2011c) The Nature of Science. *IntegratedScience Practical Manual for Science Education.*Nsukka.University of Nigeria. 1-19

Ogunleye, B.O. (2002). Evaluation of the Environmental Aspect of the senior Secondary School chemistry curriculum in Ibadan, Nigeria, *Unpublished Ph.D Thesis, University of Ibadan, Nigeria*.

Ogunneye, W. (2003).students Understanding of the Concept of gradient in physical.A case study of physics student from Jai Solarin college of Education IjebuOde.*Journal of the Science Teachers Association of Nigeria* 38(1 & 2) 100 – 106.

Ogunleye, B. O. & Babijide, V. F. T (2011).Commitment to science and gender as determinants of students' achievement and practical skills in physics.*Journal of the Science Teachers association of Nigeria*, 1(46) 125-135.

Okeke, E.A.C. (2007). Making science Education Accessible to all *23rd inaugural Lecture series. University of Nigeria, Nsukka*.Pg, 3-10.

Okwo, F.A and Otuba, S. (2007). Influence of gender and cognitive styles on students achievement in physics essay test. *Journal of Science Teachers Association of Nigeria* 42 (1&2) 133-138.

Omachi, G.T. (2000) Nigerian secondary school laboratories and goals of science education.*Proceedings of the 41st science Teachers Association of Nigerian Annual conference* 2(1) 26-30. Okebukola, P.A. (2002). *Beyond the stereotype to new trajectories in science.* Science Teachers
Association of Nigeria. Abuja: Taste and style RH 13. Cultural complex Abuja.

Olatunbosun, O. & Monica, E. (2013).Effects of scaffolding strategy in learner's academic achievement in integrated science at the junior secondary school level. *European Scientific Journal,* 9(19), 123-135.

Shaibu, A. A.M. &Usman, J.A. (2002). Effects of NISTEP mode of Teaching on Students academic
Achievement in integrated science among Junior Secondary School Students, *Journal of Science Teachers' Association of Nigeria*, 37 (1&2): 10-15.

Wambugu, P.W.Chageiywo, J.M &Ndiritu, F.G. (2014). Effects of experimental co-operative concept mapping (ECCM) instructional approach on secondary school students 'motivation in
physics in Nyeri County, Kenya. *Journal of Education and Practice*, 5(15), 74-82.

West African Examination Council (WAEC), (2009 – 2015). *The Chief Examiners Report on Students performance in Senior School Certificate Biology Examination.* Lagos, 181-186.

CORRELATE OF PARENTS' SOCIO-ECONOMIC VARIABLES ON ACADEMIC ACHIEVEMENT OF SENIOR SECONDARY SCHOOL STUDENTS IN MATHAMTICS IN ENUGU STATE

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Abstract

The study investigated and analyzed parents' socio-economic variables as correlate of academic achievement of senior secondary school students in mathematics in Enugu State. The population of the study consisted of 2701 SSS II students in Awgu Education zone of Enugu State. Multi-stage sampling procedure was used to sample 253 students out of the entire population of 2701 students. To guide the study, three research questions and three research hypotheses were formulated. The hypotheses were tested at $P \leq .05$ level of significance. The research design for the study is correlational survey design. Two sets of data were collected from the respondents. One set of data was collected using a structured questionnaire of four – point Likert scale type developed by the researcher and face validated by one expert in Measurement and Evaluation and two in Mathematics Education and its reliability was determined using Spearman Brown proficiency formula which yielded .86.The instrument asked the students to tick from the statements about how their parents' socio-economic variables (in terms of parents' level of education, occupation and income) relates to their learning of mathematics. The other set of data was the total average marks of the individual students' termly examinations for two terms which were taken to constitute their mathematics achievement test (MAT). The data collected were analyzed using mean and standard deviation (S. D) to answer the research questions while the hypotheses were tested using Pearson Product Moment correlation statistic at 0.05 level of significance ($P \leq .05$). Findings of the study showed that parental level of education, parental occupation and socio-economic status of parents correlate positively with the students' academic achievement in mathematics ($P \leq .05$), among other issues found in the study. It is recommended to teachers to teach the students without preferential treatment, since the study has shown that the students came from different socio-economic backgrounds and exhibit differences in academic achievement in mathematics.

Keywords: *Correlate, achievement, mathematics and parental socio-economic variables.*

Introduction

Mathematical needs and applications in all daily activities and endevours of mankind cannot be over emphasized. Illiterate market men and women seriously employ mathematics in counting, grouping, measuring, etc, their wares of products as well as bargaining buying and selling in momentary terms. Mathematics applications are far more than that because it is more pronounced in scientific and technological engagements. This is the more reason people believe that for science and technology to thrive in any country, competency and enhanced learning of mathematics by the citizens are required to a great extent. For instance, Adetula (2010) believed that mathematical knowledge will help Nigeria to produce citizens that can manufacture drugs, raw materials, machines and tools needed for industries. MoresoAkinoso(2011) viewed mathematics as the tool for achieving scientific and technological development. It may be in due consideration of all these that Federal government of Nigeria made it a core and compulsory subject at all the levels of 9 – year basic and 3- year senior secondary education in Nigeria, as contained in the National policy on Education (Federal Republic of Nigeria (FRN), 2013), which still remains the rallying point for all educational objectives in Nigeria. Obviously, mathematics is a special cognitive tool that is indispensable for achieving scientific and technological development in a developing country such as Nigeria whose economy is seriously undergoing recession.

Despite that mathematics is important, it is the most dreaded among all the subjects offered in schools. Students tend to respond to it with less self confidence, negative feeling and anxiety (Unodiaku, 2017). This situation is worsened by the compulsory nature of the subject at both the primary and secondary school levels. Moreso, despite the importance of mathematics in societal and national development, the subject is bedeviled by incessant reports on students' poor performance on the subject. Infact, the problems of teaching and learning of mathematics in Nigerian secondary schools have continued to be topical and attract the attention of mathematics educators and researchers. The persistent low attainment in mathematics among Nigerian secondary school students is a clear manifestation of this problem. Despite numerous methods, strategies and approaches infused into teaching the subject, reports are still raging on concerning persistent upward trend in students' poor performance on the subject. This is evidenced in literature, (Anagh and Imoke, 2012; Education, 2017; Telina, 2016; and WAEC (2006-2014) and NECO (2006-2015) chief Examiners' reports. The results of May/June West African senior school certificate examination (WASSCE) conducted by the west African Examination Council (WAEC) have been released with mass failure in two compulsory subjects-English language and mathematics (WAEC Chief examiner's report, 2014).

Several factors have been identified in literature as contributing to students' poor performance in school subjects such as mathematics. For instance, socio-economic status (SES) of parents, cultural and traditional influences contribute to students' low attainment in mathematics (Kaino&Salani, 2014). Awelgiya and John (2016) identified students' parents/guardians educational background and sources of income for students' parents/ guardians are socio-economic factors affecting students performance in mathematics in secondary education in Ghana. Awelgiya and John results indicated that most parents/ guardians do not attain education beyond secondary school education and this was represented by 66.3%, 27.5% have college education and 6.2% only have university education; students' parents/guardians sources

of income are farming (39.9%), salary (38%), business (16.8%) and casual labour (5.3%). Moreso, Cager (2010) earlier indicated that parents SES is associated with diminishing resources, hence contribute to lower academic achievement of the children whose parental SES is low. SES is deemed to affect an individual's academic achievement adversely as a result of limited access to resources (Horwood, 2013). The variability of parents' SES across countries, different educational backgrounds and sources of income of students' parents/guardians suggest possibility of differences in performance among children whose parents/guardians are from different SES. SES can be measured using a combination of indicators such as income, education and occupation (Nwosu, 2012). According to Halle (2010), low family income has been linked to lower academic achievement and slower rates of academic progress as compared with high income families. Based on the foregoing, it is obvious that income, educational attainment of parents/guardians and parental/ guardian occupation are powerful predicators of students' academic attainment, especially in a technical and most dreadful subject such as mathematics.

In Mathematics Education,there has not been much work done on parental SES in relation to students' academic achievement in mathematics (Andrew &Lauro, 2010; Fan, 2012; Kaino&Salani, 2014). Only a few researches attempted to address SES in relation to academic achievement in general. For instance, it is documented by researchers that having a higher SES enables one to have greater access to array of materials, goods and the services to promote or support academic achievement (Nwosu, 2012). Moreso, low SES is deemed to affect an individual's academic achievement adversely as a result of limited access to resources (Horwood, 2013).Andrew and Laura (2010) believed that many of the above factors and the like failed to describe the impact of the SES of parents on the academic achievement of students in mathematics in sufficient detail. Thus, the researcher has seen the need to investigate the impact of parental SES on the academic achievement among secondary school class II students on mathematics.

Socio- economic status may be conceived to refer to the social standing or social class of a person or group of persons. In other words, SES of parents refers to the extent of parental acquisition of or having access to material wealth, goods or services that can support the well being of the family. This suggests that SES of parents can be high or low. According to Nwosu (2012) having a higher SES enables one to have greater access to many of materials, goods and the services to promote or support academic achievement. However, low SES results to increased family conflict and likelihood increase in depression among parents. Therefore, when measuring the achievement of students in mathematics, it is pertinent to consider SES of parents as major determinant of mathematics achievement of students.

Variation in socio-economic status of parents cut-across parents that are working. When a parent's SES is high or in medium level, the tendency is that they can afford to buy mathematics textbooks, other mathematics learning materials, pay mathematics teacher to teach their children in extra-morale lessons and at homes, and pay for other necessary requirements that can support the child's schooling. On the other hand, parents whose SES is low, find it difficult to buy textbooks or other learning materials, hardly pay their children's school fees and most often fail to meet up with other vital responsibilities capable of enhancing their children's learning of mathematics.

Invariably, educated parents that are engaged in well-paid jobs and enhanced income

will like to give their children the best education opportunities and support which will in turn make their children achieve higher results in school subjects such as mathematics. However, most of illiterate parents who have meager income or not salaried do not value education but also discourage their children's academic pursuit. Nevertheless, this is not the end product as some of the highly educated people today, came from very poor families despite discouragements from their families and relations. This situation demands that only research can establish the extent of impact parental SES exert on the academic achievement of their children in mathematics. The problem of the study posed as a question is, how far can the socio-economic status of parents relate with the secondary school student' academic achievement in mathematics in Awgu Education zone of Enugu state?

Purpose of the study

The purpose of the study is to ascertain the relationship between socio-economic status of parents and students' academic achievement in mathematics. Specifically, the study sought to:-

1 Investigate the relationship between socio-economic status of parents (in terms of their income level) and academic achievement of their children in mathematics.
2 Investigate the socio-economic status of parents (in terms of parental level of education) and academic achievement of their children in mathematics.
3 Investigate the relationship between socio-economic status of parents (in terms of occupation of the parents) and academic achievement of their children in mathematics.

Research Questions

The study was guided by three research questions and three hypotheses. The hypotheses were tested at $p<.05$ level of significance. They include the following:

1. What relationship exists (if any) between socio-economic status of parents (in terms of their income level) and students' academic achievement in mathematics?
2. What relationship exists (if any) between socio-economic status of parents (in terms of parental level of education) and students' academic achievement in mathematics?
3. What relationship exists (if any) between socio-economic status of parents (in terms of occupation of the parents) and students' academic achievement in mathematics?

Hypotheses

The research hypotheses formulated and tested at 0.05 level of significance were:-

Ho_1: There is no significant relationship between parents' income level and academic achievement of students in mathematics.

Ho_2: there is no significant relationship between parents' level of education and academic achievement of students in mathematics.

Ho_3: There is no significant relationship between the occupation of parents and academic achievement of students in mathematics.

Method

The study adopted correlational survey research design. According to Unodiaku (2010), a survey research design is a procedure for obtaining information or research data directly from the respondents who answer the questions by themselves. The design is appropriate for the study because the study is focused on determining the relationship (if any) between the dependent variable, students, academic

achievement and independent variables (parental level of income, education, and occupation). The questionnaire were given to SSS II students in Awgu Education zone of Enugu state directly, who answered the questions by themselves. The population of the study consisted of 2701 SSS II students in the 47 government owned secondary schools in Awgu Education Zone (source: Post Primary Schools Management Board, statistical unit, Awgu Education zone, 2018).

A total sample size of 253 students was obtained through multi-stage sampling procedure. Multi-stage sampling procedure was used to sample the subjects. First stage involved using simple random sampling technique to draw 5 schools out of the 47 schools. Next stage involved using simple random sampling technique to draw one intact class from each of the 5 schools. Two instruments were used in gathering data for the study. The first was a self-constructed questionnaire of a four-point likert-type rating scale which is of the form strongly agree (SA)-4 points, agree (A) – 3 points, disagree (D) – 2points and strongly disagree (SD)- 1 point. The instrument contains 26 items eliciting responses about parents' socio-economic status. The instrument was face validated by two lecturers in Mathematics Education and one in Measurement and Evaluation areas. Thereafter, the instrument was trial tested using two intact classes of SSSII students randomly sampled from two schools in Nsukka Education zone (one class from each school). The schools in both Nsukka and Awgu Education zones have similar population characteristics. These two classes did not participate in the main study. After the trial testing of the instrument which contained 26 items was reduced to 23 items because analysis of the items found 3 items to be bad. The instrument was organized into three clusters with each cluster addressing a particular factor. The three clusters are:- cluster A (parental income), cluster B (parental level of education), and cluster C (parental occupations). Thereafter, the instrument was therefore administered to the 253 subjects. After the collection of the instrument from the subjects, it was observed that 4 students did not return their questionnaire. This reduced the actual number of sampled subjects to 249 students used for the study. The data obtained was analyzed using Spearman Brown proficiency formula which yielded reliability coefficient of 0.86. The second instrument was the total and the average marks of the individual students' termly examinations on mathematics for two terms which were taken from the school records with the permission of the principals of the sampled schools, to constitute the mathematics achievement test (MAT) of the students.

The data collected with the instruments were analyzed using mean and standard deviations (S.D) in answering the research questions raised while the research hypotheses were tested using Pearson Product Moment Correlation (r) statistic at $P \leq .05$ level of significance.

Results

Research Question One: What relationship exists (if any) between socio-economic status of parents (in terms of their income level) and students' academic achievement in mathematics?

Table 1: Summary of Pearson Product Moment correlation statistic on students' Academic achievement in mathematics in relation to their parents' level of income.

Category	N	$\bar{X}$	S. D	Mean difference	r_{cal}	r_{crit}	df	P
Parental level of income on	249	6.41	1.375					
Student academic achievement	249	10.69	1.118	4.28	0.194	0.103	248	0.31

Table 1 presented summary of Pearson Product Moment correlation statistic on students' academic achievement in mathematics in relation to their parental level of income. The table showed that there was a difference in the students' parental level of income scores (M = 6.41; S.D = 375) and their academic achievement in mathematics (M =10.69; S.D = 1.118). The mean difference was 4.28 in favour of studnets' academic achievement scores and this is supported byr_{cal}= 0.194, P =0.310 and r_{crit} (248) = 0.103. The relationship between parental socio-economic status (in terms of their income level) and students' academic achievement in mathematics was r = 0.194, which is positive correlation coefficient. Since p-value of 0.3128 is greater than alpha level of 0.05, the null hypothesis which stated that there was no significant relationship was rejected, meaning that the academic achievement of the students in mathematics is related to their parental level of income.

Research Question Two: What relationship exists (if any) between socio-economic status of parents (in terms of parental level of education) and students' academic achievement in mathematics?

Table 2: Summary of Pearson Product Moment correlation statistic on students' academic achievement in mathematics in relation to their parents' level of education.

Category	**N**	$\bar{X}$	**S. D**	**Mean difference**	r_{cal}	r_{crit}	**df**	**P**
Parental level of education	249	9.08	3.241					
Students' academic achievement	249	10.69	1.118	1.61	0.411	0.103	248	0.26

Table 2 presented Pearson Product Moment correlation statistic on students' academic achievement in mathematics in relation to their parental level of education. Table 2, showed that there was a difference in the parental level of education scores (M= 9.08; S.D = 3.24) and their academic achievement in mathematics (M = 10. 69; S.D = 1.118). The mean difference was 1.61 in favour of students' academic achievement scores and this is supported by r_{cal} = 0.411, P=0.26 and r_{crit} (248) = 0.103. The relationship between parental socio-economic status (in terms of their level of education) and students academic achievement in mathematics was r = 0.411. Since p-value of 0.26 is greater than alpha level of 0.05, the null hypothesis which stated that there was no significant relationship was rejected, meaning that the academic achievement of the students in mathematics was related to their parental level of education.

Research Question three: What relationship exists (if any) between socio-economic status of parents (in terms of parental occupation) and students' academic achievement in mathematics.

Research Question three was answered using table 3 below.

Table 3: Summary of Pearson Product Moment correlation statistic on students' academic achievement in mathematics in relation to their parents' level of education.

Category	N	$\bar{X}$	S. D	Mean difference	r_{cal}	r_{crit}	df	P
Parental level of education	249	8.97	3.001					
Students' academic achievement	249	10.69	1.118	1.72	0.316	0.103	248	0.098

Table 3 presented Pearson Product Moment correlation statistic on students' academic achievement in mathematics in relation to their parental occupation. Table 3 showed that there was a difference in the mean of parental occupation scores (M = 8.97; S.D = 3.001) and their academic achievement in mathematics (M = 10.69; S.D. = 1.118). The means difference was 1.72 in favour of students' academic achievement in mathematics and this is supported by r_{cal} = 0.316, P = 0.098 and r_{crit} (248) = 0.103. The relationship between parental socio-economic status (in terms of their level of occupation and students' academic achievement in mathematics was r = 0.316. Since 0.098 is greater than 0.05 alpha level, the null hypothesis which stated that there was no significant relationship was rejected, meaning that academic achievement of the students in mathematics was related to their parental level of occupation.

Discussion of the findings

The results of the study were discussed in line with the research questions and the hypotheses. Research questions one clearly indicated that the main reason why many students do not perform well in mathematics was because of their parental low level of income. The result of table 1 which indicated a small mean value difference of 4.28 between the students' academic achievement in mathematics and their parental level of income was in favour of students' academic achievement. This implies that the students' academic achievement in mathematics and their parental level of income are closely related. This finding is in consonance with earlier finding of Ajila (2013) who reported that parents with high income are more likely and capable of providing simulating educational materials which would foster the latter rate of success of their children's educational achievement. Similarly, Andrew and Laura (2010) reported that increase in school SES are consistently associated with substantial increases in achievement in mathematics and this phenomenon holds for all groups, regardless of their individual SES. Obviously, parental income level is a factor that can correlate positively with children's academic achievement in mathematics. The relationship between parental income level and academic achievement of their students in mathematics was also tested and found significant ($p \leq 05$).

Furthermore, research question two was answered using table 2, which clearly indicated that educational attainment of parents is a factor of academic achievement of their children in mathematics. In other words, educational attainment of parents can correlate positively with their children's academic achievement, especially in mathematics. This correlational value (0.411) was tested and found significant at $p \leq .05$. This finding is supported by Benfiovinon (2014) who reported that parental level of education is related to students'

intellectual growth and educational motivation in different ways. This suggest that parental high level of education is not only closely related to students' acquisition of learning but encourage them to be desirous in learning through various means, especially in mathematics.

Research question three revealed that parental occupation is closely related to performance of their children in mathematics. This finding is in agreement with earlier report of Memo, Muhmammadu and Mohammadu (2010) who found that students whose parents are engaged in high prestigious occupations perform better than those whose parents are engaged in low occupations. That is to say that students whose parents are employees of highly paid jobs will perform better in mathematics achievement tests than those whose parents are peasant farmers and petty traders, to mention a few. Moreso, the relationship of parental occupation with students' academic achievement in mathematics was tested and found significant ($p \leq .05$).

Conclusion

Based on the findings of the study, it was concluded that parental income level, parents' level of education and occupation of the parents were factors found to be related to academic achievement of the students on mathematics. Moreso, parental income level, parental level of education and occupation of parents were found to have significant relationship with academic achievement of students in mathematics ($p \leq .05$).

It is hoped that if these factors highlighted above in this study are taken into cognizance of in the secondary school mathematics pedagogy, there is tendency that fundamental problems in mathematics learning will be permanently resolved.

Recommendations

Based on the findings that reveal significant differences that prevail in the academic achievement in mathematics among students from different socio-economic status, the following recommendations were therefore, made.

1. Teachers should ensure that while teaching the students, they should realize that the students came from different socio-economic backgrounds, and therefore teach them without preferential treatment.
2. Government should provide adequate teaching materials and facilities on mathematics education so as to reduce or eliminate the depression and loss suffered by the students from such disadvantaged homes.
3. Government at all levels should sponsor adult classes for the illiterate parents as well as providing job opportunities for the literate ones that are jobless.
4. Government at all levels should grant loan and financial assistance to peasant farmers, petty traders and low income earners, so as to reduce poverty level ravaging many homes in Nigeria. This will raise socio-economic status of parents thereby enhancing the academic achievement of their children in mathematics.

References

Adetula, L.O. (2010). The role of mathematics in physics education. *Journal of mathematical science Education: A journal of National mathematical Centre, Abuja,* 142-160.

Ajia, C. (2013). Impact of parent SES on university students' academic performance in Ogun state secondary schools. Nigeria: Implications of

counseling for national development. European Journal for social science, 13(2), 229-249.

Akinoso, S. O. (2011). Correlates of some factors affecting students' achievement in secondary school mathematics in Osun State.*International Journal of Education, Science, Mathematics and Environmental Studies (IJSMES)*, University of Abuja, 3 (10), 83-95.

Andrew, Mc. C. and Laura, B. P. (2010) Socio-economic status, self-efficiency, and mathematics Achievement in Australia: a secondary Analysis, *www.journal.supepub.com.9(2),77-91*.

Awelegiya, E. K. and John, B. A. (2016). Importance of Socio-economic status in determining students' Achievement in mathematics: A longitudinal study in primary schools in Ghana.*International Journal of Education Learning and Development,* 4 (6), 31-47.

Benfioving, O. N. (2014). "Family friendly as double edge sword: lesson from the location friendly workplace". *Review of Educational Researcher,* 78(3), 434-489.

Coger, R. D. (2010). Socio-economic status, family processes, and Individual Development.*www.ncbl.nlm.nih.gov*.

Fan, F.A. (2012).The relationship between the socio-economic status of parents and students' academic achievement in Social studies.*Researcher in Education,* 87(1), 99 – 103.

Federal Republic of Nigeria (FRN) (2013).*National Policy on Education (Revised)*. Lagos: NERD press.

Halle, P. (2010). Breaking Barriers or locked out? Class-bases perceptions and experiences of post secondary education in J. I. Mortimer (ed), social class and transitions to Adulthood. *New directions or child and adolescentdevelopment*.San fancisco; Jossey –Bass.

Horwood, S. N. (2013). Wealth, traditional socio-economic indicators, and the achievement debt.*The Journal Negro Education,* 76(4), 530-541.

Imoke, B.I. and Anyagh, I.P. (2012).Effect of Bilingual Medium of Instruction on students' Achievementin Mathematics.*African Journal of science, Technology and Mathematics Education (AJSTME), University of Nigeria,Nsukka*, 2 (1), 83 -90.

Memo, G. R. Muhammadu, A. K. (2010).Impact of parental socio-economic status on students, educational achievement at secondary schools of district Macir, Karachi, Middle, East.*Journal of Scientific Research,* 6 (1) – (10).

National Examination Council (NECO) (2006-2015).Chief Examiners' Reports. Mina: Niger State.

Nwosu, S.R. (2012). Socio-economic status and students' achievement.Metal-analytic review of research.*Review of Educational Researcher,* 75(3), 417-453.

Telima, A (Retr. May, 2016). Problems of Teaching and learning geometry in secondary schools in rivers state. University of Science and Technology, Nkpolu, Port – Harcourt.*www.citeseerx.psu.edu/down/*.

Unodiaku, S. S. (2017). Motivational strategies for effective learning of mathematics among senior secondary school students in Obollo-Afor Education zone of Enugu State. *Journal of Science and Computer Education Department, Enugu State University of Science and Technology, ESUT,* 3 (3), 142-152.West African Examination council (2006-2014).Chief Examiners' Reports.Yaba: Lagos.

EFFECT OF GUIDED DISCOVERY AND DEMONSTRATION TEACHING METHODS ON STUDENTS ACHIEVEMENT TO SENIOR SECONDARY SCHOOL IN ENUGU STATE

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Abstract

This study investigated effect of guided –discovery and demonstration teaching method on students' achievement in senior secondary school chemistry in Enugu State. It was a quasi – experimental study specifically of the pretest –post test, non equivalent control design group type. A total of 180 ss1 students were drawn from two co-educational secondary school in Enugu East local Government Area of Enugu State. Chemistry Achievement Test (CAT) was used for data collection. The instrument was validated by three experts. CAT achieved 0.76 calculated using Kuder Richardson 20(KR-20) formula. Two research questions and two hypotheses guided the study. Mean and standard deviation were used to answer the research questions while the hypotheses were tested at 0.05 level of significance using Analysis of Covariance (ANCOVA). Major finding of the study revealed that students taught practical chemistry using guided discovery teaching method achieve higher than students taught the same topic using demonstration teaching method. It was recommended that chemistry teachers in senior secondary schools should make effective use of guided discovery teaching method in teaching chemistry concepts.

Introduction

Science and technology are imperative to the achievement of any nation's transformation agenda. That is why the federal government of Nigeria has invested so much in science and technology so as to enhance national empowerment.The federal republic of Nigeria (2013) states that the broad goals of secondary education is to prepare individuals for "useful living" within the society. The curriculum designed for senior secondary schools is comprehensive and broad based, aimed at broading students' knowledge. Subjects offered in senior secondary school are in three groups: science subjects, vocational and non-vocational subjects (Mohammed2006) among the science subject in chemistry.Chemistry is a branch of science that studies the structure composition properties and reaction of matter in different forms (solid, liquid and gases), (Aniodoh, 2008). The central purpose of teaching chemistry at the secondary school level is to bring about a positive outcome in the educational behavior of the learner. Contrary to this, the students' achievement is on the downward trend. These poor achievements have

been attributed to many factors which includes the method employed by the teachers as well as the students' attitude to chemistry.

One of the major problems faced by science teachers today is not necessarily "what to teach" but how to teach. In addition, teachers' inability to teach science in a meaningful way has been identified as one of the factors of students' poor performance in both public and internal examinations (Abdullah, 2009). (Alokan, 2010), the poor achievement in chemistry shows the teaching method used by the teachers are poor.Note – worthy is the fact that educators and researchers have recommended the use of effective teaching methods which is in tune with modern scientific and technological dispensation to students' poor achievements in secondary school chemistry (Ojogan and Oganwu, 2006)(Njoku, 2004) these are different teaching strategies, they include demonstration, guided discovery, discussion, project, co-operative, concept mapping, and questioning Socratic. These strategies ensure a shift from teachers dominated classrooms to learners. The teaching methods of interest in this study are guided-discovery and demonstration teaching method. The guided discovery approach involves engaging the learners in simple experimental activities involving genuine 'lets' find out exercises (Madugu, 2005).

According to (Mayer, 2003), guided discovery teaching method encourages students to take more active role in their learning process by answering series of questions or solving problems designed to introduce general concept. (Nelson, 2004), pointed out that guided discovery is a method of teaching were teachers act as a motivator to help students overcome difficulties by providing illustrative materials for students to study on their own and provide reasonable answers to questions asked. This method of teaching is a learner centered.Demonstration as a teaching method involves engaging the learners in displaying or exhibiting objects, equipments or experimental procedure. Demonstration according to (Clark, 2005) is based on simple but sound principle that we learn by "doing". Today experimental or "hands-on" learning is fast replacing the traditional "chalk-talk" method through experiments, activities, simulations, debate activities which motivates students to learn and also encourage group cooperation (Alokan, 2010). Chemistry educators have lamented over poor students' achievement in chemistry in our secondary schools for the past decades (Ezeliora, 2003, Ifeakor, 2006, Mari, 2002, Njoku, 2002 and 2009, Nwachukwu, 2008). They all attributed the poor performance and indifference to mainly the poor conventional teaching method used by chemistry teachers. Our nation's position in global competitiveness, job creation, development and wealth generation cannot be improved under the present poor achievement in secondary school chemistry. It is therefore important to seek this teaching strategy that will be efficacious in enhancing students' achievement. In difficult chemistry concepts, this research work therefore set out to find out the effects of guided-discovery and demonstration teaching methods on students' Achievement chemistry to senior secondary schools in Enugu State.

Purpose of the study

The purpose of this study is to determine the effects of guided- discovery and demonstration teaching methods on senior secondary students' achievement to chemistry in Enugu State. Specific terms, the purpose of this study are sought to,

1. determine the mean achievement scores of ss1 students taught qualitative analysis using guided-discovery and those taught the same topic using demonstration teaching method in senior secondary schools in Enugu State.

2. determine the mean achievement scores of male and female students taught qualitative analysis using guided –discover method and those taught the same topic using demonstration teaching method in senior secondary schools in Enugu State.

Research Questions

The following research questions guided the study;

1. What are the mean achievement scores of ss1 students taught qualitative analysis using guided-discovery method and those taught the same topic using demonstration teaching method?
2. What are the mean achievement scores of male and female ss1 students taught qualitative analysis using guided-discovery method and those taught the same topic using demonstration teaching method?

Hypotheses

The following null hypotheses were at 0.05 level of significant

1 :There is no significant difference between the mean achievement scores of students taught qualitative analysis using guided-discovery teaching method and those taught the same topic using demonstration teaching method.

2 There is no significant method between the mean achievement score s of male and female ss1 students taught qualitative analysis using guided-discovery teaching method and those taught the same topic using demonstration teaching method.

METHOD

Research Design

The research design adopted in the conduct of this investigation was quasi-experimental design. Specifically the design was a pretest-post test, non equivalent control group design.

The area covered in this study was Enugu-East Local Government Area of Enugu State. The population for the study consisted of all senior secondary school one (SS1) students in co-educational schools in Enugu-East Local Government Area numbering six hundred and thirty (630) students as at the time of this study. A sample of one hundred and eighty (180) senior secondary school one (SS1) students was used in the study. By purposive sampling, the researcher sampled all the secondary schools that have functional chemistry laboratories from Enugu-East Local Government Area of Enugu State, from these schools, using simple random technique he sampled two (2) senior secondary schools.

Furthermore, from the two schools so sampled, the researcher used simple random techniques to sample four SS1 intact classes, two from each school and consequently assigned them to experimental and control group randomly.

The following instruments were used for data collection. Chemistry Achievement Test (CAT)was developed by the researcher. It was made up of forty (40) multiple choice Questions with four options each. The items were drawn using a table of specification to ensure adequate coverage of the content area covered in the study as well as maintain event spread across the different levels of the cognitive domain tested.

The instrument (CAT) was validated by three research experts. After necessary corrections as directed by the experts was carried out. Kudar-Richardson's formula 20 (K_R- 20) was used to determine the reliability. A reliability coefficient of 0.76 was obtained for the instrument. The instrument was administered to SS1science students in a different school outside the schools sample for the study the score obtained were used to obtain the reliability coefficient stated above.

Experimental procedures

The researcher trained the regular chemistry teachers in the two secondary schools used in the study for a period of two weeks on the use of the CAT used for the study.

Foremost, the CAT was administered to all the subjects of the study as pretest. Thereafter, the treatment was administered for a period of six weeks. The experimental groups in each school were taught qualitative analysis using guided-discovery and demonstration teaching while the control groups were taught the same topic using guided discovery and demonstration teaching methods.

At the end of the treatment period, the CAT was re-arranged and administered to all the subjects as posttest.

Research Questions were analyzed using mean statistics and standard deviation. Any mean score from 50 to 100 was interpreted as high while mean score below 50 was interpreted as low. Furthermore, the standard deviation was used to determine how spread the scores were around the mean, the less the value of standard deviation, the closer the scores are the mean, hence the more reliable such mean is. On the other hand, the higher standard deviation implies existence of extreme scores, hence, the less the reliability of such mean. Test of hypotheses were done with Analysis of Covariance (ANCOVA) at 0.05 level of significance.

The choice of ANCOVA at the statistical tool for testing the hypotheses was to take care of possible initial differences in the abilities of the subjects as non-equivalent intact classes were used. The null hypotheses were rejected when the F-calculated value was equal or greater than the F-calculated value at the appropriate degree of freedom, and were not rejected when F-calculated was less than F-tabulated value.

Results

Research Question One

What are the mean achievement scores of SS1 students taught qualitative analysis using guided discovery and those taught the same topic using demonstration teaching methods?

Table 1: Mean score and standard deviation of guided discovery and demonstration groups in the pre-test.

Sample Size: 180
Highest: 90%
Lowest: 40%

Group	Pretest Mean	Pretest S.D	S.D Mean	
Experimental Discovery	53	5.907	75.5	5.93
Experimental Demonstration	49.2	4.638	67.8	4.686

Table 1 shows that the pretest mean achievement scores for experimental groups are 53 and 49.2 respectively with standard deviation of 5.907 and 4.638 respectively posttest achievement mean scores of guided discovery group (75.5) is higher than the post test achievement mean scores of demonstration (67.8), with standard deviation of 15.93 and 4.686 respectively. The gained mean score of the guided discovery group is 22.5 which is greater than the gained mean score of the demonstration group which is 18.06.

Sample Size: 180
Highest: 90%
Lowest: 40%

Research Question Two
What are the mean achievement scores of male and female students taught qualitative analysis using guided discovery and those taught the same topic using demonstration teaching methods?

Table 2: Mean score and standard deviation of male and female SS1 students in the guided discovery and demonstrative groups in the pretest and post test.

Group	Pretest Mean	S.D	Pretest Mean	S.D
Experimental Guided Discovery	54.2	2.49	51.8	8.289
Experimental Demonstration	51.2	6.017	47.2	1.483

Table 2, shows that post-test scores for male and female students in guided discovery group which are 76.6 and 74.4 respectively were higher than post test scores for male and female in demonstration group which are 67 and 68.6.
Also the pretest scores for male and female students in guided discovery group were 54.2 and 51.8 respectively were higher than pretest scores for male and female in demonstration group are 51.2 and 47.2 respectively.

Hypotheses 1
There are no significant achievement scores of students taught qualitative analysis using guided discovery and those taught the same topics using demonstration teaching method.

Hypotheses2
There is no significant difference between the mean achievement scores of male and female SS1 students taught qualitative analysis using guided discovery and those taught the same topics using demonstration teaching methods.

Table 3 ANCOVAAnalysis of Students

Source of Variance	Sum of Squares	df	Mean Squares	F-Calc.	Level of Significance	Decision
Co-variants	314.950	3	104.983	3.389	.044	NS
Intercept	102674.450	1	102674.450	3314.752	.000	NS
Group	296.450	1	296.450	9.571	.005	S
Gender	.450	1	.450.015	.906	NS	
Group Gender	18.050 1	1	8.000	.583	.456	NS
Error	495.600	16	30.975			
Total	103485.000	20				
Corrected	810.550	19				

S=Significant, NS=Not Significant at 0.05 Level of Probability

Table 3 shows that the f-calculate value on the mean achievement scores of students taught qualitative analysis using guided discovery and those taught same topic using demonstration teaching method is 9.571, is significant at .005 level of significance for the study and therefore the null hypotheses is rejected. This means that there is a significant difference between the mean achievement scores of students taught chemistry using guided discovery and those taught same topic using demonstration teaching method.

Hypothesis Two

There is no significant difference between the mean achievement scores of male and female students taught qualitative analysis using guided discovery and those taught same topic using demonstration.

Table two shows that f-calculated value on the mean achievement scores of male and female students taught qualitative analysis using guided discovery and those taught same topic using demonstration teaching method is 0.015 is not significant at 0.906 level of significance for the study and the null hypothesis is not rejected. This means that there is no significant difference between the mean achievement scores of male and female students taught chemistry using guided discovery and those taught same topic using demonstration teaching method.

From the findings, it was revealed that,

1. Students taught qualitative analysis with guided discovery achieved better than students taught the same topic using demonstration teaching method.
2. Male and female students taught qualitative analysis using guided discovery performed better than those taught the same topic using demonstration teaching method.

Discussions

Students taught qualitative analysis using guided discovery achieved higher than demonstration group.Results of data analysis table one shows that the guided discovery group achieved higher mean than the demonstration counterpart. The results was in agreement with the research carried out by Braggs (1999) in which guided discovery method of teaching was found more effective than the demonstration

method of teaching fostering students' achievement in physics (options).

Chakamai (1998), Ezejitu (2009) and Otobo (2012) stated that guided discovery is a problem solving method which is needed self-development and that it should be included in every study of science. From the findings of this study, it showed that guided discovery instruction strategy is important in teaching and learning of science and technology. Hence it should be used in teaching of science, Omoiko (2016).

The result of the study in respect to the effect of guided discovery method on mean achievement scores does not, however agree completely with (Odo, 1990 and Ezeji 1993) who found that guided discovery method and demonstration method on mean were equally effective in promoting students' achievements in same aspect of secondary school physics. The observed quality in the efficacy of the two methods in fostering achievements in physics might have arisen from the fact that attempts were not sufficiently made by the researcher (Odo, 1990 and Ezeji 1993) to control some extraneous variables (teacher difference).

Conclusions

Based on the findings of the study, the following conclusions were made:

1. Students in the guided discovery group taught qualitative analysis achieved better than those taught the same topic using demonstration teaching method.

2. There have been persistent challenges of chemistry educators to discover methods of teaching that will make chemistry lessons especially practical chemistry (Acid and bases) more meaningful to the learners.

3. There is a significant difference between the mean achievement scores of students taught qualitative analysis using guided discovery and those taught same topic using demonstration teaching method.

Recommendations

The following recommendations are made;

1. Chemistry teachers at all levels should start now to use guided discovery method in teaching students practical chemistry (Acid and bases) since it increases achievement.

2. Professional bodies such as Science Teachers Association of Nigeria, STAN, West African Examination Council (WAEC) and National Examinational Council (NECO)should organize seminars, workshop conferences and house training for teachers and textbook authors in the use of guided discovery method in chemistry and other effective method ofteaching.

3. Government should establish chemistry laboratories in secondary schools and such laboratories should be equipped chemicals and reagents and also efficiently energized by constant electricity supply.

References

Abdulahi, A. (2009). Science Teaching in Nigeria. Ilorin Nigeria: Ototo Press

Akinsola, A.C.(2004). *Skilled Demonstrations for Educators.*Yola: Plensan Plus Publishing House.

Alokan, F.B. (2010). Influence of Sex and Location on Relationship between students' Problems and Academics performance. *The Journal of Social Sciences (TJSS):* 340 -345.

Aldler (1971). What the *Best College Teachers Do.* Havard University press.

Aniodo, H.C.O. (2008).Modern Aspects of Integrated Science Education Enugu: HacofamEducational Books.

Aniodo (2008)Chikamai, K. (1998). Gender differences a factor in computer science achievement in Secondary School in Nigeria. The academic forum 1,157-160.3.

Clark, R.R. (2005).*Analysis of Demonstration Method of Teaching.* London: the Falmer Press. Pp.4.

FGN-NPE, 2013.*Federal Government of Nigeria, Policy of Education (2006-2013)* Federal Ministry of Education Abuja.

Gbamanja J.A. (2003).*Perfection of difficult topics in chemistry curriculum by students in Nigeria secondary schools, Ilorine Journal of Education.*

Jegede, S.A. (2007). Students anxiety towards the learning of chemistry in some Nigeria secondary schools. *Educational Research and Review, 2 (7): 193-197.*

Mayer, R. E. (2003). *A History of Educational Taught.* Columbus Ohio: Charles E. Merrill Publishers & co.

Mayer, R.E. (2003). *Learning and Instruction.* Pearson Education, Inc: Upper Saddle Rive, 287-88. Mohammed (2006).

Nelson, B.D. (2004). Method that teaches Journal of Educational Research. London: Summer Publishers 33(2): 22.

Njoku S.N. (2004). Enhancing the relevance of chemistry curriculum delivery. Using Science Technology Society Approach (STM).

Nordin, A. and Chin, M.T. (2010).*PemahamaanKonsepPelajarTingtakanEmpatDalamTajukIkatan Kimia Di Skudai Johor.* PemahamaanKoncepPelajarTingkatanEmpatDalamTajukIkata Kimia Di Skudai Johor. Pp 1-10. Last Retrieved on (4th August 2012) from http://eprints.tum.my/11251/.

Otobo, K. (2012).*Effect of Guided Discovery Method of Instruction on the Achievement of Junior Secondary School Students in Computer Studies.Abakaliki.*Unpublished.

WEAC (2014). *Statistics of Entries and Performance for WASSE MAY/JUNE 2014 in Lagos Nigeria: Test Development Division.*

Njoku S.N. (2004). Enhancing the relevance of chemistry curriculum delivery. Using Science Technology Society Approach (STM).

Nelson, B.D. (2004). Method that teaches Journal of Educational Research. London: Summer Publishers33(2): 22.

EFFECT OF OIL PRICE MOVEMENT AND RELATIVE PRODUCTIVITY DIFFERENCIALS ON REAL EXCHANGE RATE IN NIGERIA

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Abstract

The study aimed at investigating whether or not productivity differentials and oil price movement affect the real exchange rate in Nigeria. The study employed the Augmented Dickey –Fuller (ADF) to test for the order of integration while Johansen method of vector error correction Model (VECM), was used to analyze the work using secondary time-series data for the period 1986-2014.The data were sourced from IMF (2017), International Financial Statistics, World economic outlook, World Econstat (various issues), World Bank data and CBN statistics bulletin. The results show that productivity differentials have negative effect on the real exchange rate movement in Nigeria and very significant while real oil price has positive effect on the real exchange rate movement in the long run and also very significant. The study recommends that Policy makers should concentrate on the causes of real exchange rate appreciation due to foreign exchange inflows emanating from oil revenue. Effort should be made by government to encouraging export-oriented industries that use local inputs for the production of their goods.. Export promotion industries should be the target policy of the government in order to continue strengthening the value of Naira and improve terms of trade. The findings of this study have serious implications for exchange rate policy in Nigeria and are relevant to many developing countries whose economies are being used as a dumping ground for low standard goods and where oil revenue is a major source of income.

Keywords: Real exchange rate, Relative Productivity differentials, Oil price, Nigerian economy

Introduction

As at 2019, Nigeria is currently the second largest oil exporting country in the Organization of Petroleum Exporting Countries (OPEC) and is heavily dependent on its crude oil exports, which accounts for about 95% of its exports and foreign exchange earnings and about 80% of total Government revenue in annual budgets. Since then, oil has been the influential factor in Nigeria's economy since its discovery in 1956.Oil exporting Countries ceteribus paribus may experience real exchange rate appreciation when oil price and productivity of that Country increases, likewise real exchange rate of oil exporting Countries may depreciate when oil price and productivity relative to other Countries decreases. Maintaining oil price stability is becoming a serious problem in

Nigeria and very worrisome to Economists and Policy makers.

Between 2000 and 2008. Oil price increased more than 5-folds from $23 per barrel in the year 2000 to peak at an all time high at $146 per barrel in the year 2008 before crashing to $42 per barrel in the year 2008.Decrease in prices then began the year 2009 at below $40 a barrel, averaging $61.73 per barrel for the yea r peaking at $78 in the year 2010. In 2011, the price of crude oil started the year on a high note hitting a 2-year high selling at $95 a barrel. The price has continued to trend upward due to political crisis in the Middle East. This trends in oil prices is shown in figure 1 below:

Figure1: Trends In Oil Prices

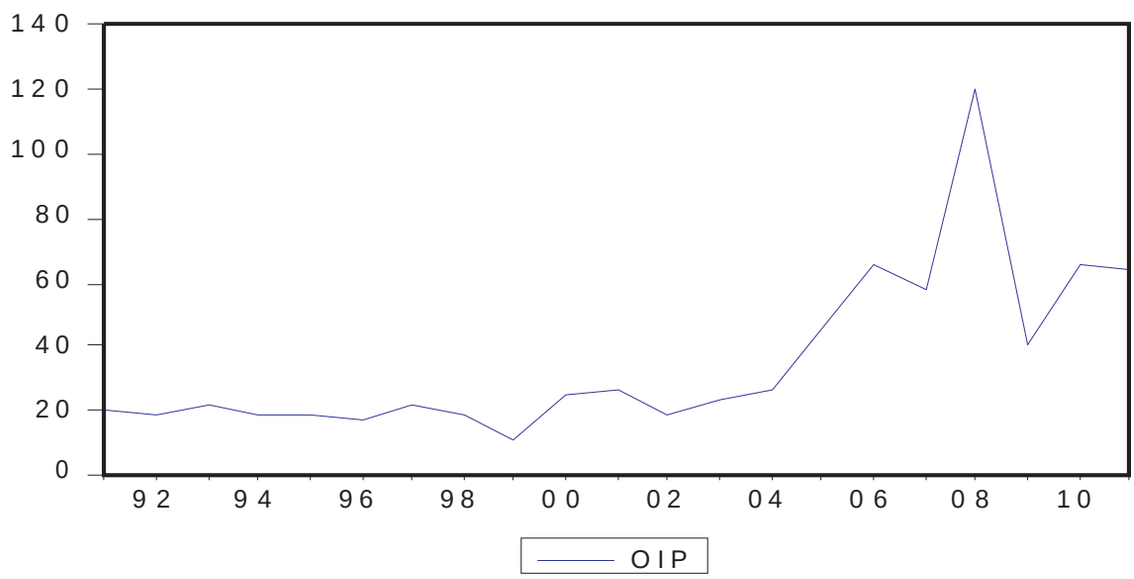
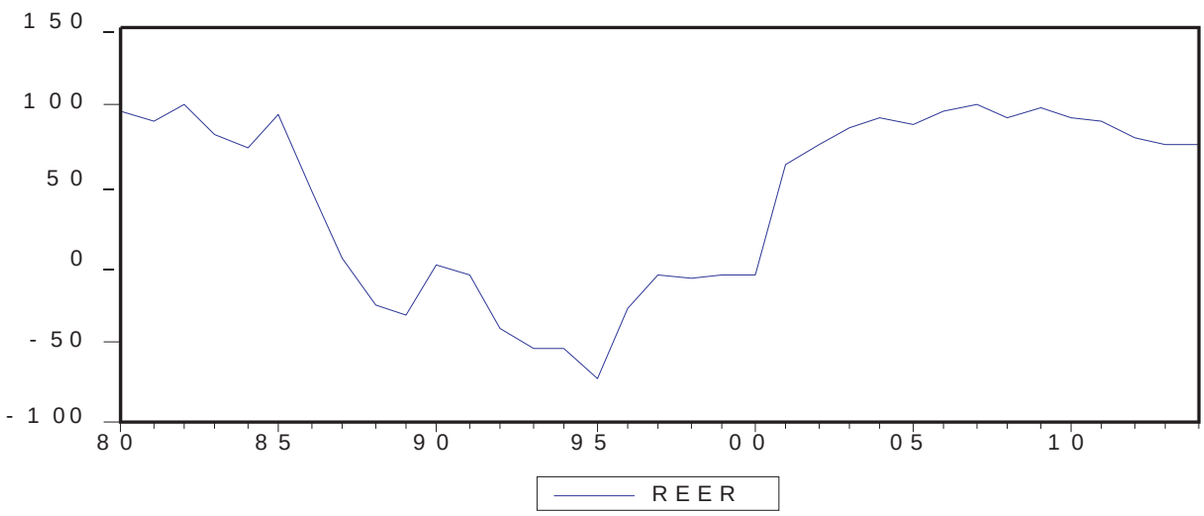


Figure 2 below shows Nigeria's real exchange rate over the period 1980 to 2014. From 1980 to1995 following the oil price increase, we can observe a downward trend with the real exchange rate depreciating significantly leading to gain of competitiveness for the Nigerian economy. In 1986, Nigeria experienced a sharp decline in its real exchange rate following declining oil prices and the Structural Adjustment Programme (SAP), which led to the devaluation of the Nigerian currency- the Naira. Between 1996 to 2001, there were significant upward movements in the real exchange rate. Since then, the real exchange rate index continues to appreciate. From 2009, owing to rising global oil prices and increased oil exports, Nigeria experienced large foreign exchange inflows. The real exchange appreciation could be seen as a response to the large foreign exchange inflow that characterized the Nigerian economy or it could as well be a response to productivity gains.

Figure 2: Nigeria's Real Exchange Rate



Finally, statistical evidence revealed that in 2014, the Purchasing Power Parity GDP per capita for Nigeria was 1,057.60 billion international dollars; increasing from 651 billion international dollars in 2008 to 1,057.60 in 2014. While that of the other Countries especially China within the same period was 18,285.25, increasing from 10,073.75 billion international dollars in 2008 to 18,285.25billion in 2014. The Purchasing Power Parity GDP for China reached a maximum annual rate of 17.27% in 2007 and then decreased to 8.97% in 2018, while Nigeria Purchasing Power Parity GDP per capita annual rate grows at an average rate of 8.36% from 1999-2018. The ratio of Purchasing Power Parity GDP per capita for Nigeria and China in the year 2008, 2012 and 2017 stood at 1:15, 1:17 and 1:20 respectively. These ratios simply means that while the purchasing power parity GDP which is a measure of productivity and international competitiveness for China is increasing in geometrical progression, that of Nigeria is increasing in arithmetical progression showing serious imbalance. The macroeconomic effects of all these fluctuations, the recent upward trend of oil prices and foreign exchange inflow pose challenges for exchange rate management in Nigeria.

According to Manchehr and Boo (2002), the competitiveness of a Country is often measured by its real exchange rate and relative Productivity. This assertion has its origin in the theorem of Purchasing Power Parity (PPP), which is one of oldest hypothesis in Economics. Studies on the effect oil price and productivity differential on real exchange in Nigeria is limited. Most of these studies have looked at the influence of oil price on exchange rate movements. Evidence of oil price movement having a significant effect on the exchange rate of oil producing nations has been reported for Nigeria by (Ozsoz and Akinkunmi,2011), Canada(Issaetal,2008),Kazakhstan(Kutanand Wyzan,2005),Russia(SpataforaandStavre,2003 ;OmesandKalcheva,2007),Algeria(Korancheli an, 2005), Venezuela(Zalduendo, 2006), Egypt(Mongardini,1998) and OPEC Countries (Korhonen and Juurikkala,2007).While insignificant negative result has been reported for Norway (Bjornland and Hungnes, 2008; Akram,2000, Habib and Kalamova, 2007),

Canada (Amano and van norden, 1995; Gauthier and Tessier, 2002) and Saudi Arabia (Habib and Kalamova, 2007).

Majority of these previous empirical studies concentrated on developed Countries and used multiple regressions involving crossed sectional or quarterly data and failed to find out the fundamental real factors that affect real exchange rate movement in developing Countries like Nigeria. This study seeks to fill the gap by employing Vector Error Correction Models using time-series data, which is correct when Country specific factor are constant over time.

Thus this study aims to find out the effect of oil price movement and relative productivity differentials on real exchange rate as regard to Nigeria economy..**Purpose of the study:**

The purpose of this empirical study was to determine the effect of oil price movement and relative productivity differentials on real exchange rate in Nigeria. The specific objectives include:

1. To determine the long-run effect of oil price movement on real exchange rate in Nigeria
2. To determine the long-run effect of Relative productivity differential on real exchange rate movement in Nigeria

Research questions:

1. What is the long-run effect of oil price movement on real exchange rate in Nigeria
2. What is the long-run effect of Relative productivity differential on real exchange rate movement in Nigeria

Hypothesis:

$H0_1$: Real oil price has a positive effect on the real exchange rate movement in Nigeria in the long run

$H0_2$: Productivity differentials have positive effect on the real exchange rate movement in Nigeria in the long run

uelson effects.

Method

The study adopted a quantitative research design using secondary data from 1986- 2014. The researcher employed the Augmented Dickey –Fuller (ADF) to test for the order of integration. The choice for this test is made because it is more reliable and robust than the Dickey-Fuller (DF) test. It also eliminates the presence of auto-correlation in the model.

ADF unit root test is specified as:

$$yit = \alpha_0 + \alpha_{1y1}t - 1 + \sum_{i=1}^{n} \beta \Delta yit - 1 + U$$

Where yi = variables in the model

α_0 α_1 and β = parameters in the model

μ = Error term

A variable is stationary of the order in which its ADF test statistic is greater in absolute value than the ADF critical values at different levels of significance. We determine whether the variables are integrated and identified the long-run relationships. Johansen co integration was employed using OLS Methodology. The Johansen systems procedure is used to test for the presence of a long-run relationship.

The Johansen method for testing for co integration is based on the properties of a Vector Error Correction Model (VECM) and takes the form:

$$? _t1 = Đz_t\text{-}1 + \sum Dj? Zt\text{-}j + Vt$$

J= iWhere the vector of I(1) endogenous variables z = [LNREERt, LNPRODt, LNROILPMUVt], ? Æ are all I(0) variables vtis a (3 x 1) vector of white noise error

terms. D is a (3x3) matrix of coefficients of deterministic terms.The ï matrix contains information regarding the long run relationships, it is decomposed into n x r matrices of á and â such that âá?=Ð, with the /columns of matrices â representing the r linear combinations of Xt that are stationary or co integrated and the columns of á is the vector of speed of adjustment to equilibrium coefficients (Asteriou and Hall, 2006). Johansen (1988, 1991) proposed two statistics, the trace and maximum eigen value statistic which take the form

$$\lambda_{trace}(r) = -T\sum \ln(1-\hat{\lambda}_{ii} \text{ and } \lambda_{max}(r, r+1) = -T\ln(1-\hat{\lambda}_{r+i})$$

Where T is the number of observation, ëi are the ordered eigenvalues and ër is the eigenvalue corresponding to r co integration vectors(Wang, 2003).The ëtrace is a joint test with the null that the number of co integration is less than or equal to r against the alternative that there are more than r. While ëmax has as its null hypothesis that the number of co integrating vectors is r against the alternative of r+1 (Brooks, 2008). Since there are three variables there can be at most two linearly independent co integrating vectors i.e. r ≤2. Our empirical analysis proceeds as follows: We first investigate the integrational properties of our variables and then search for any potential co integrating relationship. Assuming the real effective exchange rate, Relative productivity differential and oil price are stationary, we will then check if change in real oil price and productivity differential can explain the REER.

Sources of Data:

These data were sourced from IMF (2017), International Financial Statistics,World economic outlook, World Econstat (various issues), World Bank data and CBN statistics bulletin.

The study uses annual data on real exchange rate based on relative CPI and average crude oil spot price. The annual data ranges from 1986 to 2014 for 29 years observations. The study period is because of data availability. All variables were expressed in natural logarithms before conducting the econometric analysis for better fit and to reduce the problem of heteroscedasticity. Referring to already related existing works, the annual real oil prices was constructed as the nominal average price of crude in US Dollars divided by the IMF index of the unit value of world manufactured exports (Cashin et al, 2004; Habib and Kalamova,2007 and Suseeva,2010). Following Habib and Kalamova(2007), a proxy was used to calculate the Relative Productivity Differential variable defined as the trade weighted relative productivity differential against trading partners productivity, where Productivity is the PPPGDP per capita. Data on GDP per capita based on PPP are from the World Bank world economic indicators.

Table 1: Descriptive Summary Statistics for the Real Exchange Rate, Relative Productivity Differential and Real Oil Price

	LREER	LROILPMUV	LPROD
Maximum	5.433216	-0.366467	-0.854436
Minimum	4.027601	-2.378753	-1.580558
Std. Dev.	0.79025	0.620595	0.11762
Skewness	1.122756	0.432177	1.212062
Kurtosis	2.84217	1.811252	-5.58311
Jarque-Bera	5.313897(0.05)	2.160817(0.25)	17.75362(0.00)

Table 1 presents the descriptive summary statistics for the Real exchange rate, Relative Productivity differential and real oil price. It is apparent from the standard deviation that REER has the highest volatility even higher than the real oil price. The distributional properties of our productivity differential variable appear to be not normal. The Jarque-Bera statistic and its associated p value reject the null hypothesis that the variable is normally distributed. All series have positive skewness and kurtosis indicate leptokurtic distribution.

The empirical analysis examines whether oil price fluctuations and Relative productivity differentials affect the real exchange rate using Johansen's VAR technique.

Table .2: Augmented Dickey Fuller Test and Phillip Perron and DFGLS

Variables	ADF (i)	(ii)	**PP (i)**	**(ii)**
LREER	-1.55	-1.32	-1.99	-1.72
LROILP	-0.85	-0.72	-0.83	-1.35
LRPROD	-1.81	-1.40	-3.88	-2.91

Table 2 summarizes the results of the unit root tests based on the Augmented Dickey Fuller (ADF) and Philips Perron (PP) test. We include both (i) an intercept and (ii) an intercept and trend in the estimation. As noted by Habib and Kalamova(2007) and Taylor (2003), identifying the integrational properties of the real exchange rate is a difficult task due to their near unit root behaviour as both stationary and non stationary data generating processes may characterize the real exchange rate. Using both ADF and PP unit root tests, the common suggestion is that the real exchange rate (REER) and real oil price (ROILP) and Productivity differentials(PROD)are non stationary in their levels and stationary at their first difference. The result of the unit root test is unequivocal regarding the order of integration.

Table 3: Johansen Maximal Eigenvalues Test and Trace Test

LNREER LNROILP LNPROD

Null Hypothesis	Alternative	Test statistic	p-value
Trace test			
r=1	r≤2	2.55	0.88
r= 2	r≤3	0.21	0.65
Max.eigenvalue test			
r=0	r≤1	27.11	0.00
r=1	r≤2	2.43	0.77
r= 2	r≤3	0.11	0.76

Table 4: Co integration vector (t-Statistics)

Cointegrating Eq:	CointEq1
LREER(-1)	1.000000
LRPROD(-1)	-4.730058 [13.0778]
LROILPMUV(-1)	0.878028 [-3.37360]

Table3 reports the results of the Johansen co integration test. We first estimated a VAR in levels to determine the optimal lag length as co integration is sensitive to lag length. Starting with two lags due to the limited number of observations, we limited the maximum lag to one in the lag length selection process based on LR, SC and HQ after having checked for the absence of residual serial correlation. The VAR also satisfy other stability condition and there was no root lying outside the unit circle. Table 3 displays results of the co integration analysis. The results of the ëtrace and ëmax statistics strongly suggest there exist one significant co integrating vector. The result rejects the null of no co integration but cannot reject the hypothesis that there is at most one co integrating equation. On the basis of the ëtrace and ëmax, there is evidence of one co integrating vector and is significant at 5% and 1% respectively. The real exchange rate, real oil prices and Relative productivity differential are therefore linked together by a long run equilibrium relationship as real oil price and Relative productivity differential adequately capture innovations in the real effective exchange rate. The Johansen co integration approach showed that the three variables are linked together by long run equilibrium relationship that is presented in **Table 4** above. The long run parameters of the estimated system are given by the matrix after normalizing by the coefficient of the real exchange rate. In the long run oil price (LOILP) exercises a significant positive effect on the real exchange rate (LREER). This long run positive relationship is as expected, positive and relatively large; it could be explained by the fact that Nigeria is an oil exporting country. This has been confirmed in a number of similar studies (Olomola and Adejumo, 2006etc). A 1% change in real oil price will lead to 87.8 % increase in the real exchange rate. On the other hand, Productivity differential exerts a negative effect on real exchange rate. Thus in Nigeria, the Balassa–Samuelson effects do not seem to play an important role in driving the real exchange rate indicating that higher productivity in Nigeria's traded goods sector vis a vis its trading partners decreases the real exchange rate in the long run. A 1 % increase in productivity differential will lead to a 4.73% decrease in the real effective exchange rate in the long run. Over all, the findings suggest some significant dependency between oil price, Productivity differential and the real effective exchange rate. Given the relatively short time series, results should be interpreted with caution.

Summary of finding

The work examined whether movements in the real price of oil and Relative productivity differentials against 29 major trading partners affect the real exchange rate in Nigeria. We observed a modest appreciation of the CPI based REER since 2000(figure 2).

The real appreciation could be attributed to the large inflows of foreign exchange in the form of oil revenue during that period, or a response to productivity gains. The result also indicated that the Nigerian currency-the Naira could be described as an “oil currency” as results indicate a long run positive and significant relationship between real exchange rate and real oil price. Real exchange rates commove with oil price and Relative productivity differentials in the long

run.

Finally, there is a lack of support for the Balassa-Samuelson effect as indicated by the negative and significant coefficient on the Relative productivity differential. The observed real exchange rate appreciation is attributed to improvements in oil prices and not the Balassa Samuelson effect.

Conclusions

The researcher estimated the long run effects of real oil price and productivity differential on real exchange rate using the Johansen framework technique based on annual data from 1986 to 2014.Testing whether real oil price and productivity differential has serious effect on real exchange rate movement in Nigeria. Following Habib and Kalamova(2007),the researcher constructed Nigeria's productivity differential against thirty major trading partners and include it as an explanatory variable of the real exchange rate model. Relative Productivity differential is used to capture the Balassa Samuelson effect. The list of major trading partners are: Australia, Austria, Benin Brazil, Cameroun, Canada, China, Cotedevoire, France, Germany, Ghana, India, Ireland, Italy, Japan, Netherlands, New Zealand, Niger, Peru Portugal Senegal, South Africa, Spain, Sweden, Switzerland , Thailand, Turkey, U.A.E, U.K and U.S constituting more than 86% of the trade between Nigeria and the rest of the world.The empirical result showed that real oil price has positive effect on the real exchange rate in the long run and was very significant, while Relative Productivity differentials have negative effect on the real exchange rate in Nigeria and also very significant.. The study also revealed that, the real exchange rate appreciation of 1986-2014 was influenced by oil prices and relative productivity differential between Nigeria and other Countries of the world.

Recommendations

- The researcher recommends that Policy makers should focus attention on the implication of real exchange rate appreciation due to foreign exchange inflows arising from oil revenue, which is an indication of “Dutch disease” both in medium and long term. The Nigerian economy is a “commodity economy”, as oil exports have maintained the largest share of Nigeria's total exports for decades. Nigeria's real exchange rate needs to be moderated as a result of oil price fluctuations. Some level of real appreciation is inevitable given high oil prices, Nigeria's exchange rate policy has contributed to nations 'boom and bust' cycles over the past 30 years (Budina, et al, 2006).

- Government should encourage export-oriented industries that use local inputs for the production of their goods. There should equally, be government concerted effort towards boosting the agricultural production. Policies to encourage these sectors and strategies toward effective implementation of already existing ones should be put in place.

- Government should encourage small and medium scale enterprises (SMEs) that use

local inputs. Export promotion industries should be the target policy of the government in order to continue strengthening the value of Naira and improve terms of trade. There should be a shift of attention away from the oil and service sectors by government as the major sources of government revenue to the real sectors- agricultural and industrial sectors that can produce import substitution goods with greater local inputs.

References

Annsofie Peterson (2005). "Identifying the determinants of Exchange Rate Movements: Evaluating the Real Interest differential model" cited at http//um.kb.se/resolve?Umeurn:nbn.se:hjdira –247

Akram, Q. F., (2004). Oil Prices and Exchange Rates: Norwegian Evidence. EconometricsJournal, 7(2), 476-504.

Amano, R., Van Norden, A.S.(1996). Exchange Rates and Oil Prices. Bank of Canada Working Paper95-8

Aziz, M. I. A., (2009). Oil Price and Exchange Rate: A Comparative Study between Net Oil Exporting and Net Oil Importing Countries. ESDS *International Annual Conference `2009*

Balassa, B., 1964.ThePurchasing Power Parity Doctrine: A Reappraisal. Journal of Political Economy. Vol. 72,584–596.

Cashin, P., Luis, F. C., Sahay, R.,(2004). Commodity Currencies and the Real Exchange Rate. Journal of Development Economics, 75(1), pp. 239-68.

Chaudhuri, K., Daniel, B. C., (1998). Long-run equilibrium real exchanges and oil prices. Economic Letters,58,231-238.

Choudhri, E.U., Khan,M.S., (2004). Real Exchanges Rates in Developing Countries: Are the Balassa-Samuelson Effects Present? IMF working paperWP/04/188

Coleman, S., Cuestas, J. C., Mourelle,E., Cuestas,J.,(2011). Investigating the oil price-exchange nexus: Evidence from Africa.Sheffield Economic Research Paper Series SERP: 2011015 University of Sheffield, Sheffield.C

Coudert, V.,(2004). Measuring the Balassa-Samuelson Effect for the Countries of Central and Eastern Europe? Banque de France Bulletin Digest No122, 23-43.

Habib, M.M.,Kalamova,M.M.,(2007). Are There Oil Currencies? The Real Exchange Rate of Oil Exporting Countries. European Central Bank working Paper 839

Johansen, S.,(1988). Statistical Analysis of Cointegration Vectors. Journal of Economic Dynamics and Control. No. 12. P. 231–254.J.

Kutan, A. M., Michael, L. W.,(2005). Explaining the Real Exchange Rate in

Kazakhtan, 1996-2003: Is Kazakhstan Vulnerable to the Dutch Disease?. Economic Systems, 29, pp. 242-55.

Lizardo, R. A., Mollick,A.V., (2010). Oil price fluctuations and U.S. dollar exchange rates, Energy Economics32, 399-408.

Manuchehr,I. & Boo,S.(2002). Productivity and Real Exchange Rate: Some empirical ` examples. Journal of EconomicsIntegration,vol.17.No.13(September 2002),pp527-` 353.

Nikbakht, L.,(2010). Oil Prices and Exchange Rates: The Case of Opec. Business Intelligence Journal, 3(1).

Ozsoz, E., Akinkunmi, M. (2011). An Evaluation of Price Based Determinants of Nigeria's real Exchange Rate. SSRN Library

Pattichis, C., Kanaan., M. (2004). The Balassa-Samuelson Hypothesis and Oil Price Shocks in a Small Open Economy: Evidence from Cyprus. Open economies review,15,45-56..

Salehi-Isfahani, D., 1989. Oil Exports, Real Exchange Rate Appreciation, and Demand for Imports in Nigeria. Economic Development and Cultural Change,37,495-512.

Samuelson,P.,1964. Theoretical Notes and Trade Problems. Review of Economic Statistics. Vol. 46. P. 145–154.

Spatafora, N., Stavrev, E.,(2003). The Equilibrium Real Exchange Rate in a Commodity Exporting Country: The Case of Russia, In IMF working Paper03/93.

Suseeva, N.,(2010). The Real Exchange Rate of an Oil Exporting Country: The Case of Russia,In.Paris: Erasmus Mundus

Tsen, W. H.,(2011). The real exchange rate determination: An empirical investigation, International Review of Economics and Finance20, 800-811.

EFFECTS OF FLAT PICTURES ON STUDENTS' ACADEMIC ACHIEVEMENT IN ENGLISH LANGUAGE IN SECONDARY SCHOOLS IN ENUGU EDUCATION ZONE

BY

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Abstract

The continuous deteriorating trend of students' achievement in English language is a source of concern to all facets of the society. Also the instructional materials used by teachers in teaching English Language in the Nigerian secondary schools had been implicated. In view of the above problems, the study was designed to investigate the effects of flat pictures on students' academic achievement in English Language in secondary schools in Enugu Education zone. The researcher adopted a non-equivalent quasi-experimental design. The population for the study was all the 4,713 SS 2 students in Enugu Education zone. A sample of 240 SS 2 students was drawn from the three secondary schools used; one intact class was then sampled using simple random sampling technique. One intact class was assigned to the Experimental Group I, and the other intact class was assigned to the group II taught without flat pictures. The two groups were taught using flat pictures and without flat pictures. One research question and one hypothesis guided the study. Relevant data for the study were collected using English Language Achievement Test (ELAT). The instrument was face validated. The reliability of the instrument was determined using Kuder Richardson 20 which was 0.86. Research question was answered using mean and standard deviations while hypothesis was tested using Analysis of Covariance (ANCOVA). It was found that the use of flat pictures in teaching English language in secondary schools in Enugu Education zone was found to be better than teaching without flat pictures. Teaching without flat pictures had no significant influence on students' achievement in English language in secondary schools. Based on the findings the researcher recommended among others that flat pictures be adopted for use and no teacher should teach English language without the use of flat pictures.

Introduction

English language deals with facts and words associated with reasoning which is essential for technological growth. Sparikie (2010) stated that English language is a subject of study which helps in realizing the nation's educational objectives and technological aspirations. Ullyelle (2009) considered English language as a subject that encroaches into all aspects of human endeavors and further described it as the life wire in the study of various disciplines. English language is a system of communication in speech and writing. According to Anukam (2010) English language is the study and understanding of the science of language which includes the study of nature and importance of language as a vehicle of communicationof interpersonal and intergroup relations and maintenance and transfer of culture and civilization. It also involves the study and understanding of language and the problems militating against the effective learning of language. English language is a vehicle or tool of communication. It is man's most basic tool without which it would be difficult for man and woman to live together, to think, to act and share ideas together Anukam, (2010). English language makes it possible for man to engage in social conversation, to transfer ideas, thoughts and feelings through mass communication media, to develop social and linguistic units or communities. English language is the language of Britain, North America, Australia and some other countries. In other words, it is the official language of Britain, United States of America (USA) and most of the wealth countries.

Learning English is important; consequently many countries include English language as a second language in their school syllabus and children start learning it at a young age as a result of the following importance enumerated by Frank, (2012).

English language is the language of science, of aviation, computers, diplomacy and tourism. Knowing English language increases your chances of getting a good job in a multinational company within your home country or of finding workabroad.

English language is the most commonly spoken language in the world. One out of five people can speak or at least understand English language.

Flat pictures are powerful instructional materials that we can use to compress and represent information in a more vivid form to our learners thereby enhancing students' achievement inEnglish language. The two dimensional instructional materials are flat pictures having only length and breadth. Eya (2005) stated that flat pictures represent all the alternative channels of communication which we can use to compress and represent information in a more vivid form to our learners. Offorma (2001) saw it as materials that facilitate teaching and activities and consequently the attainment of the lesson objectives. Flat pictures include illustrations in books, magazines, newspapers, photographs and study print. Flat pictures, therefore, are those materials that appeal to the sense of the learner thereby facilitating learning.

The importance of flat pictures cannot be over emphasized; this may be that flat pictures provide facilitating challenges to students' achievement and retention in English language. Okorie (2002) expressed that they are the materials and devices used in learning situations to supplement the written or spoken work in the transmission of knowledge in English language. Mcluhan and Flore (2009) described the flat pictures as the various means through which messages can be produced, stored, transmitted, retrieved, amplified, reproduced/channeled or carried between the source and the receiver. Flat pictures help to maximize learning on the part of the students by appealing to a variety of senses and increase their academic achievements especially in

English language.

According to Blair (2009) to achieve is to accomplish, gain, reach by effort or do something successfully with an effort and skill. Love (2013) asserted that academic achievement concerns mental health. He explained that mental health has its basis, physical health and intellectual skills, which lead to satisfactory means of adjustment, social sensitivity and adequate self concept.

The outcomes of the Nigeria secondary school student examination in English language have been consistently poor. Despite the position of English language in the National Policy on Education as a core subject, the students' performance in the subject have remained very low (Ellington, 2009). In May/June 2015, Senior Secondary School certificate Examination in Enugu Education zone student continued to record low retention which may have resulted to poor academic achievement in the subject (WAEC, 2017). English language teachers are, therefore, concerned with the problem of how to improve the academic achievement of students in the subject hence there is need for this study.

The study investigated the effects of flat pictures on senior secondary school students' achievement in English language in senior secondary schools in Enugu Education zone of Enugu State.

What is the difference in the mean achievement scores of students taught English language using flat pictures and those taught without flat pictures?

There is no significant difference in the mean achievement scores of students taught English language using flat pictures and those taught without flat pictures.

Method

The design for this study is quasi-experimental design. The design is specially a pretest-post-test, non equivalent control group design. The choice of this design agreed with Campbell and Cook (2014), Best and Kahn (2014) and Abimbade (2009) in Okafor (2000) who observed that this design was often used in classroom experiments when experimental and non-control groups are naturally assembled groups, such as intact classes, which may be similar in the level of education.

This study was carried out in Enugu Education zone of Enugu State. Enugu Education zone to the North is bounded by the Udi L.G.A, South by Nkanu West L.G.A, East by the Igbo Etiti L.G.A and West by Enugu South L.G.A. It also has rural areas and semi-urban areas. The urban and semi-urban areas are covered mainly by civil and public servants and business men. The rural areas are mainly occupied by Enugu South indigenous and few non-indigenous persons - Some of them are farmers, some are pretty traders and some are civil servants. The choice of this area is because of logistical convenience and the researcher saw the zone as thickly populated zone in terms of SS2 students among all the six zones in Enugu State.

The populations considered of all the 31 secondary schools in Enugu Education zone. The population was 4,713. (PPSMB, 2017)

The sample size for the study is 360 SS 2 students. Stratified simple random sampling technique was used to divide Enugu Education zone into Enugu East, Enugu North and Isi-uzo Local Government Areas.

English language Achievement Test (ELAT) developed by the researcher was used for data collection. The number of periods that essentially cover a particular unit and the objectives of the English language contents

guided the development of ELAT items. This implies that where more time is required to teach a unit, more items were drawn from such a unit. ELAT consisted of 50 objective test items.

The choice of objective test items was to allow the researcher to cover more topic areas. Forty objectives test items were at the lower cognitive level (that is knowledge and comprehension) while 10 items were in higher thinking process (that is application). The instrument was used for pre test, post test and retention tests but the serial numbers of the items were rearranged during post testing of the achievement and retention testing of the students. The items for the ELAT were written to reflect the specification in test blue print prepared. The scoring guide for the ELAT was prepared in order to guide the teachers that scored the ELAT.

The instrument went through both face and content validity.

The items of ELAT and experimental packages were subjected to face validation by one expert in English language education, one expert in educational technology and one expert in Measurement and Evaluation. The instrument and experimental packages were validated in terms of clarity, appropriateness of the language used and also if any item is ambiguous. Their corrections and comments were useful in modifying the items of the tests and experimental packages. The surviving items, therefore, possessed adequate face validity of the instrument for data collection. The English Achievement Test after scoring guide was also "face" validated by the experts that validated the same English language Achievement Test.

One expert in English language, one expert in measurement and evaluation and one expert in educational technology using the test blue print that was developed by the researcher subjected the ELAT items to content validation. The table of specification was validated by the experts to determine how effective it is in selecting questions considering the percentage allocation of the various levels of contents. Fifty questions survived out of 57 questions after validation and these were reflected on the table. The items measured objectives in the cognitive and psychomotor domains of Bloom's taxonomy of educational objectives. The weight of the objective levels were based on the proportion of low and high order levels of cognitive and psychomotor domains as suggested by Margaret (2015) in the same units of study in the senior secondary school Biology curriculum. This is because it was observed that students do not normally exceed the comprehension level by the timethey complete their post primary school programme in some science subjects (Sturoges, 2013).

The reliability of ELAT was determined using test re-test method. The choice is because it is most suitable and appropriate in determining the correlation between sets of scores from two administration of the test. To determine the reliability of ELAT for the study, the ELAT was trial tested in community secondary school Olo in Ezeagu LGA of Enugu State. The ELATwas re-administered to the students after two weeks and data collected. Then the two sets of scores from first and second administration of ELAT were correlated using Pearson Product moment correlation coefficient (?) and is 0.86. The measure of internal consistency was determined using Kuder Richardson 20. (K-20). The value of Kuder Richardson value was 0.704. The choice of Kuder Richardson's 20 was the most appropriate because the i tems were dichotomously scored.

Three English Language teacher (research Assistants) from each of the sampled schools received briefing for a period of one week from the researchers on the use of flat pictures and teaching without flat pictures in teaching English Language respectively. Prior to the treatment, the English language teachers /

research Assistants in the sampled schools who received briefing on how to use the research instrument administered the ELAT respectively to their SS2 students. At the end of the testing, the question papers and the answer script were collected from each student who took the pre test.

There were some extraneous or confounding variable that the researcher felt could constitute potential threats to the validity, reliability and generalization of the result s of the study. Such variable included inter-group variable, teacher variables and Hawthorne effect.

ELAT was administered as pretest on the first week of treatment by research assistants. Scores of the students on the pretest were recorded and kept for the use after the experiment. The post test data were also generated after re-administration of ELAT to the students on the last week of treatment. For each for the groups, data for pretests and post tests were recorded separately. The test item on ELAT was scored two marks each to give a maximum mark of one hundred percent.

Mean (*x)* and standard deviation were used in answering the research questions. Mean was used because it is the most appropriate statistical tool to use for such situation because such takes all measurement (observations) into consideration. Analysis on covariance was used to test the hypothesis. Analysis of covariance (ANCOVA) was used because intact classes were used and as such corrected the errors of initial differences in the ability levels among the students used in the study.

Rejected the null hypothesis (Ho) if the F-calculated is greater than F-table at 0.05, then fall to reject the null hypothesis at 0.05 if F-calculated is less than F-table.

Results

There was significant difference in the mean achievement scores of students taught English language with flat pictures and those taught flat pictures in favour of those taught with flat pictures.

Research question

What is the difference in the mean achievement scores of students taught English Language using flat pictures and those taught without flat pictures?

The data for answering research question one is presented on Table 1 below.

Table 1: Mean achievement scores and standard deviation of students taught English Language using flat pictures and those taught without flat pictures.

	Mean (X)		Standard Deviation		
Groups	Pretest	Posttest	Pretest	Posttest	**N**
Experimental 2 (taught with Flat pictures)	22.34	54.712.60	8.83	115	
Experimental Group 3 (taught without flat Pictures)	22.41	23.712.81	10.26	125	
Total					240

Table *1* above showed that the experimental group taught English Language using flat pictures, obtained mean achievement scores of 22.34 and 54.71 in pretest and post test respectively. The group equally had standard deviation of 2.60 and 8.83 in pretest and post test respectively. Alternatively, the Group taught English Language without using flat pictures got mean achievement scores of 22.41 and 23.71 in pretest and post test respectively. The group also had standard deviation of 2.81 and 10.26 in pretest and post test respectively. Table 1 above showed that the experimental Group taught English Language using flat pictures achieved higher than those taught English Language without using flat pictures in posttest.

Hypothesis

There is no significant difference in the mean achievement scores ofstudents taught English language using flat pictures and those taught without flat pictures.

Table 2: Analysis of Covariance ofthe mean achievement scores ofstudents taught English language using flat pictures and those taught without flat pictures.

Source of Variation	Sum of Square	Df	Mean square	F-Cal	F- Table	Decision
Covariates	1073.496	1	1073.496	11.704		
Main effect	5130.675	2	2565.337	55.940		
Instructional Material Flat pictures and without flat pictures	60654.952	1	60654.952	661.323	3.00	S
Error	26322.933	287	91.718			
Residual	71708.063	4	17927.016	195.458		
Total	164890.12	295	82240.519			

S=Significance
NS= Not Significance

In the Table 2 above the result of the Analysis of covariance showed that the F calculated (661.323) is greater than the F table (3.00) at 2 degree of freedom.Consequently, the null hypothesis of no significant difference in the mean achievement scores of SS 2 students taught English language using flat pictures and those taught withoutflat pictures was rejected at 0.05 levels of significance. This means that there was a significant difference in the mean achievement scores of student taught English language with flat pictures and those taught without in favour of flat pictures.

Conclusions

This conclusion was made based on the findings of the study.

It was concluded that the use of flat pictures in teaching English language in secondary school was found to be better than teaching without flat pictures in students' achievement.

Recommendations

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

The serving teachers of English language in secondary school should adopt the use of flat pictures in teaching English language lessons-

In view of the fact that most of the serving teachers may not be familiar with the construction and use of flat pictures, courses in teacher education and in-serving programmes should be made to emphasize the need to teach the subject using instructional materials that are characterized by flat pictures among other things.

References

Anukam, L. L. (2001).*Assessment of learning achievement.* Abuja: Federal Ministry of Education.

Blair, G. M. (2009) *Educational psychology,* NewYork Macmillian

Ellington, I. T. (2009).*Using games and simulations in the classroom.*London: KoganPage Limited.

Eya, P. E. (2005).*Instructional Material Production in a Challenging Education system in curriculum and Media Technology Research.* A journal of CUDIMAC, 1(1) 144.

Frank, H. W. (2012).*The King's English Oxford.*Ganendon press

Love, B. S. (2013) *Innovation in teaching learning process.* India: Vikal publishing House.

Margaret, J. S. (2015). *Introduction to measurement in physical education and Exercise sciences.*(2nd Ed). Missouri: Mosboy College Publishers

Mcluhan, M & Flore O, (2009): *Mediums the message.*New York: Bantham Books Inc.

Offorma, G. C. (2001). *Curriculum implementation and Instruction.*Onitsha: Uni-world Educational PublishersLtd.

Okafor, G. (2000).*Effect of note-taking patterns on students' academic achievement, interest and retention in geography,* published Thesis science and computer department, University of Nigeria Nsukka.

Okorie, J. U. (2002). *Fundamentals of teaching practice*. Enugu: Fourth Dimension Publishing Company Ltd.

Sparikie, G. M. (2010). *English in use,* New Delhi: Nelson, Thomas Press (India) Limited.

Sturoges, P. T. (2013). *Effects of instructional and forms of information feedback on retention of meaningful materials.* Journal of Education Psychology 63(2) 77-90

Ullyelle, U. A. (2009).*Historical view of the English Language*. Ibadan: Potan Press.

West African Examination Council (2017).Chief Examiners Report in English Language.

EFFECTS OF INTEGRATED MODEL OF TEACHING ON ACHIEVEMENT AND RETENTION OF SECONDARY SCHOOL STUDENTS IN BIOLOGY IN ENUGU STATE.

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Abstract
This study which determined the effects of integrated model of teaching on achievement and retention of secondary school students in biology in Enugu state was guided by four research questions and four null hypotheses. The effect of gender on achievement and retention was also determined. Quasi-experimental non-equivalent research design was adopted. Four schools from Agbani Education zone, with a total of 351 SS2 students were involved in the study. One biology teacher from each sample schools was used as a subject for the study. The teachers were trained by the researcher on how to carry out the teaching and administration of the test. In each school, two groups namely experimental and control groups were selected for the study. Instrument for data collection Biology Teacher Made Achievement Test (*BTMAT) was developed and adopted by the researchers. The reliability coefficient of the instrument was estimated using Kuder-Richardson (K-D) formula 20, while validation was done by three specialists two from science education and one from measurement and evaluation, all from science and vocational education department, Godfrey Okoye University, Enugu. Analysis of covariance (ANCOVA) at o.o5 probability level was used to test the null hypotheses while mean (x) and standard deviation were used to answer the research questions. The results are that there is a significant difference between the experimental groups and their counterparts in control groups. The study revealed that gender is not a significant factor on students' achievement in biology. On the other hand, the finding revealed that gender is not a significant factor in biology retention though females had higher mean (x) retention than males and experimental groups higher than the control groups. The interactive effect of gender and teaching method were not significantly different. Some recommendations made include that the use of integrated model of teaching should be given greater emphasis in pre-service teachers biology curriculum so as to popularize its use; serving teachers should be sponsored to attend in-service training, orientations and refresher courses to update their knowledge on some innovative methods and become conversant with their use especially the integrated method of teaching biology.*

Introduction

Science is a dynamic human activity concerned with understanding the workings of the world. This understanding helps man to know more about the universe. Without the application of science, it would have been difficult for man to explore the other planets of the universe. Science comprises the basic disciplines such as Physics, Chemistry, Mathematics and Biology. Effective science education for technological development of a nation is achieved through classroom instruction, where the future scientists and technologists are equipped with science process skills. Thus, for a country like Nigeria to be a giant in science and technology theory and practice should be matched in the classroom (Baike, 2016). This is why emphasis has been laid on science subjects unlike Art subjects which enjoyedstudents' preference in the past. Nigeria has reflected this recognition in the National Policy on Education (NPE)(2013) where it stipulates that the study of science at all levels of education. Aniodo (2011) opined that in the world of today, science and technology have become a dominant cultural factor and any nation that is not alive to this fact, is either dead or dying. The author's view was that man requires knowing and practicing enough science for self-survival and preservation.

Unfortunately, in spite of the efforts of governments and advantages of science in technological growth and development, the current status of the secondary school teaching and learning have remained poor while the academic achievement has been low in science education in public examinations (Ude, 2011;Okafor, 2013;Akubuilo, 2014). For instance, Okafor (2002) stated that science at all levels in the country is in a deplorable condition despite the fact that science exposes one a way of thinking and reasoning to the extent that one develops scientific attitude. To achieve the laudable objectives of science education stated in NPE (2013) and enhance the Nigeria's technological advancement, all science subjects have important contributions to make.

Among such science subjects is biology – a core science subject offered by a large number of students in secondary schools. Accordingly, Ugwu (2015) explain that biology is concerned with the study of life of organisms, their behaviours, appearance, habits, distributions, origins and what they do. Biology principles are applied extensively in the field of agriculture, pharmaceutical industries as well as field of medicine. The knowledge of biology also helps to know and understand sex determination and linkage, natural birth control and crime detection (Ezugwu, Chukwu&Arinze, 2012). Based on the above and other importance of biology therefore, it follows that a sound theoretical and practical knowledge and understanding of biological concepts and principles are necessary for the well-being and technological advancement of developing countries like Nigeria (Akubuilo, 2014). Biology curriculum contains a lot of abstract concepts like ecology, digestive system, nervous system, photosynthesis, osmoregulation, genetics, sense organs and their structures, food nutrients to mention but a few (Ude, 2018). The foundation of this knowledge is laid at secondary school level hence the West African Examination Council syllabus of 2004 to 2008 contains the aims and objectives of biology education to remind/re-direct the attention of the biology teachers in the secondary schools about the set goals. To achieve the goals of biology at the secondary level, biologists and biology teacher educators have concerned themselves with continuous search for better and effective methods, approach, strategies and models of teaching and learning that can make the study of biology more meaningful to the learner and thus, enhance high achievement and retention (Ugwu, 2015). Consequently, one expects high achievement in

the subject at senior secondary school certificate examination (SSCE) in Nigeria due to its high potential applicability for meeting daily needs and solving problems of life and living.

However, contrary to the above, evidence in literature over the years still indicates low academic achievement of the students in the subject (Akubuilo, 2014;Ude, 2011;Ezeugwu, 2012). Factors responsible for poor achievement and retention in biology include ineffective teaching methods employed by biology teachers (Brown, 2015;Akubuilo, 2014), resource materials (Ude, 2011),negative attitudes of students' interest in science (Onyia, 2010).West African Examination Council (WAEC) Chief Examiner's report (2005-2010) states that the persistent poor achievement of students in biology at senior schools certificate examination leaves one in doubt about the effectiveness of instructional materials and instructional delivery approaches popularly used by the biology teachers for the teaching and learning of biology. Statistics from the 2017 West African Examination Council revealed that achievement in biology in the May/June examinations has been on the decline. Of the total number of students who sat for the examination in the year 2010, the total percentage of candidates who attained credit level and above is 26% while 53.13% failed out rightly. Also, statistics from the National Examination Council (NECO) indicate that the percentage failure in biology for years 2008, 2009 and 2010 were 55.80%, 57.60% and 55.20% respectively. This trend, if not arrested, will spell doom for the scientific and technological development of the nation. The poor achievement of students in biology in external examination is also linked to the use of poor method in teaching biology concepts in senior secondary schools.

In view of the noted development in students' trends of poor performance in biology, there is need to try some other teaching methods. Considering the need to improve on the achievement of students in biology, it becomes necessary to explore two modes of presenting biology concepts in senior secondary schools which may facilitate or enhance achievement. There is need to depart from the traditional method of teaching (Nworgu, 2016). The increasing awareness in recent years of the importance of learners' centeredness in teaching and learning situation has attracted attention to the understanding of how learners learn and how to help them learn. Teaching students' biology theory separately may be viewed as traditional approach because the attention is on what to teach rather than on the students to be taught. In view of the above, it becomes necessary to investigate the effectiveness of the integrated model of teaching on biology students' achievement and retention.

The integrated model is an innovative instruction model of teaching that entails combination of theory and practical instructions at the same time (Ezemoka, 2016). The integrated model is a purpose-driven instructional model that supports students as they work to develop the ability to learn independently using various thinking skills. The model supports students` learning across the academic subject areas while also empowering them to become independent learners.

The efficacy of practical approach to biology/ science instruction and that of integration of theory and practical on students' achievement and mastery of units of instruction is yet to be empirically determined, hence the need to investigate the effect of integrated model of teaching on achievement and retention of secondary school students in biology in Enugu State.

Another independent variable of interest in this study is retention. Retention is an act of remembering things learnt or the ability to store information for a long time. Ezugwu (2018) stated that facts, principles and concepts are

retained for a longer period if senses, examples visual media, feeling etc. are used to put them across to students.

Gender according to Okeke (2011) is a socio-cultural construct of ascribing characters and roles to sex such as males and females. The prevalent effects of professions like Medicine, Engineering, Architecture etc. are regarded as men's while Nursing, Typing, Catering etc. as women's. The stereotyping bias that science is a male enterprise is of great concern in the field of science education and has resulted to a controversial issue and conflicting reports from different researchers. The question is: would the integrated model of teaching biology bring about better achievement and retention in the subject at the secondary school

Over the years, the academic achievement of biology students at secondary school level has remained poor. Many studies carried out so far attributed the poor achievement to the ineffective teaching methods adopted by the teachers of biology in Nigerian secondary schools. Teaching methods such as lectures, discussions etc. are used mostly in biology teaching. These methods are non-inspiring and largely ineffective. Because they are largely ineffective, didactic, dull and non-result oriented, many researchers in science education do not recommend their use in the senior secondary school science teaching(Ude 2011, Ezugwu, 2012). Consequently, there is a need for a paradigm shift from the traditional methods to innovative method, approaches and strategies which will bring the teaching of theory and practical together in secondary school biology. The question then is: would the integrated model of teaching biology bring about better achievement and retention in the subject at the secondary school level? Hence, the need for the present study.

The main purpose of the study is to determine the effect of integrated model of teaching on achievement and retention of secondary school students in biology in Enugu State. Specifically, it was to determine:-

1. The effect of integrated model of teaching on academic achievement of biology students.
2. The effect of integrated model of teaching on male and female biology students.
3. The effect of integrated model of teaching on retention of biology students.
4. The effect of integrated model of teaching on retention of male and female biology students.

The study concentrated on the effect of integrated model of teaching biology on achievement and retention in Enugu State senior secondary school. The students in senior secondary Two (SSII) biology classes formed the study subject. The researchers decided to use SSII biology students because the SSIII are now in their final year class and so are not allowed to be used due to the PPSMB regulation that examination classes should not be used for research work. In terms of content scope, the researcher selected the following topics:

1. Food - classification, function, deficiency symptoms; Food Test – on carbohydrates, proteins and lipid.
2. Cell and its environments – diffusion, osmosis.

The above content areas were chosen because they fall within the SSII syllabus.

The following research questions guided the study:

1. What are the mean achievement scores of the experimental and control groups?
2. What are the mean achievement scores of male and female students of the two groups?

3. What are the mean retention scores of experimental and control group?
4. What are the mean retention scores of control group?

The study was tested by the following null hypotheses at 0.05 probability level.

1. There is no significant difference between the mean (x) achievement scores of experimental and control groups.
2. There is no significant difference between the mean (x) achievement scores of male and female students of the two groups.
3. There is no significant difference between the mean (x) retention scores of biology students in experimental group.
4. There is no significant difference between the mean (x) retention scores of biology students in control group.

Method

The design of this study is quasi-experimental while the specific design was by pre-test – post-test non-equivalent control groups design because the research subjects were not randomly selected rather intact classes were used.

The area of the study was Agbani Education Zone of Enugu State. The education zone consist of three local government areas namely Nkanu-West with a total of eleven (11) secondary schools, Enugu-South with a total of fifteen (5) secondary schools and Nkanu-East with a total of seventeen (7) secondary schools bringing the total number of secondary schools in the zone to 43. The study was carried out in the zone because the schools in the zone have the necessary attributes as urban and rural location as well as co-educational schools needed for the study. The population of the study comprised of all the senior secondary class two (SS2) students who are offering biology in all the secondary schools in Agbani Education Zone. The total population of SS2 biology students in Agbani Education Zone is two thousand, nine hundred and thirteen (2,913) (PPSMB,2019). Population of SS2 students in Enugu-South is one thousand, five hundred and fifty eight (1,558), six hundred and ninety three (693) in Nkanu-East and six hundred and sixty two (662) in Nkanu-West of Source (PPSMP Enugu, 2019). SSII were chosen because they are not examination class and the topics were selected from their scheme of work.Agbani Education Zone has sixteen single-sex secondary schools. Out of the sixteen schools, then four (4) schools (two boys and two girls schools) were drawn for the study using random sampling technique. The total number of students sampled by balloting are (351) 171 and 180 respectively for the boys and girls or 176 and 175 (351) for experimental and control groups respectively. Proportionate stratified random samplings are used here because it ensures better approximation of the population and minimizes sample error.

Stratified random sampling technique was used to sample the four (4) schools from the study area which has 43 schools. Sex and school types form the strata.

The instrument used for data collection was the Biology Achievement Test (BAT) developed by the researchers. The test items are of the same format in arrangement, plan and design with that of Senior Secondary School Certificate Examination Questions e.g. WAEC or NECO. This is because the researchers were of the opinion that the students at this stage should be exposed to such level of questions since they would soon enter their final year class and that some of them do register for SSCE while in SSII. The instrument was designed to explore the cognitive, affective and psychomotor skills of the learners in biology.

The BAT consists of thirty multiple-choice questions which were designed to measure the students` achievements and retention in biology.

The same test items were used for pre-test, post-test and retention test. Their marking schemes were also be made available.The BAT was content and face validated by experts in measurement and evaluation in the department of science education. Two from ChukwuemekaOdumegwuOjukwu University, Uli, Anambra State and one from Godfrey OkoyeUniversity, Enugu State. The instrument was validated in terms of clarity of instrument, proper wordings of items and adequacy of terms in addressing the purpose and problems of the study.Test blueprint was developed by the researchers and was validated with the instruments to determine its effectiveness.

Reliability of BAT was established to be 0.76 using Kuder-Richardson formular -20 (K-R 20).

Experimental Procedure\For this study, two treatment conditions were used. These are Integrated Model of Teaching(IMT) and Separate Model of Teaching (SMT). The IMT was used on one treatment group – the experimental subjects whereas, the SMT was used for the other group – the control subjects. In terms of content basic instruction objectives and mode of evaluation, the IMT is identical to SMT. The major difference is in the instructional activities while the experimental groups were taught theory and practical simultaneously or sequentially within lesson periods, the control groups were taught at different lesson periods or in separate lesson periods.Before the on-set of the treatment, pretest was administered on students in both treatment groups. The time allowed for the test was 40 minutes, immediately after which the question papers and answer scripts were retrieved from members of both groups. The reason for retrieving the question papers was to ensure that the instrument was not lost, duplicated or memorized by the students as this would affect the result in subsequent tests (post and retention).After the pretest, the treatment was administered to the groups. The study was conducted during the normal school periods in accordance with school timetable.

At the end of the treatment that last for three (3) weeks of three (3) periods per week, the items in the instrument were re-arranged and administered to both the experimental and control groups as Post-BAT. The rearrangement/reshuffling was necessary so that the students would not recognize the instrument as the same test items.The scores obtained from the Pre-test and Post-test were analyzed using mean and standard deviation to answer the research questions respectively while Analysis of Covariance (ANCOVA) was used to test the hypotheses at 0.05 level of significance.

Results

Research Question 1: What are the mean (x) achievement scores of experimental and control groups?

Table 1:Mean Achievement Scores of Students in Biology by Method

N = 351 cases

		PRE-BAT		POST-BAT		
	N	Mean	SD	Mean	SD	Difference
Experimental Group (IMT)	15	0.64		23	1.01	8
Control Group (SMT)	16	0.81		21	0.94	5

Table 1 indicated that students taught biology withIntegrated Model of Teaching (IMT) had mean achievement score of 23 with standard deviation of 1.01 while the mean achievement score of students taught using Separatist Model of Teaching (SMT) was 21 with standard deviation of 0.94. Also the experimental group had a gain score of 8 over the control group who had a gain score of 5. Therefore students taught biology using Integrated Model of Teaching (IMT) performed better than students taught using Separatist Model of Teaching (SMT).

Research Question 2: What are the mean (x) achievement scores of male and female students of the two groups?

Table 2: Mean Achievement Scores of Male and Female Students Taught Using IMT and SMT

N = 351 cases, (Nm = 171, Nf = 180)

N	PRE-BAT		POST-BAT		
	Mean	SD	Mean	SD	Gain
MALE	15	0.97	20	0.91	5
FEMALE	16	1.12	22	0.81	6

From table 2 it is revealed that the male students had mean score of 20 with standard deviation of 0.91 while the female students mean achievement score is 22 with a standard deviation of 0.81. The gains for male and female students are 5 and 6 respectively. The females gained more than the males. The females performed better when taught biology with Integrated Model of Teaching (IMT) than the male students though the females had always performed better than the males in biology considering the Pre-BAT score.

Research Question 3: What are the mean (x) retention scores of biology students in the experimental and control group?

Table 3: Retention Scores of Students Taught Using IMT and SMT

N = 351 cases.

N	PRE-BAT		RET-BAT		
	Mean	SD	Mean	SD	Gain
Experimental Group (IMT)	15	0.64	20	1.07	5
Control Group (SMT)	16	0.81	19	0.95	3

From table 3 it is indicated that for the students taught using Integrated Model of Teaching (IMT) had mean retention score of 20 with standard deviation of 1.07 while the students taught using Separatist Model of Teaching (SMT) had mean achievement score of 19 with a standard deviation of 0.95 The gains for students taught using Integrated Model of Teaching (IMT) and Separatist Model of Teaching (SMT) are 5 and 3 respectively. The students taught using Integrated Model of Teaching (IMT) gained more than the students taught using Separatist Model of Teaching (SMT) and therefore have a better retention rate.

Research Question 4: What are the mean (x) retention scores of male and female biology students in the two groups?

Table 4: Mean Retention Scores of Male and Female Students Taught Using IMT and SMT

N = 351 cases, (Nm = 171, Nf = 180)

	PRE-BAT		POST-BAT		
	Mean	**Sd**	**Mean**	**Sd**	**Gain**
MALE	15	0.97	18	1.10	3
FEMALE	16	1.12	20	1.06	4

Table 4 indicates that the females have better retention scores in biology than the males in the pre-test with differences of 4 and 3 respectively for the experimental group (IMT) and the control group (SMT). It also revealed that female students performed better than the male students in biology differences in teaching methods notwithstanding.

Hypotheses 1:
$H0_1$: There is no significant difference between the mean (x) achievement scores of the groups – experimental and control.

Table 5:ANCOVA RESULT

Source of Variation	Type of III Sum of Square	Df	Mean Square	F	Sig	Decision
Covariates	8936.439	3	2978.813	13.739	.000	S
Main Effects	2971.190	1	2971.190	24.119	.000	S
Achievement	7.492 1	7.4920.582	.240	NS		
Gender	11.439	1	1.439 0.381	.072	NS	
Method	3363.340		3363.34039.592	.000	S	
Error	87464.172		39.532			
Total	75496.042	351				

From table 5 above, it is observed that the significant (F) (39.592) for method is .000. This value is less than .05 probability level set for the study. Hence, the null hypothesis is rejected. This implies that the method influenced the students' achievement in biology. This led to the conclusion that there is significant difference between the mean (x) achievement scores of the groups – experimental and control subjects in Pre-Biology Teacher Made Achievement Test (Pre-BTMAT) and Post-Biology Teacher Made Achievement Test (Post-BTMAT).

Hypotheses 2:

$H0_2$: There is no significant difference between the mean (x) achievement scores of males and females in the two groups.

From table 5 it shows that the significance of "F" (0.381) for gender is 0.072. This value is greater than .05 probability level set for the study. Hence, the null hypothesis is not rejected. It was therefore concluded that there is no significant difference between the

$H0_3$: There is no significant difference between the mean (x) achievement scores of the groups – experimental and contro

Table 6: Mean (x) achievement scores of male and female taught using Integrated Model of Teaching (IMT) and those taught using Separatist Model of Teaching

Source of Variation	Type of III Sum of Square	Df	Mean Square	F	Sig	Decision
Covariates	5908.413	3	1969.471	13.739	.000	S
Main Effects	3179.049	1	3179.049	24.119	.000	S
Achievement	5.834	1	5.834	0.582	.109	NS
Gender	9.7827	1	9.7827	0.381	.613	NS
Ret	6372.227		6372.227	39.592	.000	S
Error	43671.681		42.672			
Total	28356.012	351				

From table 6 it shows that the significance of (f) (39.592) for Retention is .000. This value is less than .05 probability level set for the study. Here, the null hypothesis is rejected. It was therefore concluded that there is significant difference between the mean (x) achievement scores of the groups – experimental and control subjects in Pre-Biology Achievement Test (Pre-BAT) and Post-Biology Teacher Made Achievement Test (Post-BAT).

Hypotheses4:

$H0_4$: There is no significant difference between the mean (x) retention scores of male and female students taught biology in the two groups.

From table 6 it shows that the significance of "f" (0.381) for gender is .613. This value is greater than .05 probability level set for the study. Hence, the null hypothesis is not rejected. It was therefore concluded that there is no significant difference between the mean (x) achievement scores of male and female students taught

biology using Integrated Model of Teaching (IMT) and those taught using Separatist Model of Teaching (SMT).

Discussions

The main focus of this study is to find out the effect of integrated model of teaching on achievement and retention of secondary school students in biology in Enugu state.The.study revealed that students taught biology using Integrated Model of Teaching (IMT) performed better than students taught using Separatist Model of Teaching (SMT) and there is significant difference between the mean (x) achievement scores of the groups – experimental and control subjects in Pre-biology Achievement Test (Pre-BAT) and Post-Biology Achievement Test (Post-BAT). This is in line with Nwago(2012) who said that students taught using guided discovery and expository method perform and achieve better than those with lecture method.

Findings also show that the females performed better when taught biology with Integrated Model of Teaching (IMT) than the male students. There is no significant difference in the mean (x) achievement scores of male and female students taught using Integrated Model of Teaching (IMT). The finding is not surprising as female students are always more interested in biology than the male students. Most male students offer biology as a requirement and not necessarily as of interest especially for males wanting to go into the health profession. With the integrated teaching model in biology, the female students have more edge with their interest and motivation. However, the males could perform equally well. Both genders should be encouraged to offer the subject. The students taught using Integrated Model of Teaching (IMT) have a better retention rate than the students taught using Separatist Model of Teaching (SMT). There is significant difference between the mean (x) achievement scores of the groups – experimental and control subjects in Pre-biology Achievement Test (Pre-BAT) and Post- Biolog Achievement Test (Post-BAT). Female students taught using Integrated Model of Teaching (IMT) have better retention scores in biology than the male students, however, there is no significant difference between the mean retention scores of male and female students taught biology using Integrated Model of Teaching (IMT) and those taught using Separatist Model of Teaching (SMT) in Pre-BAT and Post-BAT. This affirms the earlier finding by Eze C. U. (2013) who said that female students taught using target task method achieve better than males in Chemistry.

Conclusion and recommendations

It was therefore recommended among others that:-

1. Teachers in sciences especially biology should adopt Integrated Model of Teaching (IMT) in secondary schools in the state. It allows for better retention as well as enhances students' achievements.
2. School administrators should ensure the updating of teachers' knowledge especially in practical lessons for all science subjects through seminars and workshops.

References

Akubuilo, (2014). Teacher's demographic factors as predicate of improvisation and utilization of instructional materials research. *A journal of CUDIMAC faculty of education, University of Nigeria, Nsukka.*

Aniodoh, H. C. O. (2011). Modern aspects of integrated science education, *uwanienugu hacoform educational books.*

Baikie, A. (2016). Enriching science, technology and mathematics education in Nigeria: problems and prospects, *41st annual conference proceeding science teachers association of Nigeria 3 – 8.*

Ezemoka, J. A. (2016). Effect of expository and laboratory methods on students' achievement in biology. A case study of Federal Government College, Enugu *unpublished M.Sc dissertation.*

Ezugwu, E. N. (2012). Effects of laboratory and expository methods of teaching difficult concepts on students' achievement in senior secondary school biology in Enugu State. *Unpublished M.Sc dissertation ESUT.*

Federal Republic of Nigeria (2007). 9 – years basic education curriculum. *Basic science for junior secondary 1 – 3.*

NERDC, (2009).Workshop on difficult concepts biology group report. Nigeria Educational Research and Development Council, Lagos.

Nwagbo, C. (2012). Effects of guided discovery and expository teaching method on attitude towards biology students of different levels of scientific literacy – Journal of science teachers association of Nigeria. 34 (1) (8) (2) 20.

Nworgu, B. G. (2016). Educational research, basic issues and methodology, *22nd and enlarged edition, University Trust Publisher, Nsukka, Enugu.*

Okafor P. N. (2000). Laboratory resources and utilization as correlate chemistry students learning outcomes, Science Teachers Association of Nigeria. *41st Annual Conference Proceedings 169 – 173.*

Okeke E. A. C. (2011). Towards gender equity in the 21st century.In C. V. Nnaka and M. C. Anaekwe (eds), *towards gender equality in Nigeria in the 21st century, Enugu: Podik.*

Ude, V. C. (2011). Relationship between academic self-concept, worldview and misconceptions in photosynthesis and senior secondary students' achievement in biology in Enugu Urban, Enugu State, Nigeria. *Unpublished Ph. D. Thesis, Enugu State University of Science and Technology (ESUT)Enugu.*

Ude, V. C. (2018). Promoting students' engagement in biology laboratory through active learning. Emerging issues in science and vocational education.*Department of Science and Vocational Education, Godfrey Okoye University, Enugu. 1 (42 – 48).*

CHALLENGES AND PROSPECTSOF TEACHING BIOLOGY WITH NEW TECHNOLOGIES IN NIGERIA

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Abstract

The advancement of technology has affected the former ways teachers teaches because they now integrate different technological tools like computers, internet, power points, white boards into the educational system. Students can learn any biology topic using internet without having direct contact with the teachers. However with the new technology teacher can give feedback to the learners. Therefore, this paperanalyses the need for technology in educational system. This new technologies are specifically being used to perform many tasks in various areas of life.In education, technology precisely the computers and internets are used to perform such tasks like drawing of biology diagrams, drawing of charts, teaching, teleconferencing keeping records of students, admission records, attendance and leave records, fee collection, examination records for students as well as uploading of students results. Notwithstandingthe notable things technology can offer in life, its application, particularly in education in Nigeria is slim because of their inadequacy in the educational system.Its narrow usage has been attributed to few challenges as pointed out in this paper to be: lack computers and its accessories, lack of constant power supply, low internet connectivity, poor training and professional development, and lack of confident in skills and knowledge. The paper further outlined the prospects of teaching with technology in Nigeria. Some recommendations were made on how to improve the application of new technologies in teaching and learning of biology.

Key words: Teaching, Biology, Technologies, challenges and prospects.

Introduction

In today's society, individuals and organizations are confronted with an ever growing load and diversity of information and content with increasing demands for knowledge and skills. Every sector of theeconomy in the society today needs new technology and itsknowledge; however the adoption of new technology will facilitates rapid growth and development of any sector including the educational sector. Specifically the adoption of new technology in the teaching and learning of biology will facilitates to meeting demands of the global educational standard. It will also help in the making ofbiology to be real and not abstractas been presumed by some learners.

Biology is concerned with the interrelationship between the living organisms and their environment. In all sphere of human activity, biology plays paramount roles. It is indispensable in the field of medicine,

agriculture, brewery and petro-chemical industries and even in geology and mining (Ogbaga, 2016). Because of the indispensability of biology, much emphasis has been placed on biology instruction; instructional material and even the content knowledge of the biology teachers. The teaching of biology with new technology will improve in ensuring that biology contents are taught and perform the necessary practical as it relates to the subjects. Biology as a science subject has been providing many important innovations through specialized disciplines such as genetics, biotechnology, molecular biology, micro biology and biochemistry. However to achieve this innovations new technology is required to play roles in giving clear picture of what the biology subject is all about. Moreover the National Policy statement noted that biology teaching should ensure adequate laboratory and field skills, meaningful and relevant knowledge to everyday life in matters of personal and community health and Agriculture, (FRN, 2008). To ensure the full realization of these interesting objectives, the recommended instruction materials including computer and its accessories should be adequately provided to teachers and students of biology. The roles of technology in teaching of biology cannot be overstated. It is useful in testing and analyzing DNA results. New technology are useful in evolutionary biology for hypothesis testing, to verify analytical methods, to analyze interactions among evolutionary processes and to estimate evolutionary parameters. In particular, the simulation of DNA sequences with recombination in diverse evolutionary questions, such as the genome structure.Chemicalanalysis of chromosomes shows that they are composed of proteins are combined with nucleic acids which are of two kinds, deoxyribonucleic acid (DNA) and ribonucleic acids (RNA), this can be showed to the learner with the help of computer assisted instruction on new technology. New technology helps in diagram illustration of facts to learners.New technologies are also applied in the hospital by doctors and nurses to monitor the health condition of patients, some the new technonologies used in the hospitals include thermometer, microscope, radiography, scanning machine, computers for recording andstorage of patient's information.

The introduction of new technology into Nigeria educational system, knowledge has been revolutionized and the ability to collect, develop, exchange, store and manage information has been modified and increased as well. The introduction of technology into Nigeria Education system has made teaching and learning easy (Okenyi 2012). Technology has changed how education industry works. Earlier, blackboard and books were used to teach but now, it's completely changed to digital boards and smart books which can be accessed anytime and anywhere. Learning is much faster and students can gain more knowledge through internet.All information can now be found on the web which is not even in the books (Reengwe, Onehwori, Wachira, 2008).

In the past decades, teacher-training programs used to prepare teachers to perform tasks which were aligned with the traditional roles and functions of schools. Until today, the theoretical components of teacher-training programs, to a great extent as well as the school practices correspond with the "traditional model" which the nation state selects, prioritize and disseminate to students. Nowadays, many top colleges and universities are offering online programs for all national and international students due to the fact that new technology

tools such as computer, internet, information and communication technology (ICT) among others has rapidly enhanced teaching and learning of science including biology (Hughes, 2005).

The adoption of new technology and its applications to education has brought rapid development in the socio-economic sectors, political and totality in economic transformation which has eventuated in a network society organized around us. The emergence of new technology in education sector, has also imparted much on quality and quantity of teaching, learning, and research in traditional and distance education (Ameh 1991). The introduction of new technology in education system has reduced the teaching efforts and costs making learning more interesting. Projectors are used to display video and presentations for better learning and understanding. Students can easily analyze any data from biology researches with tools and software in their computer system and also, the education infrastructure is much secured than earlier. The roles of new technology in the education sector cannot be over-emphasized. Although teachers generally appreciate the benefits of new technologies, they often find smooth and effective integration and interaction of such technologies challenging (Edmer, 2012). However, it is necessary to consider some of the challenges being encountered against the smooth and effective integration of new technology in Nigeria Education System.

Challenges to the use of New Technologies in Schools

As technology is becoming increasingly important into school education, significant challenges are preventing wide-spread and effective implementation of education sector with the idea of new technology. However, despite all the things technology can accomplish in the nation's development, there are many challenges militating against its proper implementation especially in teaching and learning. These challenges can be viewed under the following headings:

1. **Lack of Constant Power:** It is a fact that power is needed to run technological devices and until power is widely available, reliable, and affordable for many African countries particularly in Nigeria, educational technology uptake will continue to be slow. About 80% of those living in rural geographical areas in Nigeria do not have easy access to electrical power. Even if people could not afford to purchase various electronic gadgets, access to power as noted above, would improve their lives because they would be able to read after dark and would be healthier as they would not be exposed to fumes caused by burning fossil fuels and plant matter (Hannafin, F. Savenye, 1993).

2. **Internet Connectivity:** The potential to increase internet connectivity has risen substantially during the last few years due to the laying and planned installation of marine telecommunication cables. The challenge for all countries in the developing world such as Nigeria is delivering the last "Mile" of connectivity to homes for a reasonable cost. In addition, the bandwidth must be capable of carrying compressed videos so that citizens can have access to the wide variety of educational materials available in a video format and be able to exchange reasonable quality photographs and video clips. Increased internet accessibility and increased bandwidth are unlikely, to occur without commitment by governments and the involvements of private enterprise such as the

mobile phone operators. In time perhaps, broadband access to the internet will be considered a basic human right (Lowther, F Ross, 2008).

3. **Training and Professional Development:** Electrical power, internet bandwidth, and electrical devices may all be present, but teachers need to know how to use them effectively. Teachers who have been brought up in a world with limited technology can find it difficult to use technology to engage and support learning (Ertmer, 2012). Whatever training and professional development opportunities that are provided to teachers must be long enough for them to grasp the concepts behind teaching with technology, to have hands-on experience using the technology, and to revise or develop one lesson that they can use when they return to their classroom or online environment (Rakes &Casey, 2002).

4. **Value Teachers:** Teachers should be valued more, yet in many places, they are not especially in Nigeria. Being paid a proper living wage relative to other in an area is part of it, but the other is respect for the profession. People cannot focus on teaching if they must hold several part-time jobs in order to support themselves and their families. Teachers should be looked upon as cornerstones of the society as upon them rests the responsibility of educating the next generation (National Education Association, 2008).

5. **Sustainability of Technology:** The outcome of any educational technology project in the developing world must have at least two aspects. First, how does the technology or instructional method improve learning and second, how will the technology or method be sustained once initial funding has ended? New technology that cannot be sustained frustrate those who spent considerable time to learn them only to find that they can't maintain them. Resources and time are lost.

6. **Confidence in Skills and Knowledge:** Given the abundance of educational technology, it is essential that teachers feel comfortable and confident about their ability to use them effectively. Many current teachers grew up without access to technologies such as the personal computer and the internet but students today are raised in an environment saturated by computer. These "Digital Nature" can intimidate teachers, especially teachers with little technological experience. If teachers feel they do not have the necessary competences when using technology, they may feel less in control of the class, use less technology, and be unlikely to explore new possibilities that utilize technology when designing their classes (Fisher, Dwyer &Yocam, 1996). By sticking to traditional teaching methods, teachers who are less fluent with new technology maintain a feeling of control in the classroom and will not have to prepare to face the challenges of instructing digital natives in a digital environment.

Prospects of Teaching with Technology

Time will inevitable bring about the increased adoption of classroom technology on a large scale, so this paper suggest some strategies that can be used by educators and researchers alike to encourage technology integration in schools today. However, to overcome the challenges of teaching with technologies, teachers must be persuaded that technology will empower them and help their students learn. The following strategies for successful teacher adoption of education technology are discussed based on (Wozney,

Venkatesh&Abrani, 2006).

1. **Schools must use technology to empower teachers:** Teachers rightly rejects education technologies that divert their attention from instruction. The best education technologies enable teachers to do more with fewer resources. Communication platforms like Twitter, Facebook or Tumble enable dynamic communication with students. Such teacher empowering technologies include mobile apps that grade written student work and provide lesson plan databases. School systems need to aggressively track what works for their teachers and put all other unworkable technologies aside.

2. **Teacher should treat the adoption of technology as part of lesson planning:** One of the major drivers of bad policy is churn. New district leaders want to make their mark adopting new polices and jettisoning the old. This constant changing of priorities make beneficial reforms difficult of implement. Teachers can incorporate technology directly into their practice and insulate their students from the deleterious effects of policy churn. For example, teachers can use Khan Academy or other resources to improve remediation. Systematic adoption of technology at the classroom levels limits the damage of shifting policy maker priorities.

3. **Teachers should not fear open-source technologies:** Many teachers mistakenly believe that education technologies are expensive and complicated to use. Open-source technologies are stable, secure and compatible with other platforms. Organizations both small and large use open-source devices everyday. Many business use open-source servers for their efficiency and costs savings. They often have large communities that provide high quality customer support. Best of all, open-source technologies often cost less than proprietary products.

4. **Use online education portfolios to evaluate students:** Educators have known about the benefit of paper based portfolios for generations. Portfolios allow students to express creativity for difficult to access subjects. Teachers can choose from a variety of online portfolios-providers tailored to the needs for their classroom. They also serve as a platform for students to demonstrate growth. Online portfolios have many advantages over paper based options because they cost less and allow for more robust outreach. Online portfolios are also amenable to a wider variety of formats including video, music or other interactive features.

5. **Teachers should embrace the common core state standards:** Common standards make teaching simpler. Teachers have to write lessons that comply with district state and national standards. Having a single set of standards eliminates redundancy and conflicting guidelines. Furthermore, universal adoption of common standards will support future technological innovations that aid teachers. From a technical perspective standards facilitate the development of new technologies. Innovators can focus on developing tools that better serve students rather than solving technical challenges of interoperability created by multiple set of standards.

6. **Undoubtedly, weak financial support inhibits the adoption of new technologies:** Despite this obstacle, teachers working together have tremendous potential to reform education. Every day, teachers face choices about how to implement the curriculum and instruct students.

Those moments are opportunities for teachers to engage in education reform that has a real impact on students. Teachers should use education technologies that are inexpensive, easy to use and improve student learning.

Conclusion

Although the task of technology integration presents significant challenges to school districts, school administrators, and teachers alike, exciting new educational technologies are increasingly available that offer teachers novel ways of presenting material to students. Research on the reading and writing technologies reviewed throughout this book demonstrate they can have considerable positive impacts on student performance. And, effort to adopt new educational technologies in the classroom will be rewarded, albeit with some potential barriers. Recent research on technology use in the classroom indicates that significant advances have been made to overcome the barriers to technology integration.

Recommendations

Having assessed the challenges and prospects of teaching with technologies, the writer is of the opinion that such challenges can be resolved if the following recommendations are considered for implementation:

1. Request training on newly adopted educational technologies.

2. Ensure that adequate technical, administrative, and peer support is available to teachers during the implementation.

3. Focus professional development efforts toward those which emphasize the use of technology in instruction, rather than for administrative tasks.

4. Offer teachers training on the intersection of technological knowledge, pedagogical knowledge, and content knowledge.

5. Provide teacher training that highlight constructivism and student-centred education.

6. There should be constant supply of power to enable the steady and easy use of new educational technologies.

References

Ameh, C.O. (1991). *The use of educational technology in teaching*. The effective teacher Jos: Matchers publishing Ltd, Lagos. PP. 33-35.

Cleaver, S. (2014).“Technology in the classroom.Helpful or Hamful?” Retrieved from *http://www.education.com/magazine/article/effective-technology-teaching-child/*

Ertmer, P.A.(2012). Teacher beliefs and technology Integrated practices: *A critical relationship. Computer & Education* 59, 423-435.

Fisher, C., Dwyer, D.C., &Yocam, K. (Eds.). (1996). “*Education and technology*: Reflections on computing in classrooms”. San Francisco: Josey-Bass.

Hannafin, R.D., &Savenye, W.C., (1993). Technology in the classroom: The teacher's new role and resistance to it. “*Educational Technology*”, 33(6), 26-31.

Hughes, J. (2005). The role of teacher knowledge and learning experiences in forming technology- integrated pedagogy. *"Journal of technology and teacher education*, 13(2), 277-302".

Keengwe, J.G., Onchwari, G &Wachira, P. (2008). Computer Technology Integration and Student Learning: Barriers and Promise. *"Journal of Science Education and Technology* 17(6), 560-565.

Lowther, D.L., & Ross, S.M. (2008). Does technology integration "Work" when key barriers are removed? *"Educational Media International,* 45(3), 189-206. National Education Association (2008). Technology in schools: The ongoing challenge of Access, Adequacy and Equity. Washington, DC:NEA policy and Practice Department. "Retrieved from *http://www.nea.org/assets/docs/PB19_Technologies.pdf."*

Ogbaga, E. (2016). Students' identification of difficulties in content of secondary school biology in Ebonyi State.*Unpublished Msc. Ed Thesis.*

Okenyi, C.I. (2012). Science and Technology Education for Entrepreneurship development, *proceedings of 7th National conference of sciences* FCEEPP 15-19.

Rakes, G.C., &Cassey, H.B. (2002). An analysis of teacher concerns toward instructional technology. *International Journal of Educational Technology*, 3(1).

Wozney, L., Venkatesh, V., &Abrami, P. (2006). Implementing computer technologies: Teachers perceptions and practices.*Journal of technology and Teacher Education14,173-207.*

TEACHERS DIFFICULTIES IN CONTENT AREAS OF SECONDARY SCHOOL BIOLOGY CURRICULUM

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Abstract

This study identified the contents of the school biology curriculum that teachers find difficult to teach. The study employed a descriptive survey research design. Two research questions guided the study. The population of the study was sixty nine biology teachers in public secondary schools in Ebonyi State. All the sixty nine teachers involved were used for the study. The instrument for data collection was a checklist titled "Difficult Biology Topics determination Checklist (DBTDC)". The checklist is strictly a semantic differential scale in the sense that although four points are identifiable in the scale, only two differential categories (difficult and not difficult) formed the basis for judgment. The DBTDC was face validated by three specialist in biology education and two specialists in measurement and evaluation. The reliability of the checklist was determined using Pearson Product Moment Correlation procedure, this were done to test the stability of the instruments. The checklist yielded a stability index of 0.73. Frequencies and percentages were used to answer the research questions while chi-square test was used to test the hypotheses. Findings of the study revealed that teachers encounter some difficulties in some content areas of the secondary school biology curriculum. In addition difficulties encountered by teachers in teaching some content of biology do not depend significantly on the years of job experience of the teachers. Based on the findings of the study, it was recommended that teachers should pay attention on the identified difficult biology topics and endeavours to attend conferences, seminars and workshops to enable them find lasting solution to the difficulty areas of the curriculum.

Introduction

The overall importance of science education and biology in particular in nation building and sustainability cannot be over emphasized. No Nation expecting to have a standard development can afford to neglect science education at any level of its educational system and hope to thrive in any field of human endeavor. This is because science and technology education is significantly useful in man's daily struggle to control his environment and build a strong world (Osuafor and Okonkwo, 2013). Science education is essential for useful living in any society. It plays a vital role in socioeconomic, scientific and technological development of any nation (Egbunonu and Ugbaja, 2011).

Biology, according to Odaibo,Gbenro, Ala and Chukwuka is the study of life which includes both plants and animals. It also has to do with the studies of the inter-relationships between the living organisms and their

immediate environment. In all spheres of human activity, biology plays prominent roles. It is very useful in the fields of medicine, agriculture, brewery and petro-chemical industries and even in geology and mining. Because of the indispensability nature of biology, much emphasis has been placed on biology instruction especially at the secondary school level. This is to ensure full realization of the objectives of biology education as stipulated in the National Policy on Education (F.R.N, 2004).

Biology as a science has been providing many important innovations through specialized disciplines such as in genetics, biotechnology, molecular biology, micro biology and biochemistry.

Biology is taught both at the secondary and tertiary levels of the Nigerian educational system. The secondary school biology curriculum was derived from a draft developed by the Comparative Education Study and Adaptation Centre (CESAC), University of Lagos and presented to the National Critique Workshop in December 1984 (FRN, 1985). Based on the experiences gathered over the years, a biology curriculum was proposed for the new (6-3-3-4) system of education and presented to the National Critique Workshop which was further presented to the Joint Consultative committee (JCC) Reference Committee on secondary education in April 1985 for final review and recommendation to the JCC Plenary (FRN, 1985). Since then it has undergone a number of reviews and modification to suit the emerging challenges of modern systems and environmental changes.

The focus of the syllabus was derived from the National Policy on Education (F.M.E 2008). The cardinal objectives of the syllabus are to prepare pupils to acquire:

(a). adequate laboratory and field skills in biology

(b). meaningful and relevant knowledge in biology

(c). ability to apply scientific knowledge to everyday life in matters of community health and agriculture; and

(d). reasonable and functional scientific attitudes

The new biology curriculum is designed to provide new biology courses while meeting the needs of the society through relevance and functionality in its contents. In terms of structure it adopted the spiral approach to sequencing thus providing for intellectual maturity as students progresses in their studies. In an effort to ensure continuity and smooth transition from the junior secondary science programme, the content of the junior secondary curriculum was arranged in such a manner that the six themes of the basic science curriculum have references to the themes presented in the new biology curriculum.

The persistent poor achievement of students in Secondary School Biology Examination as conducted by West African Examination council (WAEC) and National Examination Council (NECO) is an issue of great concern to the Science Technology and Mathematics (STM) practitioners, the government and society at large. The West African Examination Council (WAEC) annual Report May/June (2007 - 2008), statistics shows that out of 609,026, 96,202 (15.79%) got credit and above in biology. In 2008, out of 841, 868 students that sat for biology, 31.29% scored credit and above 34.08% got pass while 34.62% failed. The scenario did not change up to 2012 because out of 5,135, 283 candidate that sat for biology only 31.81% got credit and above.

Although the recent Chief examiners reports (WAEC, 2011; WAEC2012, WAEC 2013) made reference to curriculum contents and instructional resources, they were not specific about the topics that have constituted a major setback to teachers. Also the reports tend to suggest that emphasis be laid on some topics in the curriculum with special instructional

measures and teachers years of working experiences: researchers in biology education are still in doubt about the specific topics that attention should be focused on. The problem of this study therefore is to find out from the teachers and students the content areas of the secondary school biology curriculum they identified asdifficult.

Purpose of the Study

The main purpose of this study is to identify the topics in the secondary school biology curriculum that teachers find difficult to teach. Specifically the study sought to Identify:

1. content areas in the secondary school biology that teachers find difficult to teach.
2. influence of job experience of teachers on difficulties encountered in teaching content areas of the secondary school biology curriculum

This study is delimited to identification of topics in secondary school biology curriculum that teachers identified as difficult. The study will cover the curriculum of SS1, SS2 and SS3 biology of the Federal Ministry of Education.

Research Questions

The following research questions are formulated to guide the researcher in the study:

1. Which content areas in the secondary school biology do teachers find difficult to teach?
2. What is the influence of job experience of teachers on difficulties encountered in teaching content areas of the secondary school biology curriculum?

Method

The design that was adopted for this study is the descriptive survey design. Descriptive survey design according to Abonyi, Okereke, Omebe and Anugwo (2006) is the type of design in which data are collected from a small sample of people, objects or items considered to be a true representative of a large population from which they are drawn from, to enable the researcher describe in a systematic manner and interpret the characteristic features and facts about things that exist. Ali (2006) defines descriptive design as those studies that describe events as they are, without, any manipulation of what caused the event or what is being observed. The study therefore is designed to describe and ascertain from senior secondary school biology teachers and students the content areas or topics they identify as difficult in biology.

This study was conducted in Abakaliki Education Zone of Ebonyi State. The zone is made up of four Local Government Areas. They are Abakaliki, Ebonyi, Izzi and Ohaukwu Local Government Areas. The zone is bounded in the North by Benue, South by Ezza South, West by Enugu state and East by Cross River state. The people of the zone are predominantly farmers and civil servants.

The population of this study comprised of all the biology teachers and students in the seventy seven (77) public secondary schools in the zone. Their population according to the Ebonyi State Secondary Education Board (SEB, 2018, new edition) is sixty nine (69) teachers. The distribution of teachers across the local government areas are: six (6) in Abakaliki Local Government Area, twenty three (23) in Ebonyi Local Government Area, seventeen (17) in Izzi Local Government Area and twenty three (23) in Ohaukwu Local Government Area.

A total of six hundred and sixty nine (669) research subjects were used for this study. This comprised all the sixty nine biology teachers in the zone in addition to six hundred biology students that were drawn from the secondary schools in the four local government areas of Abakaliki Education Zone. In each of

the four local government areas of the zone a total of five co-educational secondary schools were drawn through a non proportionate stratified random sampling. For the four local government areas a total of twenty secondary schools were drawn for the study. In each of the schools thirty students were drawn from each school in such a way that ten students (5males & 5females) were drawn from each streams of SS1 to SS3. That is to say that in each of the twenty schools a total of fifteen male and fifteen female biology students were drawn for the study. This was achieved through a simple stratified random sampling technique. This generated the six hundred biology students from the twenty schools. The researcher decided to use all the sixty nine biology teachers because the size is relatively small.

The instrument that was used for data collection for this study was checklist designed by the researcher which is titled "Difficult Biology Topics Determination Checklist (DBTDC). The Checklist was presented in four formats as follows:

a) Checklist covering all topics in senior secondary Classes 1 – 3 biology curriculum.

The Checklist is a comprehensive listing of all topics and subtopics in the curriculum and respondents are required to indicate the level of difficulty of the topics with respect to the teaching by the teachers.

The checklist was of two sections (A and B). Section A was designed to elicit personal information from the respondents such as: name of school, gender, academic qualification and years of teaching experience for teachers. while section B comprised of the comprehensive listings of the contents of the biology and response options. The response options were on a four point rating scale of Very Difficult (VD), Difficult (D), Easy (E), and Very Easy (VE). The checklist is strictly a semantic differential scale because although it is presented in four scales at the point of data collection, the data that were collected are categorized into two differential poles in terms of difficulty (i.e. difficult *and* not difficult).

The checklist was given to 5 specialists (3 subject specialist in biology and 2 specialists in measurement and evaluation) for face validation. The specialists assessed the instruments in terms of their level of correspondence with the core topics in the biology curriculum of the Federal Ministry of Education and also the suitability of the response options. The modifications and suggestion made by the specialists were incorporated in the final draft of the checklists.

The checklists were trial tested using 20 secondary school teachers. Their responses were subjected to test of stability using the test retest procedure (pearson's product moment procedure). The checklist for teachers yielded a stability index of 0.73.

The researcher administered the instrument for the teachers directly to the teachers. The researcher took time to explain the purpose of the study to teachers who responded to the instrument and returned same to the researcher

The research questions were answered using frequency and percentages.

RESULTS

Research Question I

Which content areas in the secondary school biology curriculum do teachers find difficult to teach?

Data collected with the Difficult Biology Topics Determination Checklist (DBTDC) were used to answer this research question. Based on the two semantic differential categories data were described in frequencies and percentages as shown in Table 1

Table 1: Summary of frequency and percentage ratings of Difficulties of Topics in SSCE Biology for teachers

S/N	Topics	Frequencies	Percentages (%)
1	Living things	0	0%
2	Classification of living things	51	82.3%
3	The cell	5	8.1%
4	The cell and its environment	5	8.1%
5	Properties and functions of cell	8	12.9%
6	Tissues and supporting system	9	14.5%
7	Nutrition in animals	12	19.4%
8	Basic ecological concept	51	82.3%
9	Functioning ecosystem	53	85.5%
10	Energy transformation in nature	20	32.3%
11	Relevance of biology to agriculture	9	14.5%
12	Micro organism around us	9	14.5%
13	Micro organism in action	15	24.2%
14	Toward better	25	40.3%
15	Aquatic habitat	33	53.2%
16	Terrestrial habitat	26	41.9%
17	Reproduction in unicellular organisms and invertebrate	21	33.9%
18	Classification of plants	54	87.1%
19	Digestive system	21	51.6%
20	Transport system	12	19.4%
21	Respirator y system	17	27.4%
22	Excretory system	32	51.6%
23	Nutrient cycling in nature	45	72.6%

S/N	Topics	Frequencies	Percentages (%)
24	Ecological management	42	67.7%
25	Tolerance	29	46.8%
26	Adaptation	12	19.4%
27	Pollution	6	9.7%
28	Conservation of natural resources	41	66.1%
29	Pests and diseases of crops	15	24.2%
30	Reproductive systems in vertebrate	12	19.4%
31	Reproductive systems in plants	11	17.7%
32	Pollination in plant	20	32.3%
33	Regulation of internal environment	43	69.4%
34	Nervous coordination	38	61.3%
35	Sense organs	37	59.7%
36	Ecology of population	29	46.8%
37	Balance in nature	14	22.6%
38	Reproductive systems and reproduction in animals	14	22.6%
39	Development of seeds	4	6.5%
40	Fruits	15	24.2%
41	Reproductive behavior	29	46.8%
42	Biology of heredity	28	45.2%
43	Variation	38	61.2%
44	Evolution	49	79.1%

The result presented in table 1 indicates that topics list below are difficult for biology teachers, topic 2 (classification of living things), topic 8 (basic ecological concept), topic 9 (functioning ecosystem), topic15 (aquatic habitat), topic18 (classification of plants), topic19, (digestive system), topic 22 (excretory system), topic23 (nutrient cycling in nature), topic 24 (ecological management), topic 28 (conservation of natural resources), topic33 (regulation of internal environment), topic 43 (variation) and topic 44 (evolution). Topics listed below were identified as not difficult to the biology teachers, living things, cell, cell and its environment, properties and functions of cell, tissues and supporting system, nutrition in animals, energy transformation in nature, relevance of biology to agriculture, micro organism around us, micro organism in action, toward better health, terrestrial habitat, reproduction in unicellular organism and invertebrate, transport system, respiratory

system, tolerance, adaptation, pollution, pest and diseases of crop, reproductive system in vertebrate, reproductive system in plants, pollination, nervous coordination, sense organs, ecology of population, balance in nature, reproductive systems and reproduction in humans, development of seeds, fruits, reproductive behavior, and biology of heredity.

Table 2: Frequency and percentage Ratings of difficult topics by experienced and inexperienced Biology teachers.

S/N	Title of the Topic		Category	F	(%)
1	Living things	0	Experienced	0	0%
			Inexperienced	0	%
2	Classification of living thing	51	Experienced	17	33.3%
			Inexperienced	34	66.7%
3	The Cell	5	Experienced	1	20%
			Inexperienced	4	80%
4	The Cell and its environment	5	Experienced	1	20%
			Inexperienced	4	80%
5	Properties and functions of cell	8	Experienced	2	25%
			Inexperienced	6	75%
6	Tissues and supporting system	9	Experienced	3	33.3%
			Inexperienced	6	66.7%
7	Nutrition in animals	12	Experienced	4	33.3%
			Inexperienced	8	66.7%
8	Basic Ecological concept	51	Experienced	17	33.3%
			Inexperienced	34	66.7%
9	Functioning Ecosystem	53	Experienced	19	35.8%
			Inexperienced	34	64.2%
10	Energy transformation in nature	20	Experienced	8	40%
			Inexperienced	12	60%
11	Relevance of Biology to Agriculture	9	Experienced	3	33.3%
			Inexperienced	6	66.7%
12	Micro organism around us	9	Experienced	5	55.6%
			Inexperienced	4	44.4%
13	Micro organism in action	15	Experienced	6	40%
			Inexperienced	9	60%
14	Toward better Health	25	Experienced	16	64%
			Inexperienced	9	36%
15	Aquatic Habitat	33	Experienced	12	36.4%
			Inexperienced	21	63.6%

16	Terrestrial Habitat	26	Experienced	9	34.6%
			Inexperienced	17	65.4%
17	Reproduction in Unicellular organism and invertebrate	21	Experienced	7	33.3%
			Inexperienced	14	66.6%
18	Classification of plants	54	Experienced	20	37%
			Inexperienced	34	63%
19	Digestive system	21	Experienced	4	19%
			Inexperienced	17	81%
20	Transport system	12	Experienced	4	33.3%
			Inexperienced	8	66.7%
21	Respiratory system	17	Experienced	4	23.5%
			Inexperienced	13	76.5%
22	Excretory system	32	Experienced	12	37.5%
			Inexperienced	20	62.5%
23	Nutrient cycling in nature	47	Experienced	15	31.9%
			Inexperienced	32	68.1%
24	Ecological management	42	Experienced	19	45.2%
			Inexperienced	23	54.8%
25	Tolerance	29	Experienced	8	27.6%
			Inexperienced	21	72.4%
26	Adaptation	12	Experienced	4	33.3%
			Inexperienced	8	66.7%
27	Pollution of the atmosphere	6	Experienced	_	0%
			Inexperienced	6	100%
28	Conservation of natural resources	41	Experienced	14	34.1%
			Inexperienced	27	65.9%
29	Pest and diseases of crops	15	Experienced	6	40%
			Inexperienced	9	60%
30	Reproductive systems in vertebrate	12	Experienced	4	33.3%
			Inexperienced	8	66.7%
31	Reproductive systems in plants	11	Experienced	2	18.2%
			Inexperienced	9	81.8%
32	Pollination	20	Experienced	4	20%
			Inexperienced	16	80%
33	Regulation of internal environment	43	Experienced	14	32.6%
			Inexperienced	29	67.4%
34	Nervous coordination	38	Experienced	15	39.5%
			Inexperienced	23	60.5%

35	Sense organs	37	Experienced	17	45.9%
			Inexperienced	20	54.1%
36	Ecology of population	29	Experienced	8	27.6%
			Inexperienced	21	72.4%
37	Balance in nature	14	Experienced	2	14.3%
			Inexperienced	12	85.7%
38	Reproductive systems and reproduction in humans	9	Experienced	3	33.3%
			Inexperienced	6	66.7%
39	Development of seeds	4	Experienced	0	0%
			Inexperienced	4	100%
40	Fruits	15	Experienced	5	33.3%
			Inexperienced	10	66.7%
41	Reproductive behavior	29	Experienced	9	31%
			Inexperienced	20	69%
42	Biology of heredity	28	Experienced	8	28.6%
			Inexperienced	20	71.4%
43	Variation	38	Experienced	15	34.5%
			Inexperienced	23	65.5%
44	Evolution	49	Experienced	20	40.8%
			Inexperienced	29	59.2%

As shown in Table 2 inexperienced teachers encounter more difficulties in teaching most of the topics in biology curriculum than the experienced ones.

Summary of Findings

Results of data analysis are summarized as follows:

The under listed topics were identified as difficult to teach by biology teachers.

1. Topics 2 (classification of living things), 8 (basic ecological concept), 9 (functioning ecosystem), 15 (aquatic habitat), 18 (classification of plants), 19, (digestive system), 22 (excretory system), 23 (nutrient cycling in nature), 24 (ecological management), 28 (conservation of natural resources), 33 (regulation of internal environment), 43 (variation) and 44 (evolution)

2. The less experienced teacher encountered more difficulties in teaching biology topics more than the experienced teachers

Discussion of Finding

1. Content areas in the secondary school biology curriculum that teachers find difficult to teach.
2. Influence of job experience on difficulties encountered by teachers in teaching contents area of the secondary school biology curriculum.

Contents areas in the secondary school biology curriculum that teachers find difficult to teach

The results of the data analysis presented on table 1 of chapter four indicates that teachers identified 14 topics out of 44 major biology topics as difficult to teach. The topics identified to be difficult include classification of living things, Basic ecological concepts, Functioning ecosystem, Aquatic habitat, classification of plants, digestive system, Excretory system, Nutrient cycling in nature, Ecological management, conservation of national resources, regulation of internal environment, Nervous coordination, variation and Evolution. These findings are in line with those by

Olorundare and Oni (2014) who earlier reported that teachers perceived Biology of heredity (which is made up of sub-topics like genetics, genes, and chromosome) and evolution theories as difficult. This study is also in line with that of Abimbola (1998) who reported that teachers generally perceived genetics and Evolution theory as biology content areas that are difficult to teach. The studies covered parts of the biology curriculum, only that the present study covered the entire senior secondary biology curriculum.

Influence of job experience on difficulties encountered by teachers in teaching content of the secondary school biology.

The results of the data analysis presented in table 4 indicates that although inexperienced teachers encounter more difficulties in teaching many topics in the school certificate biology topics job experience was not a significant factor. The findings of the present study is in line with that of Ololundare and Oni (2014) who conducted a study on difficulties encountered by teachers in teaching biology topics and factors responsible for such difficulties. The study revealed that experienced teachers encountered less difficulty in teaching some biological concept while inexperienced teachers encountered more difficulties in teaching the biological concept.

Conclusions

Based on the findings of this study, the following conclusions were drawn:

1. Teachers encounter some difficulties in the content areas of the secondary school biology curriculum, example classification of living things, basic ecological concepts, and aquatic habitat among others.
2. Although the less experienced teachers encounter more difficulties in most of the topics they taught in biology curriculum.

Recommendations

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

1. Teachers should give special attention to those topics they find difficult to teach. They should ensure that they attend workshops, seminars and conferences to enable them get solution to the topics they find difficult to teach.

2. The less experienced teachers should attach themselves to the more experienced to obtain appropriate mentorship.

References

Abimbola, I.O. (1998). Teachers' perception of important and difficult biology content. *Journal of Functional Education, 1(1),10-21* University of Ilorin, Kwara State.

Abonyi, O.S., Okereke, S.C., Omebe, C.A and Anugwo, M.N. (2006). *Foundation of educational research and statistics*. Enugu: Fred Ogar Publishers.

Ali, A. (2006). *Conducting research in education and social science*. Agbani Enugu: Tashiwa Network Limited and Tian Venture Publisher.

Egbunonu, R. and Ugbaja, J. (2011). Biology teachers' perception of the factors affecting the effective implementation of the biology curriculum; the way forward for education reform. *Proceedings of the 52nd Annual Conference of Science Teachers Association of Nigeria (STAN) 235-241*.

Federal Government of Nigeria (NPE, 2004). Lagos: Federal Ministry of Education. Curriculum implementation committee symposium

National Examination Council (NECO, 2008). Chief examiners' report. Minna, Niger State.

National Policy on Education (FRN, 2004). Implementation analysis: Published by Federal Ministry of Education Lagos.

National Policy on Education (FRN, 1998). Strategies for enhancing biology education programme. Federal government of Nigeria, Lagos.

Olorundare, A.S. and Oni, M.O. (2014). Teachers perception of difficult biology concepts and the factors responsible for such perception. *University of Ilorin, Ilorin, Kwara state (In press).*

Oni, J.O.(2014) Teachers quality and students academics achievement in basic technology in junior secondary school in south west, Nigeria. *Journal of Educational and social science research.* MCSER Publication, Rome, Italy.

Osuafor, A. and Okonkwo, I. (2013). Influence of family background on academic achievement of secondary school biology students in Anambra State. *Multidisciplinary International Journal, Ethiopia,10 (43)3-12.*

West African Examination Council (2004). Chief examiner's report Lagos.

West African Examination Council (WAEC), 2007). Chief Examiner's Report. Lagos.

West African Eamination Council (WAEC), (2008). Chief Examiner's Report. Lagos.

West African Examination Council (WAEC) (2009). Chief Examiner's Report. Lagos.

West African Eamination Council (WAEC) (2010). Chief Examiner's Report. Lagos.

West African Examination Council (WAEC) (2011). Chief Examiner's Report. Lagos.

West African Examination Counil (WAEC) (2012). Chief Examiner's Report. Lagos.

West African Examination Council (WAEC) (2013). Chief Examiner's Report. Lagos.

West Afican Examination Council (WAEC) (2014). Chief Examiner's Report. Lagos.

EXTENT OF COMMUNITY PARTICIPATION IN THE ADMINISTRATION OF SECONDARY EDUCATION IN ENUGU STATE

By

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Abstract

The study investigated the extent to which communities have participated in the administration of secondary education in Enugu State. Two research question and one research hypothesis guided the study. The study was a descriptive survey, involving 314 principals as respondents. Data was collected using questionnaire titled community participation in the administration of secondary education in Enugu State (CPIASS). Mean and standard deviation were used to answer the research question. The hypothesis was tested using z-test statistics, which was done at the alpha level of 0.05. The findings of the study showed that secondary schools in Enugu State have not had enough support from their host communities. As a result, it was recommended among other things that sensitization exercises be carried out both by the government, traditional rulers, religious heads, women organization, town unions and public spirited individuals in our various communities on the need for their support in administering education.

Key words: Education, Secondary Education and Community

Introduction

Education can be thought of as the transmission of values and accumulated knowledge of a society into the newer generation. It can be said to have been designed to guide the children in learning a culture, molding their behaviour through the ways of adulthood and directing them towards their eventual role in the society. It can be likened to what social scientists call socialization or enculturation. By implication, no nation can hand down anything meaningful to its younger generation without the process of education. It is in the light of the above that Federal Government of Nigeria (2013), asserted thus; Education is also a vital instrument for national development. Education is seen as a means of enlightenment and a process of training and preparation for useful living in the community (Onuseluogu, 2007). Succinctly put,**it** is the process of facilitating learning, or the acquisition of knowledge, skills, values, beliefs, and habits, which include storytelling, discussion, teaching, training, and directed research as its methods(Ejeh, Okenjom, Chizi-woko and Agbo, 2016). Education takes place under the guidance of educator/educators, it can take place in formal or informal settings and any experience that has a formative effect on the way

one thinks, feels, or acts may be considered educational. The methodology of teaching is called pedagogy. Formal education is commonly divided into such stages as preschool or kindergarten, primary school, secondary school , college, university, or apprenticeship. But for the purpose of objectivity, the researcher is focusing this work on secondary education.

Secondary education comprises the formal education that occurs during adolescence. It is characterized by transition from the typically compulsory and comprehensive primary education for minors, to the optional, selective tertiary, "postsecondary", or "higher" education (e.g. university/ vocational school) for adults, the purpose of which may include to give common knowledge or to train directly in a profession. Depending on the system, schools for this period, or a part of it, may be calledhigh schools, gymnasiums, lyceums, middle schools, colleges, or vocational schools. The exact meaning of any of these terms varies from one system to another. The boundary between primary and secondary education also varies from country to country and even within them but is generally around the seventh to the tenth year of schooling.UNESCO (2009), positedthat **Secondary education** covers two phases on the International Standard Classification of Education scale. Level 2 or **lower secondary education** (less common **junior secondary education**) is considered the second and final phase of basic education, and level 3 **(upper) secondary education** is the stage before tertiary education. Every country aims to provide basic education, but the systems and terminology remain unique to them. Like primary education, in most countries secondary education is compulsory, at least until the age of 16, it stated further. This level is meant for children between the ages of 12-18years(Federal Government of Ngeria, 2013).Secondary education occurs mainly during the teenage years. AccordingOzoagu (2015), it prepares the children for future challenges of life, it helps to make them adaptable citizens of a given society. in similar viewObanya (2000), opined that secondary education in Nigeria provides the beneficiaries both with literary and basic skills, which the individual can use for himself or in the industries and government establishments while performing a task for living. Supporting this, Taiwo (2006), added that most workers of pre-independent Nigeria were products of the voluntary agency grammar schools. It equally provides the bulk of the nation's workforce. It is against the above background, that Mkpa (2001),noted that proper handling of secondary school students will yield good results at the university in terms of character and learning. It is stated that government welcomes the participation of voluntary agencies and communities in the establishment and management of secondary schools. This is because the provision of education has become very expensive not to be left for the government alone. The school and community are two inseparable entities which are mutually dependent on one another. In his own opinion,Nwangwu (2007) in Okenwa and Igbo (2013), supported this by adding that a school does not exist in isolation. It exists in a social setting, in other words, it is an integral part of the community in which it is situated. This therefore means that the community as well as the general public in one way or the other owns and supports the school. He further stated that because of this supports, these people deserve to be informed on regular basis on the needs, progress and activities of the school.

In Nigeria specifically, and of course so many African countries, the typical image of a community is that of a medium sized rural village with a close-knit group of inhabitants,

largely self-contained with everybody knowing and standing in accepted relationship with one another (Amujiri 2000, in Okenwa and Igbo 2013). A community can be said to be a living cycle where the people are either of the same race, culture/ traditions and more especially have common features. According to Ejeh, Okenjom, Chizi-nwoko and Agbo(2016),It can also be seen as a social unit larger than a small village. In the words of Hornby (2001) in Ejeh,Okenjom, Chizi-nwoko and Agbo (2016), community is a group of people living in same place or having particular characteristics in common.Scott (2001) posited that a community can be seen as a group of individuals who have learned how to communicate honestly with each other, whose relationships go deeper than their masks of composure, and who have developed some significant commitment to "rejoice together, mourn together", and to delight in each other make others' condition their own. A community is said to be a group of people sharing the same geographical location, under the same traditional government and observing the same rules. Members of which are most likely to possess similar attitudes and pursue common goal. Those expected to make up a community include parents/guardians, adults, children among others. Ugwu (2000) described a community as a people obliged to one another not because of the place of birth, race, sex, religion, but people bound to one another and governed by shared taste, specific needs or common interest.Ngoka(2003), on the other hand observed that a community is a body of people living in the same locality and having a common cultural and historical heritage and the willingness to work together.

Community participation on the other hand, can be loosely seen as the coming together or the involvement of people within a community, probably sharing the samelanguage, culture and religion to solve their own problems. Community participation is, according to Greenwood (2008), the process by which consultation in decision making, goal setting, profit sharing, teamwork and other such measures through which the community tries to increase its members' commitment to collective objectives is enhanced and achieved. Itin other words, means that many people are involved, community participation is not an activity considered to be a special venture ofthe knowledgeable few (Norman, 2000). Stressing peoples' involvement here, it is equally worthy of note that people cannot be forced to 'participate' in projects which affect their lives but should be given the opportunity where possible. The above assertion was supported by United Nations in the year 1981 as captured by Ugwu (2000), when it described community participation as the creation of opportunities to enable all members of the community to participate in activities that contribute to and influence the developmental process and to share equitably in the fruits of development. As in other spheres of community development, people gather to look into the state of affair of the schools situated in theircommunity and equally agree on possible ways to move it forward. Ngoka (2003) identified some of the agencies within the communities through which effective and efficient school-community relationship are maintained as Parents Teachers Association (PTA), school Based Management Committee (SBMC), social clubs, old students association, Board of Governors and women Association.

From the fore going, it is acceptablethat both the school and the community have the task of creating a better generation through the provision of qualitative knowledge by the way of school education. As a result, the school as well as the community should understand and

appreciate the need for mutual co-existence. Thus, there is absolute need to create opportunities and forum where views on school policies, programmes, activities are discussed. Community participation is essentially important in school administration, where members can be allowed to take decision on issues and make necessary contributions as it concerns their children's education. This need was reiterated by Federal Government of Nigeria (2004), when it posited that for secondary education to achieve its goal and objectives as stipulated in the 2004 National Policy on Education (NPE), it should involve the participation of other stakeholders. This entails schools creating room for private individuals, community based organizations and other civil society organizations to participate in the administration, management and co-ordination of school activities for greater advancement.Chukwuma, Nworie, Okoye and Ovri (2014)addedtherefore, The school needs assistance from external forces for its growth and improvement.

According to Obiechina (2006), the school exists to serve the community while on the other hand the community provides funds, equipment and facilities of plants, insurance and other educational materials for school environment. Still on the place of the community in the administration of secondary school, the Federal Government of Nigeria (2004), reiterated that local governments through the local communities shall have the responsibility for the financing and management of schools (especially primary education) within their areas. They shall assist the government in areas of retraining teachers, overall management of their educational plans, supervision and quality control in conjunction with federal and state authorities, assist in payment of teachers' salaries and allowances, construction of classrooms, development ICT center, extension of electricity, organization of conferences for teachers, engaging in decision making processes, provision of health facilities, construction of teachers' quarters, provision of access roads, provision of adequate security in the hostels and donation of lands for farm use. The role of communities in the administration and management of secondary education can therefore never be overemphasized. Supporting the previous points Universal Basic Education Commission (UBEC, 2009), asserts that school community partnership initiative programme evolved as a strategy to involve the community and private sector participation in education delivery through the initiation, execution, administration and ownership of designed school level projects.

According to Chukwuma, Nworie, Okoye and Ovri (2014) , community participation entails communities getting involved in school based project, administration and management in areas such as:

(a) Physical Infrastructural development which include, renovation/ rehabilitation/completion of school buildings; provision of toilet facilities; provision of furniture; construction of additional classrooms;provision of access roads to school; extension of electricity that will benefit the school; provision of potable water and first aid facilities in the school.

(b) Teachers' Support which involves, supporting teachers training programmes to upgrade existing teachers to the required specification; allocating lands to teachers in the remote areas for farming purposes; construction of teachers' quarters in remote areas and give to them free to rental payments;

sponsoring teachers by helping them attend conferences, seminars and workshops; improve teachers' welfare packages and remuneration.

(c) Teaching Materials –which include construction of community library close to the school; provision of library books, supplementary readers and reference materials to the school; provision of textbooks in core subject areas for students and teachers.

(d) Measures to increase access –which involves engaging in decision-making process in the school; contributing towards the growth and development of the school and assisting the school to create programmes for drop-outs, boy-child, girl-child and street-child. Stakeholders' involvement (parents, PTA, community chiefs and leaders ,village heads, community unions and cooperative societies, private organizations and individuals, Non-Governmental Organization NGOs, women and trader).

"Most educationists all over the world seem to have argued that community participation plays vital role in promoting education in terms of quality and quantity; and it is assumed that community participation and empowerment has the potentials to make major contribution in educating people and enriching their quality of life". Community participation also contributes to preparing and improving home environment, by encouraging parents to understand about the benefits of their children's schooling & their children's readiness for schooling, provide them with adequate nutrition and stimuli for their cognitive development. It was also noted in the Concept Note, that when education was about to be given a back seat in India as a result of government's lukewarm attitude,The communities did not wait but decidedto take their fate into their hands and secure the future of their children byestablishing schools, hire teachers in their various areas and if not for such initiative and community efforts, the country could have been far behind education wise. It is equally noteworthy, that Most schools at the early stages of our development existed as community initiated programmes, which received different kinds of contributions from the community e.g. land, funds, voluntary teachers, labours, construction materials etc, which aided in the production of the needed workforce. To achieve reasonable level of progress, the direct involvement of the community is very important (Norman, 2000). As communities initiate schools, the management of such schools is usually the responsibility of the people at least for a period of time, he stated further. At this juncture, it is agreeable that community gets involved to help in the provision of both qualitative and quantitative education that will reflect in the standard of leaving of its members. The role of community in educational development is so significant thatUdeozor(2014), said that, "through the partnership with members of the community such as parents, elders, private sector, NGOs, community-based organizations; people, will not only know more about their children, the school programmes and problems; but as well, contribute towards the effective development of the school". A statement corroborated by Mitrofanova (2007) who opined that this partnership is like a symbiotic relationship in which teachers can sell out both the school programmes and the school to the parents and the community. Students also get better idea, understanding and knowledge of

their community. They tend to understand the community history; values and identify its abilities and access opportunities; understand the community organization and its leadership, including its economic and financial resources; understand its social networks and citizen participation, he puts further. School-community partnership would aid development into the school and vise -versa the community as well through organizing adult literacy programmes for adults or health programmes for the community by the school. Awards, scholarships, bursaries, donations, aid and grants could be given to students in the school through this medium of partnerships (Chukwuma, Nworie, Okoye and Ovri 2014). Furthermore, the multi grade action research project report of the UBE in 2004 on improving teaching and learning through school-teacher, school-based teacher development also highlighted the importance of community participation in education and in school programmes, projects, games, procurement of needed materials for their children, visiting schools to see their children in classroom, parents holding discussions with their teachers, giving room for home-visitation by the school, etc., brought in a lot of benefits including advancement to the school which equally assisted in effective administration and management ofschools.

According to Akubue (1997), "there is no doubt that efforts aimed at promoting school community partnership will not meet difficulties". In line with the above, Udeozor (2004), identified the underlying as some of the factors that affect effective school-community partnership and among such challenges include: bad leadership and attitude towards community members; in-experienced leadership in school; poor communication between the school and community; lack of interest on the part of the community in school matters; isolation of school from their community; lack of community support on school programmes and activities. Chukwuma, Nworie, Okoye and Ovri (2014), also argued that such things that challenge school-community partnership may include: Problems of local politics especially where schools are situated in the local communities; hostile attitude of the community; indifference or lack of co-operation on the part of teachingstaff.

Another is the non-clear perception of the school needs and principles by the community; this is a situation where the community people might want to come up with aprogramme or idea which to them is purposeful but to the school administrator, it is a hindrance to the achievement of set objectives. For instance, bringing in parents into the class for curriculum delivery as a result of insufficient workforce in the rural schools, will certainly affect the children academically, as most of the parents are not professional teachers. The principal may oppose this idea and it becomes a problem. Another factor that weakens school-community partnership is undue interest. Example, a project might be agreed to be carried out but the problem will be from whose side the contractor come will. In most cases, you find out that this is true of both the community leaders and the school administrators. It is these issues and many more that elucidate the relevance of continued studies on community participation in the administration of secondary education.

The general feelings that the state of Nigerian education system has deteriorated the public outcry for standard and the global yearnings for qualitative service delivery in education. The need for high productivity at all levels of education has made it necessary for all stakeholders of private and public sectors to

contribute towards the administration and management of all educational level and systems. In the face of dwindling economy, a situation where government is still battling with payment of salaries and other recurrent expenditures, it has become obvious that education will not survive if left in hands of government alone. Hence, the need for the intervention and participation of various concerned entities such as communities, non-governmental organizations (NGOs) etc, in the provision/administration of education in Nigeria. In the light of the above, the present study sets out to investigate the extent of community participation in the administration of secondary schools in Enugu State.

The main purpose of this study was to assess the extent of community participation in the administration of secondary schools in Enugu state. Specifically the study determined:

1. The extent to which communities have contributed to the administration of secondary education in Enugu Statethrough the provision of physicalfacilities.

2. The extent to which communities have contributed to the administration of secondary education in Enugu State through the provision Security Devices

The questions below guided the study;
1. To what extent do communities participate in the administration of secondary education in Enugu State through the provision physical offacilities?

2. To what extent do communities participate to the administration of secondary education in Enugu State through the provision security devices?

Method

Thestudy adopted a descriptive survey design. The area was Enugu State. The population for this study was 314 principals serving in the public secondary schools in Enugu State (State Ministry of Education). Due to the fact that this population was a sizeable one, the researcher utilized the entire population for this study. Instrument for data collection was questionnaire titled "Community participation in the administration of secondary school(CPIASS)". The instrument was developed by the researcher. It has two sections, where section "A" is concerned with the respondent's bio-data; section "B" contains information on the extent of community participation in administration of secondary schools in Enugu State. The B part of the questionnaire was based on four points rating scale of Very Little Extent (1point), Little Extent (2points), Great Extent (3points) and Very Great Extent (4points). The instrument was face validated by two experts in educational management and one in measurement and evaluation, faculty of education, Enugu State University of Science and Technology (ESUT), Agbani. The questionnaires were issued to and retrieved from the respondents who were targeted at their annual ANCOPS meetingheld on the 3rd of October 2019, at teachers' house, Enugu. Mean and standard deviation were used to answer the research questions, while z-test statistics was used to test the hypothesis at 0.5 level ofsignificance

Results

Table 1 The extent to which communities have participated in the administration of secondary schools in Enugu State through the provision physical of facilities

(N= F:116; M:189)

		MALE			FEMALE		
S/N	ITEMS	MEAN	SD	DEC	MEAN	SD	DEC
1.	Construction of extent	1.53	0.49	little extent	1.43	0.50	little classroom
2.	Development of ICT centre	2.00	0.63	little extent	1.98	0.60	little extent
3.	Extension of electricity	2.93	0.75	great extent	2.83	0.18	great extent
4.	Organization of extent Teachers	2.00	0.47	little extent	2.02	0.4	little conferences for
5.	Engaging in making process	2.00	0.63	little extent	1.98	0.68	little decision extent
6.	Provision of health facilities	2.00	0.46	little extent	2.02	0.46	little extent
7.	Construction of teachers' quarters	2.00	0.62	little extent	1.98	0.60	little extent
8.	Provision of access road	2.66	0.56	great extent	2.76	0.49	great extent
9.	Construction of hostel Blocks	2.00	0.46	little extent	2.02	0.45	little extent
10.	Donation of lands for Farm use	3.27	1.01	great extent	3.08	1.6	great extent
Grand Mean		**2.24**	**0.28**	**LE**	**2.21**	**0.28**	**LE**

Table above shows data on the extent to which communities have participated in the administration of secondary schools in Enugu State. Out of the ten items, only three which are item nos. 3, 8 and 10 were accepted because their respective mean ratings are above the criterion mean of 2.50, which is the point for acceptance of any item of the questionnaire. Seven out of total number of ten items were rejected because their mean ratings fell below the bench mark (2.50).

Furthermore, the grand mean(s) of the questionnaire items are 2.24 for male and 2.21 for female respectively which were not up to the criterion mean of 2.50. The above indicates that there is a little extent to which communities have participated in administration of secondary schools in Enugu State by way of providing physical facilities.

What is the extent to which communities have contributed to the administration of secondary education in Enugu State through the provision of security devices.

(N= F:116; M:189)

s/n	Item	Female			Male		
		X	SD	Deci.	X	SD	Deci.
1	Video surveillance (CCTV)	1.82	.61	LE	1.90	.89	LE
2	Central communication centre	2.25	.98	LE	2.44	.95	LE
3	Access control	2.84	1.30	GE	2.64	1.34	GE
4	Staff and student ID cards	2.58	.89	GE	2.65	1.01	GE
5	Visitors guideline	3.53	.54	GE	3.32	.62	GE
6	Burglar bars on the windows	2.52	1.13	GE	2.65	1.23	GE
7	Iron doors	3.16	1.18	GE	2.89	1.23	GE
8	A lightening, system on sensitive areas	1.54	.85	LE	1.85	1.04	LE
9	Security lightening, illuminating paths	1.87	.68	LE	1.89	.89	LE
10	Secured car park	2.91	.65	GE	2.51	.94	GE
11	Manned control room with 24 hours operation	1.49	.79	LE	1.66	.97	LE
12	Metal dictators	1.99	1.04	LE	2.40	.95	LE
13	Armed response service	2.09	1.33	LE	2.36	1.31	LE
14	Sprinkler system to control fire outbreak	1.94	1.01	LE	2.19	1.16	LE
15	Perimeter fencing of the school	1.71	.97	LE	2.14	1.18	LE
	Grand mean	**2.28**	**.93**	**LE**	**2.37**	**1.05**	**LE**

Table 2 above presents the results of data analysis for research question 2. The results of the analyses show that both male and female principals agreed that most community support secondary school administration, through the provision of items 3, 4, 5, 6, 7 and 10 of which mean values are higher than the cut-off point of 2.50 to a great extent. The principals also

agreed that most communities don't show much interest in items 1, 2, 8, 9, 11, 12, 13, 14 and 15 whose mean ratings fall below the cut-off of 2.50 each.

Essentially, the value of the grand mean is 2.37 and 2.28 for male and female principals respectively. The grand mean of both male and female principals are less than the cut-off point, indicating little extent. This therefore means that the extent to which community has participated in the administration of secondary school in Enugu state is inadequate by providing security devices for effective security of the school.

Hypotheses

H_{01}: There is no significant difference between the mean ratings of male and female principals on the extent of community participation in administration of secondary schools in Enugu State through the provision of physical facilities.

H_{02}: There is no significant difference between the mean ratings of male and female principals on the extent of community participation in administration of secondary schools in Enugu State through the provision of security devices.

Table 3:z-test analysis of difference in the mean ratings of male and female principals on the extent of community participation in the administration of secondary schools in Enugu State through the provision physical of facilities.

Group	N	Mean	S.D	D.F	Z-calZ-critical	Dec
Male	165	2.24	0.28	312	0.87	1.96 Do not reject
Female	149	2.21	0.28			

Table 3 shows that the z-cal value for the difference in mean rating of male and female principals regarding the extent to which communities have participated in the administration of secondary schools in Enugu State by providing physical facilitiesis 0.87. This is lower than the z-critical value of 1.96. By implication, there is no significant difference in the mean responses of male and female principals on the extent of community participation in administration of secondary schools in Enugu Stat regarding the provision of physical facilities.

Table 4: z-test analysis of the difference in mean ratings of male and female principals on the extent of community participation in secondary school administration in Enugu State through the provision security devices.

Respondents	N	X	SD	Df	Z-cal	Z-crit	Decision
Female	116	2.28	0.93	303	0.78	1.96	Do not reject
Male	189	2.37	1.05				

Table 4 shows that the z-cal value for the difference in mean rating of male and female principals with respect to the extent to which communities have participated in the administration of secondary school through the provision of security devices is 0.78. This is lower than the z-critical value of 1.96. Hence, the null hypothesis is not rejected. This means that there is no significant difference between the extent of community participation in secondary school administration in the of security devices by male and female secondary school principals in Enugu State.

Discussions

The result of data analyses showed that extent of community participation in the administration of secondary schools in Enugu State is inadequate. In the tables it was revealed that the only means through which communities have contributed to the administration of secondary schools in Enugu State were extension of electricity to the school, provision of access roads, allocation of land to teachers for farm use, access control, visitors guideline, staff and students' ID card and secured car park. These seven out of the twenty-five questionnaire items have been agreed by principals to be the only ways by which the communities have supported secondary schools administration in the State in the areas of physical facilities and school security. The extent to which other items were rated is insignificant. Generally the value of the grand means revealed that the contribution of communities in the administration of secondary schools is little via the aforementioned areas. The fact that, it is only through the seven above mentioned items that communities have contributed to secondary schools administration in the areas under review in Enugu State sets this findings apart from the submission ofObiechina (2006), who stated that, the school exists to serve the community while on the other hand the community provides funds, equipment and facilities of plants, to a reasonable extent security, insurance and other educational materials for school development. As there seem to be a bit short fall on the part of the community in fulfilling their own obligation. This could be however, blamed on certain factors which include the level of awareness created in the community as regards to the need for their participation, administrative style of the school heads, the living standard of the people of thecommunity. These situations have no doubt subjected many schools to depending only on government's meager grants which is usually characterized by lack and results in insufficient provision/ maladministration of secondary education.

Additionally, the hypothetical analyses revealed that no significant difference exists in the responses of male and female principals on the extent of community participation in the administration of secondary schools in Enugu State. This finding equally supports the opinion of Chukwuma, Nworie, Okoye and Ovri (2014), who posited that the school needs assistance from external forces for its growth and improvement.

Conclusions

1 Community participation is very crucial, if education must be effectively provided

and schools properly administered. This implies that a platform where the community and the school will come together to look into matters affecting the children's education has become highly necessitated.

2 Both public and private sectors, NGOs, social organizations, religious groups etc, existing in the various communities should be allowed to take part in what goes on in the school system, so as to achieve the educational objectives. As was evident in the findings of this study, the extent to which communities have participated in the administration of secondary schools in Enugu State is little.

Recommendations

Based the above research findings, the researcher recommends that government, traditional rulers, leadership of the town unions and religious heads should intensify efforts in enlightening the people of the various communities on the importance of full participation in running of our schools. Community participation should be emphasized at the slightest opportunity by all who are concerned.

References

Akubue, A. (1997). *Administration of school-community relations.*In A.N. Ndu; L.O. Ocho and B.S.

Okeke (Eds.). *Dynamics of educational administration and management.The Nigerian perspective* (pp. 260-268).Awka:Meks Publisher Limited.

Chukuma E.T, Nworie G.O, Okoye P.U and Ovri F.B (2014). Administering and Managing secondary schools in Nigeria, through effective school community partnership initiative. *Journal of teachers perspective, volume 8. 11.*

Ejeh E.I, Okenjom C.N, Chizi-woko C.I and Agbo P.N,(2016). Extent of community participation in funding of secondary schools in Abakaliki education zone, Ebonyi State.*International Journal of Academic Research in Progressive Education and Development. 2016, vol. 5, no.3*

Federal Government of Nigeria (2004): *National Policy on Education*, Lagos: Nigerian EducationalResearch and Development Council.

Greenwood, P.W. (2008). Prevention And Intervention Programme For Juvenile Offenders.RAND Report # DRU-2634-NIJ. Prepared for the National Institute of Justice, U.S. Department of Justice. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/21338003

Mitrofanova, Y. (2007). *Building community-school relations.*Retrieved, 23/11/18 fromwww.http://Lancaster.unl.edu/community/articles/communityschools.shtml

Ngoka, G.N. (2003). *Concept and Issues In Advanced Education Administration*.Nsukka, His Glory Publishers

Norman, J.R. (2000). How people's power bring sustainable benefits to communities.USDA rural development, office of community development U S. Retrieved from http://www.rerdev.usda.gov/rbs.ezec/pubs

/Obiechina, I. (2006). *School community relations and the status of physical facilities in secondary schools in Anambra State* Unpublished M.Ed ThesisNnamdiAzikiwe University,Awka.

Okenwa G.N and Igbo R.O (2013). Extent Of Community Participation In The Provision Of School Plant In The Administration Of Public Secondary Schools In Enugu State. *Journal Of Education And Social Research 3 (4)*

Ozoagu G.C (2015). *Alternative Sources of Financing Secondary Education In Enugu State*. Unpublished M.Ed dissertation, Enugu State University of science and technology (ESUT), Agbani.

Scott, L.N. (2001). *Community: Meaning and understanding*. Massachusetts Institute of Technology: Benchmark Press.

Taiwo, C.O (2006): *Nigeria Education System*: *Past, Present and future*, Lagos: Nelson Pitman Ltd

Udeozor, R. K. (2004) . *Educational administration, perspectives and practical implications*.Nimo: RexCharles and Patrick Limited.

Ugwu, R.N (2000).*Community involvement practices for facilitating secondary school administration in Enugu State.* Unpublished doctoral thesis University of Nigeria, Nsukka.

UNESCO (2009).*Global Monitoring Report-Overcoming Inequality: Why Governance Matters*. Paris, France: UNESCO

Universal Basic Education Commission (UBEC) (2009). *UBE Community Initiated Self-Help Project*

Implementation Manual. Abuja: Department of Social Mobilization, Universal Basic Education Commission.

Universal Basic Education (2004).*Improving Teaching and Learning through School-Based Teacher Development. A Synthesis of Consultants Action Research Reports.Nigeria Secondary Primary Education Project.*Abuja: UBEC and Tee- Kay Educational Consultancy Services.

INFLUENCE OF WHOLESALE AND RETAIL TRADES ON GROSS DOMESTIC PRODUCT GROWTH RATE IN NIGERIA ECONOMY

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Abstract
In a time of declining oil price, the need for diversification for an oil dominated economy such as Nigeria cannot be overemphasized. Boosting the wholesale and retail trades could cushion the adverse effect of low oil price on her gross domestic product (GDP). The paper assessed the influence of the wholesale and retail trade on the growth of the Nigerian economy. Ordinary least square regression technique was employed to measure the extent to which the GDP increase was influenced. Wholesale and retail trade contributed significantly and positively (89%) to the growth of the economy. Specific government development of new institutions and products should be channeled to wholesale and retail facilities such as providing state owned malls with outlets for wholesale and retail traders and traditional market stores.

Keywords—*Gross domestic product, retail, trade, wholesale.*

Introduction

Middle men (wholesalers and retailers) in the chain of distribution bridge a gap between the producers and consumers. Being closer to the consumers spread across the nation, they speed up sales and increase production. While they contribute to employment and production by increasing sales and reducing distribution cost for the producers, they increase the prices of products, bringing the cost burden on the consumers. Although the cost burden is spread on the prices of more than one product, consumers still decide whether to purchase and what quantity to purchase at the whole sale and retail prices. Their decision is largely influenced by their need, the amount of their disposable income, their spending habit and the level of money stock in the economy.

Wholesalers and retailers in Nigeria are mainly small and medium enterprises, categorized as distributive trade and service industries, which have over 10% share of the gross domestic product of Nigeria (according to the National Bureau of Statistics). Small and Medium

Enterprises in Nigeria are classified as businesses with asset size ranging from -N-5,000,000 to -N-500,000,000 (Central Bank of Nigeria, 2012).However, these small and medium enterprises are the bedrock of any country's development and constitutes 96% of Nigerian businesses (Oyelaran and Oyeyinka, 2012) and **more than 80% of a country's economic growth (Jagoda, 2010).** This report discusses wholesale and retail sector in light of its effect and contribution to economic growth in Nigeria.

The Central Bank of Nigeria (CBN) Statistical Bulletin 2012 released showed that sectorial distribution of commercial bank loans and advances to domestic trade ceased after the year 2003. Also, secondary data of bank loan to the wholesale and retail sector is unavailable. Nevertheless, commercial banks loans to small and medium scale enterprises as percentage of total credit stood at an average of 0.14% as against 27.04% in the year 1992. Large number of wholesalers and retailers belong to the small and medium enterprises group. As a result of the effect of the bank consolidation in 2004, surviving commercial banks turned to big customers leaving the care of this group to microfinance banks (Iloh,Okolo and Ani, 2013). To gain a fore understanding of the subject matter, National bureau of Statistics (NBS) 2005, defined wholesale trade as "re-sale, without transformation of new and used goods to non-final consumers. The bureau also defined retail trade as "re-sale, without transformation, of new and used goods for personal or household consumption or utilization. The scope is confined to services rendered to households and enterprises. These are services provided by establishments which can be regarded as stores, hotels, restaurants, theatres, shops and offices. It excludes the producers of government services, producers of private non-profit services, financial institutions, insurance and some other services rendered by individuals (professionals, artists, authors, servants, etc.)".

Furthermore, Business Day, (2013) reported that the wholesale and retail trade contributions to the gross domestic product of Nigeria increased from 16.2% in 2007 to 19.4% in 2011 and that consumption expenditure on food, clothing/footwear and household goods in 2009/2010 stood at 74.1%. In addition, 84 million of Nigeria's population are under the age of 20 and will account for 52% of the country's population by 2015, making Nigeria the largest consumer market in Africa (Business Day, 2013). Social media and the advantage of mobile commerce are increasing the trend of online retail.

While a mass market with low levels of disposable income drives demand for Nigeria's large fast moving consumer goods (FMCG) and agro-industrial products, new malls are catering to an emerging middle class. Despite the limited development of consumer finance, demand has grown for formal retail. Retail market research in Nigeria remains largely limited to fast moving consumer goods and agro-industrial goods (Oxford Business Group, 2010). The group presented that wholesalers play a crucial role in the distribution system as they supply independent and informal retailers. Going further, the group explained that the wholesalers supply neighboring countries taking advantage of price corridors caused by exchange rate fluctuations between the West African franc and the Nigerian naira.

Awe, Sholotan, and Asaolu, (2010) assert that one other key success factor of the fast moving consumer goods sector, which is largely distributed by retail and wholesale trade is product reach. To ensure adequate market penetration, companies in the sector have employed various approaches for the

distribution of their products. Some employ dedicated main distributors covering different geographical regions with a regional manager to ensure that products are placed, priced and sold at stated terms. Others on the other hand, adopt a combination of key distributors (wholesalers) and a merchandising force. They further explained that Nigeria presents one of the best opportunities for consumer goods businesses given their growing youthful population, estimated at about half of its entire population.

In a sectorial analysis of the Nigerian economy, FinIntell, (2013) asserts that the non-oil sector (notably Agriculture, Wholesale and Retail Trade) was mostly affected by the floods and weaker consumer demand. She further explained that the agricultural sector suffered declines due to the floods, which also affected the Wholesale and Retail sector (as key inputs in the sector are from the agricultural sector).However, wholesale and retail trade caused growth in the non-oil sector of the economy by 11.8% (Odukoya, 2013). Coffey (2012) says that the 11.5% contribution of the wholesale and retail sector to Nigeria's gross domestic product could be attributed to high population growth, urbanization and increased incomes. They explained that while Nigeria's wholesale and retail sector grows quickly, inefficiencies within the chain of distribution resulted in lower prices for producers, lower wages for employers, lower profits for businesses and a higher cost of living for consumers.

Additionally, Distributive trade and service industries [DTSI] account for a substantial proportion of economic activities in every country, whether they are measured in terms of contributions to the GDP or share of total employment" (National Bureau of Statistics, Nigeria, 2005). Agreeing to this, Taborda, (2013) revealed that the fastest growing segments of the Nigerian economy are wholesale and retail trade, and telecommunication and post. Explaining further, the author said that they account for almost 35% of total output.

Having shown direct impact on the consumers and producers of commodities, an econometric analysis of the significance of this sector to the economy at large is necessary to reveal prospects for an oil dominated country to diversify.

Methods

The study employed econometric analysis, using the simple linear regression method to examine the influence of the wholesale and retail trade on gross domestic product increase for the growth of Nigerian economy. Secondary data was used for the analysis. The data was sourced from the Central Bank of Nigeria (CBN) Statistical Bulletin (2005).The model employed;

GDP = f (WRT)

Therefore;

$$GDP = B_0 + B_1 WRT + \grave{\imath} \ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where,

GDP = Gross Domestic Product

WRT = Wholesale and Retail trade contribution to GDP

$\grave{\imath}$ = error term

$B_0, B_1, B_2 \ldots$ = denotes unknown parameters to be estimated

Discussions

Unit Root Test

Philip Perron unit root test for stationarity of data showed that gross domestic product and wholesale and retail trade data passed at 1st and 2nd difference respectively. Additionally, the variables were controlled (logged) and used for analysis. The results are presented below.

Dependent Variable: LNGDP
Method: Least Squares
Date: 12/25/13 Time: 15:02
Sample: 1990 2012
Included observations: 23

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.598329	0.199257	18.05872	0.0000
LNWRT	0.890628	0.014635	60.85762	0.0000
R-squared	0.994362	Mean dependent var		15.65264
Adjusted R-squared	0.994093	S.D. dependent var		1.352957
S.E. of regression	0.103981	Akaike info criterion		-1.606282
Sum squared resid	0.227052	Schwarz criterion		-1.507543
Log likelihood	20.47224	F-statistic		3703.649
Durbin-Watson stat	1.668534	Prob(F-statistic)		0.000000

Source: Authors E-view computations

The test conducted at 5% significance level showed that wholesale and retail trade made a significant contribution (89%) to gross domestic product. Wholesale and retail trade had significant and positive effect on the gross domestic product increase. The positive effect implies that gross domestic product increases as wholesale and retail trade increases. Modeled against other factors that influence the gross domestic product, wholesale and retail trade would have made a lesser contribution (< 89%) to gross domestic product in Nigeria. This only implies the strength of the effect of wholesale and retail trade, holding other factors constant. However, drawing from the secondary data sourced from the Central Bank of Nigeria (CBN) Statistical Bulletin (2005), wholesale and retail trade in Nigeria contributed 15.5% to gross domestic product in 2012. The adjusted R^2 of 99.4% implies that variation in gross domestic product can be attributed to the variation in wholesale and retail trade in Nigeria.

Conclusions

Over the years, wholesale and retail sector in Nigeria has been on an upward trending line, despite few glitches. This implies that there is huge prospect in the sector for investors. Citing example from Angolan banks, credit to wholesale and retail trade, hotels and restaurants increased from 3.9 in 2010 to 4.0 in 2011 and to 4.3 in 2012 (European Investment Bank, 2013). The bank further revealed that loans go predominantly into the retail and wholesale trade sector (19.4% of total), agriculture (12.9%), mining (12.5%), building and construction (8.7%) and transport and communication (7.9%), showing that Angolan government considers the sector fundamental to economic growth. The same cannot be said for Nigeria. The Central Bank of Nigeria (CBN) Statistical Bulletin 2012 released showed that sectorial distribution of commercial bank loans and advances to domestic trade ceased after the year 2003. Going further, secondary data of bank loan to the wholesale and retail sector is unavailable. However, commercial banks loans to small and medium scale enterprises as

percentage of total credit stood at an average of 0.14% as against 27.04% in the year 1992. A large number of wholesalers and retailers belong to the small and medium enterprises group. Given the effect of the bank consolidation in 2004, surviving commercial banks turned to big customers leaving the care of this group to microfinance banks (Iloh,Okolo and Ani, 2013). Notwithstanding, microfinance bank loans and advances to the transport and commerce sector stood at 74.6% in 2012.

This report has shown that the wholesale and retail sector play significant role in the economy both in wealth creation and employment. However, Nigeria being a developing country, proper effectiveness of the wholesale and retail sector needs to be harnessed for the continuous growth trend. It is recommended that; 1. An oil dominated country such as Nigeria should prioritize the wholesale and retail sector in a bid to solve the unemployment problem of the country, boost commerce, local production and decongest an already crowded oil sector. 2. Specific government development of new institutions and products should be channeled to wholesale and retail facilities such as providing state owned malls with outlets for wholesale and retail traders and traditional market stores. 3. Furthermore, in line with the cashless society campaign by the Central Bank of Nigeria, government should encourage mobile commerce of the fast moving consumer goods, given that the velocity of cash movement for the consumer goods. This will save time, boost commerce and reduce physical cash in circulation and cash theft. 4. Lastly, financial institutions should be encouraged to make available more credit to the wholesale and retail sector given their significant contribution to the economy.

References

Awe, O. Sholotan, O. and Asaolu, O. (2010), "Consumer goods businesses to do well in Nigeria,Frontier Market Intelligence. Retrieved from: http://www.tradeinvestnigeria.com/feature_articles/357260.htm 25th August, 2019

Business Day, (2013), "Wholesale and retail trade in Nigeria". Retrieved from:http://businessdayonline.com/2013/08/wholesale-and-retail-trade-in-nigeria/on 23rd December2018

Central Bank of Nigeria, (2012), "Commercial Bank Loans to Small and Medium ScaleEnterprises", Central Bank of Nigeria Statistical Bulletin, retrieved on 23rd December 2012.

Central Bank of Nigeria, (2012), "Sectorial Distribution of Commercial Bank Loans andAdvances", Central Bank of Nigeria Statistical Bulletin.on 23rd December 2012.

Central Bank of Nigeria, (2012), "Summary of Assets and Liabilities ofCommunity/Microfinance Banks", Central Bank of Nigeria Statistical Bulletin.on 23rd December 2012.

Coffey, (2013), Increasing Incomes and Employment Opportunities in the Wholesale and RetailSector in Nigeria. Retrieved from:http://www.coffey.com/Projects/BusinessProject.aspx?aProjId=487on 25thAugust 2019

European Investment Bank, (2013), "Banking in Sub-Saharan Africa – Challenges and Opportunities". Retrieved

from:http://www.eib.org/infocentre/publications/all/index.htmon 25th Dec 2019

FinIntell, (2013), "Sectoral Analysis of Nigeria' s Economy. Retrieved from:http://www.myfinancialintelligence.com/banking-and-finance/sectoral-analysis-nigeria%E2%80%99s-economy23rd December 2019

Iloh, J.V.C., Okolo, V.C., and Ani, W. U., (2013). The Effect of Bank Consolidation on Lendingto Small and Medium Scale Enterprises in Nigeria, 3rd International Conference on Management, Hydro Hotel, Penang, Malaysia. Retrieved from: http://www.internationalconference.com.my/proceeding/icm2013_proceeding/016_088_3rdICM2013_Proceesing_p264.pdfon 25thDec 2019

Jagoda.K.,(2010) The *use of electron ic Commerce by SMEs. Entrepreneurial Practice Review,* 1, (3) 36-47.

National Bureau of Statistics (NBS) (2005)."Distributive Trade and Service Industries Statistics". Retrieved from:http://www.google.com.ng/url?sa=t&rct=j&q=&esrc=s

Odukoya, T. (2013), "Nigeria GDP Grows By 7.68%". Retrieved fromhttp://www.proshareng.com/news/16645 23rdDecember 2018

Oxford Business Group, 2010), The Report: Nigeria 2010. Retrieved from:http://books.google.com.ng23rdDecember 2018

Oyelaran-Oyeyinka (2012) at the FSS 2020 International Conference .*SME: Issues, Challengesand Prospects*. Retrieved from: http://www.cenbank.org/fss/wed/SME_Issues,%20Challenges%20and%20Prospects_Oyeyinka%20Banji.pdf23rd December 2018

Taborda, J. (2013), "Nigeria GDP Growth Rate". Retrieved from:http://www.tradingeconomics.com/nigeria/gdp-growth 23rdSeptember 2019

Appendix

Table1: Data used for analysis

year	Wholesale & retail trade	GDP
1990	41,045.59	472,648.75
91	47,948.46	545,672.41
92	72,278.29	875,342.52
93	118,119.40	1,089,679.72
94	186,618.81	1,399,703.22
95	324,104.27	2,907,358.18
96	423,021.10	4,032,300.34
97	464,952.47	4,189,249.77
98	526,961.49	3,989,450.28
99	575,913.58	4,679,212.05
2000	625,619.64	6,713,574.84
2001	762,736.95	6,895,198.33
2002	916,825.97	7,795,758.35
2003	1,094,638.04	9,913,518.19
2004	1,484,422.36	11,411,066.91
2005	1,930,779.52	14,610,881.45
2006	2,741,794.53	18,564,594.73
2007	3,044,773.87	20,657,317.67
2008	3,503,181.70	24,296,329.29
2009	4,082,351.76	24,794,238.66
2010	4,648,696.98	33,984,754.13
2011	5,385,815.10	37,409,860.61
2012	6,284,923.68	40,544,099.94

Source: Central Bank of Nigeria (CBN) Statistical Bulletin

EFFECTS OF INQUIRY BASED INSTRUCTION ON SENIOR SECONDARY SCHOOL STUDENTS' ACHIEVEMENT IN BIOLOGY IN ENUGU EDUCATION ZONE

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Abstract
The objective of the study was to investigate the effect of inquiry based instruction on senior school students' achievement in biology in Enugu Education Zone of Enugu State. Three research questions were raised to guide the study. Quasi experimental research design involving an experimental group and one control group was adopted for the study. The study was carried out in senior secondary schools in Enugu Education Zone involving SS 1 students. Population size was 5386 SS1 students and the sample size was 174 students made up of 91 males and 83 females. Biology Achievement Test (BAT) was used for data collection. Mean statistic was used to answer the research questions while hypotheses were tested with ANCOVA statistic at 0.05 level of significance. The findings are that students taught biology concept with inquiry based instructional approach performed better than students taught with lecture method. It was recommended that government should make available all the instructional materials that support the use of inquiry based instructional method for teaching and learning of biology in all secondary schools, school administrators should always supervise and encourage the use of inquiry based instructional approach in teaching of biology in secondary schools,.

Keywords: Inquiry-based Instruction, Achievement and Biology

Introduction

Man and his entire environment are daily faced with challenges. In pursuit of solutions to these challenges, manhas clungto science and technology as bedrock to salvaging humanity from problems of life. Science and technology have helped man socially, politically, economically, aesthetically and philosophically shaped the world and brought about human civilization which has led to economic profit, human development and general advancement.

Education is aimed at sustainable national development. Science Education is the field concerned with sharing scientific knowledge and methods with people not considered partof

scientific community (Ude, 2011). Science education which is seen as the acquisition of concepts has been identified as one of the major bedrocks for sustainable development that are important as concerned with science (Nnamdi, 2014). The need for innovation and technology advancement led to the emergence of Science, Technology, Engineering and Mathematics (STEM) as part of top national agenda for many governments in recent years. To achieve the aims and objectives of STEM, science is taught in secondary schools as physics, chemistry, biology and mathematics (Keith, 2014). Good achievement in these subjects enables students gain admission into universities and other institutionsof higher learning to study engineering, biochemistry, microbiology, anatomy, geology, pharmacy among others (Belfi, 2016).

Each branch of science has very important roles to play in the achievement of the science education goals and biology as a branch of science is not left out. Biology is the study of life and pervades all aspects of everyday life. People rely on living things and their products for food, homes, personal care, fuel and medicines (Dostson, 2018). Despite the important roles biology plays in the society, students' academic achievement in biology examination has persistently been below expectation. This view is by the West African Examination Council, Chief Examiners Report (2015 , 2017 and 2018) and National Examination Council (2016 and 2018) to back up the ugly situation. The report from WAEC stated that the performance of candidates in WASSCE 2018 was poorer than that of 2017 with a raw mean score of 30 and standard deviation of 9.00 when compared with the mean score of 31 and the standard deviation of 11.92 in 2017. Science subjects are activity oriented which make them real through actual experiences Abraham& Saglam, (2010) observed that teachers shy away from activity oriented teaching methods (student centred) which involves practical work or mode of study. They instead rely in the teaching methods devoid of practicals by students such as lecture method which is teacher centred.

Commonly used teaching methods include inquiry based method, lecture method, demonstration method, target task, discovery learning, cooperative learning among others.
Inquiry- based instruction, according to gradepowerlearning.com (2018) is an approach to learning that emphasizes the student's role in the learning process rather than the teacher teaching students what they need to know. Dotal (2015) opined that inquiry based learning method include problem based learning and it is usually used in science instruction and projects as well as research. Bayram (2013) opined that inquiry based learning refers to any pedagogy that utilizes presentations or student centred activities to develop in the students the confidence and ability to do sciences on their own. Inquiry based instruction encourages students to engage in the process of gathering data and seeking answers to their questions. This method of instruction stirs students to action. Students are encouraged to develop insightful questions and understand context.

Lecture method on the other hand, is the traditional method of teaching applied in educational institution (Umar, 2012). Lecture method is a one way channel of communication of information. Student's involvement in this teaching method is just to listen and take down notes of important points. The teachers are moreactive while the students are passive though teachers also ask questions to keep the students attentive (Meenu, 2014). This study therefore investigates the effect of inquiry based instruction on senior secondary students' achievement in biology
The methods of instruction – Inquiry-based and lecture method are all aimed at increasing the students' academic achievement which

indicates the extent to which a student, teacher or institution has achieved their short or long term educational goals (Boraddu, 2019). To actually measure the students' academic achievement, one of the characteristics of the learner, according to Dorgu (2015) which should be considered is the gender of the learners

Gender is the word used to describe whether an individual is a male or female. In the education world, males and females are found to have different academic interest, choice of subjects, extracurricular activities and as well perform differently in their school tests and examination. According to Adeneye (2011), the girls have ability to spend more time reading and doing homework than boys who would rather spend their free time in virtual world contribute to their better performances. The study therefore investigates the effect of inquiry based instruction on senior secondary school student's achievement in biology.

There have been reported failures in school certificate examinations in the sciences, biology inclusive. Studies have shown that most schools engage in the conventional method for teaching (lecture method) and this could be the reason for students poor achievement in biology which has led to decrease in number of Doctors, Pharmacists, Biologists, Biochemist, Agronomists etc. who would have helped to fight hunger, disease and food insecurity in Nigeria. There is fear that if this problem is left unattended to, Nigeria may not be able to attain the zenith of her technological development. The prime question therefore is what will be the effect of inquiry based instructional method of instruction on senior school student's achievements in biology in Enugu Education Zone.

Purpose of the Study

The main purpose of this study is to determine the effect of inquiry based instruction and lecture method on students' achievement in biology in Enugu Education zone. Specifically, the study intends to determine:

1. the impact of inquiry based instructional approach and lecture method of instruction on students achievement in biology
2. the impact of inquiry based method of instructional approach on the achievement of male and female students in biology
3. The interaction effect of method and gender on students' achievement using lecture method.

Scope of the Study

The study focused on the effect of inquiry based instruction on senior secondary school students' achievement in biology. The interaction of gender on the effectiveness of the two teaching methods was considered. The study was restricted to only the senior secondary school class one students in whose scheme of work the topic used for the study is contained. The choice of SS1 students for the study was justified by the researchers'belief that the findings and the recommendations of the study could be utilized by both the teachers and students for the remaining two years (SS 2 and SS3) in the school before they sit for SSCE (Senior Secondary School Certificate Examination). The content scope chosen for the study is phototropism (Tropic movements). The contents covered in the study include:Introduction to need for response to external stimuli by organisms, Types of Responses (Taxis (Tactic movement), Nastic movement (Nastism), Tropic Movement (Tropism)), Definition of Taxis, Nastism& Tropism and Phototropism, Geotropism and

Hydrotropism as types of Tropism. The geographical scope of the study is Enugu Education Zone.

Research Questions

The following research questions guided the study:

1. What are the mean achievement scores of students taught biology with inquiry based instructional approach and lecture method?
2. What are the mean achievement scores of male and female SS 1 students taught biology concepts with inquiry based instructional approach?
3. What is the interaction effect between method of instruction and gender on SS 1 students' achievement in Biology?

Hypotheses

The following null hypotheses (Ho) were formulated and tested at 0.05 level of probability.

1. There is no significant difference in the mean achievement scores of SS1 students taught biology concept using inquiry based instruction and those taught with lecture method of instruction.

2. There is no significant difference in the mean achievement scores of male and female SS1 students taught biology concept using inquiry based instructional approach.

3. There is no significance difference ofinteraction effect between gender and method on students' academic achievement in biology.

Methods

Quasi-experimental non-equivalent design was used for this study. Specifically, the pre-test –post-test quasi experimental design was adopted. The population of this study is 5836 SS1 students (PPSMB 2017/18). This study was carried out in Enugu Education Zone, in Enugu State. There are 31 public secondary schools in Enugu Education Zone which were classified into co-educational (male and female) and single sex secondary schools. Because gender is involved in the study co- educational schools were used. Out of 31 schools, 22 are co-educational schools, two of which were purposively sampled due to their proximity. The student sample consist of 174 students comprising of 91 male students and 83 female. Simple random sampling technique was used to sample two classes from four streams in each school. Biology Achievement Test (BAT) was used for data collection. The test consist of 20 multiple choice test questions. The scores of the students were converted to percentage (total 100%). The researchers carried out a trial testing in one secondary school in Enugu not involved in the study.

The instrument was validated by three specialists, two from Department of Science and Vocational Education and one from Department of Educational Foundations all from Godfrey Okoye University, Enugu. The reliability of the instrument was established using Cronbach alpha to obtain the reliability coefficient index value of 0.972, indicating that the instrument was consistent and reliable. Pre-Biology Achievement test was administered to both experimental and control groups before the treatment begins. Twenty minutes was allowed for the test. The test enabled the researcher establish the pre-experimental abilities of the subjects. After the treatment, a Post Biology Achievement Test was given to the two groups again. The post-test was the same as the pre-test

except that the numbering of items were altered in the post test.

Experimental Procedure

Two intact classes made up of both males and females (males 46 in number and females 40 in number in class A and males 48 and females 40 in number in class B) were assigned with inquiry based instruction method and lecture method respectively. The inquiry based instruction and the lecture methods were identical in terms of content, basic instructional objectives and mode of evaluation. Both groups were given a pre-test (BAT) which lasted for 20 minutes before the onset of the treatment. The major difference between the two types of treatment was the instructional technique adopted. The inquiry based instruction in the experimental procedure involved the teacher and the students. The teacher posed questions on tropic movements, specifically on phototropism and guided the students.The students were required to build four Boxes $2A^s$ and $2B^s$ where box A had an opening by the side while Box B had opening at the top to allow sunlight. The students were grouped into four, two groups per abox.The students were asked to gather soil and add manure to the soil in four nylon bags. Then three maize seedlings were planted in each bag. Then the bag containing sand, maize and manure will be watered. Then two of the bags were placed in box marked 'A' and the other two on box marked 'B'. Then the students were asked to water the plants daily and record their findings. Then another group of students were taught the concept of tropic movements (with emphasis on phototropism) using the lecture method.The researchers adopted the following procedures to ensure that the extraneous and intervening variables which might introduce bias into the study were eliminated or controlled. The data was analyzed using mean and standard deviation. Hypotheses were tested using ANCOVA at 0.05 level of significance.

Results

The results were presented according to the research questions and the hypotheses that guided the study.

Research Question I

What are the mean achievement scores of students taught biology with inquiry based instructional approach and lecture method?

Table 1: Mean and standard deviation of achievement scores of students taught Biology using inquiry based instructional approach and lecture method

Group	No. of Students	Pre-Test Mean (X)	Pre-Test SD	Post-Test Mean (X)	Post-Test SD	Mean Gain
Experimental	86	4.88	2.23	19.37	3.27	14.49
Control	88	4.60	2.19	13.52	3.18	8.92
Total	174					

From Table 1, it was observed that the pretest and posttest of the experimental group mean (X) score are 4.88 and 19.37 and standard deviation (SD) scores of 2.23 and 3.27 respectively. On the other hand, it was also observed that control group has pretest and posttest mean scores of 4.40 and 13.52 with standard deviation scores of 2.19 and 3.18 respectively. The positive mean deference for the experimental group is 14.49 while that of control group is 8.92 signifying superiority of the experimental group over the control group. This shows that use of inquiry based instructional approach as a method of teaching biology makes learning more practical than abstract.

Research Question 2

What are the mean achievement scores of male and female SS1 students taught biology concept with inquiry based instructional?

Table 2: Mean and standard deviation of achievement scores of students taught biology using inquiry based instructional approach and lecture method.

Group	Pre-test			Post-test		
	No of Student	Mean(X)	SD	Mean (X)	SD	Mean Gain
Male	44	4.88	1.92	18.93	3.08	14.05
Female	42	4.92	2.52	19.83	3.44	14.91
Total	86					

From Table 2, it was observed that the pretest and posttest of the male students mean (X) scores are 4.88 and 18.93 and standard deviation (SD) scores of 1.92 and 3.08 respectively. On the other hand, the pretest and posttest mean scores of female students are 4.92 and 19.83 with standard deviation scores of 2.53 and 3.44 respectively. The positive mean difference for the male is 14.05 while that of female is 14.91 signifying superiority of the female over the male. This shows that use of inquiry based instructional approach as a method of teaching biology favours female students more than the male students, though with insignificant margin of 0.9

Hypothesis 1

H_{O1}: There is no significant difference in the mean achievement scores of SS1 students taught biology concept using inquiry based instruction and those taught with lecture method of instruction.

Table 3: Analysis of Covariance (ANCOVA) for the mean achievement scores of SS1 students taught biology concept using inquiry based instruction and those taught with lecture method of instruction.

	Sum of Squares	Df	Mean Square	F	Sig.
Contrast	1349.361	1	1349.361	221.439	.000
Error	1042.004	171	6.094		

Table 3 shows the ANCOVA table for the achievement scores of SS1 students taught biology concepts using inquiry based method of instruction and those taught with lecture method of instruction. It is observed from the table that f is 221.439 and its probability is 0.000. Since the probability of f is 0.000 and the value is less than 0.05 (5% level of significance), the null hypothesis is rejected. This means that there is significant difference in the mean achievement scores of SS1 students taught biology concept using inquiry based instruction and those taught with lecture method of instruction.

Hypothesis 2

H_{O2}: There is no significant difference in the mean score of male and female SS1 students taught biology concept using inquiry based instructional approach.

Table 4: Analysis of Covariance (ANCOVA) for the mean scores of SS1 students taught biology concept using inquiry based instruction approach.

	Sum of Squares	df	Mean Square	F	Sig.
Contrast	17.659	1	17.659	2.758	.101
Error	531.529	83	6.404		

Table 4 shows the ANCOVA table for the scores male and female SS1 students taught biology with concept using inquiry based instructional approach. It is also observed from the table that the calculated/observed f is 2.758 and its probability is 0.101. Since the probability of f is 0.101 and the value is greater than 0.05 (5% level of significance), the null hypothesis is accepted. This means that there is no significant difference in the mean score of male and female SS1 students taught biology concept using inquiry based instructional approach.

Hypothesis 3

Ho_3: There is no significant difference in the interaction effect between gender and method on students' academic achievement in biology.

Table 5: Analysis of Covariance (ANCOVA) for the interaction effect of method and gender on students' achievement in biology.

Tests of Between-Subjects Effects

Dependent Variable: TEST

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	1510.702[a]	3	503.567	48.366	.000
Intercept	47059.925	1	47059.925	4519.956	.000
GENDER	.050	1	.050	.005	.945
METHOD	1510.488	1	1510.488	145.078	.000
GENDER * METHOD	4.678	1	4.678	.449	.504
Error	1769.970	170	10.412		
Total	50257.000	174			
Corrected Total	3280.672	173			

a. R Squared = .460 (Adjusted R Squared = .451)

Table 5 shows the ANCOVA table for the interaction effect of method and gender on students' achievement in biology. It is observed from the table that the probability of f-ratio of gender*method interaction is 0.504. Since the probability of f-ratio/calculated is 0.504 and the value is greater than 0.05 (5% level of significance), the null hypothesis is accepted. This means that the interaction effect of method and gender has no statistically significant effect on students' achievement in biology.

Discussions

The result of the study revealed that there is wide disparity in the achievement scores of SS1 Students taught Biology concept using inquiry based instructional approach and those taught with lecture method. The inquiry based approach makes teaching and learning of Biology more practical. Engaging students in experiment increases their commitment. The result also shows that there is significant difference in the mean achievement scores of SS1 students taught Biology concept using inquiry based instruction and those taught with lecture method. This finding agreed with the study of Uche (2013) who stated that students taught Biology using inquiry method performed far better than those taught using conventional method in secondary schools in Abuja.

Nevertheless, the result from research question two revealed that there is little and insignificant difference in the mean achievement scores of male and female SS1

students taught Biology concept with inquiry based instructional approach. More so, result from hypothesis two confirms that there is no significant difference in the mean score of male and female SS1 students taught biology concepts using inquiry based instructional approach. It means that gender is not a sensitive factor to inquiry based instructional approach in teaching and learning of Biology in secondary schools. Result from research question three revealed that the interaction effect between gender and method has no significant effect on students' achievement in biology.

Conclusions

The study centers on effect of inquiry based instruction on senior secondary students' achievement in Biology in Education Zone. The findings revealed that Students taught Biology Concept with inquiry based instructional approach performed better than students taught Biology Concept with lecture method in Enugu Education Zone.Also, the difference in the achievement mean scores of male and female students taught Biology concept with inquiry based instructional approach are insignificant. This shows that inquiry based instructional approach are not gender sensitive. The interaction effect of gender and method on students' achievement in biology was not statistically significant. It shows that the interaction between gender and method has no significant effect on students' achievement scores inbiology.

Recommendations

The following recommendations were made based on the findings of this study:

1. Government should make available all the instructional materials supporting inquiry based instructional approach in the teaching and learning of Biology in all the secondary schools.
3. School administrators should always carry out regular supervision of teachers to confirm the use of inquiry based instructional approach in the teaching of Biology in secondary schools.
4. Seminars and workshop should on well-defined intervals conducted for Biology teachers in order to update them in inquiry based method of teaching Biology.

Reference

Abraham, I &Saglam, M (2010).A study of teachers' view on practical work in secondary schools in England and Wales.*International Journal of Science Education,* 32(6), 753-768.

Adeneye, O &Adelege, A (2011). Is gender a factor in mathematics performance among Nigerian senior secondary students with varying school organization and location" *International Journal of Mathematics trends and technology, 2 (3).*Retrieved from http://www.internaitonaljournalssrg.org.

Bello, Z. A (2016). Identification of misconceptions about plant held by senior secondary school students in Illorine metropolis Nigeria. *Journal of science, technology, mathematics and education.* 12(1), 316 – 325. Available online at .

Dorgu J. (2015). Different teaching methods; A panacea for effective curriculum implementation in classrooms. *International Journal of Secondary Education*.Volume 3, Issue 6, pg 5 -77-87.

Dorstal, J (2015). Inquiry based instruction concept, essence, importance and contribution. Olomouc: Palacky: University, ISBN 978-80-244-45076 doil 10.5507/pdf.15.2445076.

Dotson, J.D (2018) Uses of Biology, a screening video vault. www.screening.com/everyday uses of Biology.

Karen, L.R (2015). Effects of inquiry based instruction on science achievement for students with disabilities: A Pennsylvania State University. Kleerizzo@gmail.com.

Nwagbo (2001). The relative efficacy of guided inquiry and expository methods on achievement in biology of students with different levels of scientific literacy. *Journal of the Science Teachers Association of Nigeria* 36, 1& 2, 43-51.

Stajkoric A & Banora A (2018) "Test of three conceptual models of influence of the big five personality traits and self efficacy on academic .Ude, V C (2011).Relationship between Academic Self-Concept, Worldview and Misconceptions in Photosynthesis and Senior Secondary Students' Achievement in Biology in Enugu Urban, Enugu State, Nigeria.Unpublished Ph.D Thesis, Enugu State University of Science and Technology (ESUT) Enugu.

Uche I.O (2013) Inquiry based method and student academic Achievement in secondary school home economics. School of agriculture, FCE Umunze.DOI:10.5901/jesr.2013.v3n4p109.

West African Examination Council Syllabus (2018) awajis.com.postedon February 20, 2018.

STUDENTS' INTEREST AS CORRELATES OF SENIOR SECONDARY SCHOOL STUDENTS' ACHIEVEMENT IN BIOLOGY IN ENUGU STATE

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Abstract

The study examined the relationship between Senior Secondary School Students' Achievement and interest in Biology. Descriptive and corelational research designs were adopted for the study. The population of the study was 1452 students in Senior Secondary Schools in Udenu Local Government Area of Enugu State. The sample size for the study was 163 Biology students comprising of 71 male and 92 female students drawn randomly from 4 Secondary Schools. Two research questions and two hypotheses guided the study. The hypotheses were tested at 0.05 level of significance. Two instruments used for data collection were Biology Interest Scale (BIS) and Biology Achievement Test (BAT) with reliability co-efficient of 0.79 and 0.81 respectively. Data collected was analyzed using Simple Linear Regression. Results showed that there was a positive significant relationship between students' interest and their achievement in Biology. Also, there is no significant moderating influence of gender on the relationship between students' interest and achievement in biology. Based on the findings, the study recommends that the Biology teachers should foster positive and right interest towards the learning of Biology as this will enhance interest and achievement of students in Biology.

Keywords: Biology, Achievement, Interest, Gender.

Introduction

Biology is a branch of science that deals with the study of living things. Biology is a natural science that deals with the living world: how the world is structured, how it functions and what these functions are, how it develops, how living things came into existence and how they react to one another and with their environment (Umar, 2011). It is an integral science subject which provides contents in the training of students who want to study medicine, nursing, pharmacy, agriculture, forestry, fisheries and many other areas. Biology is one of the senior secondary school subjects taught in Nigeria

schools and because of its importance, more students enroll for biology in the senior secondary school certificate examination (SSCE) than for physics and chemistry (West African Examination Council, 2011). Biology is introduced to students at senior secondary school level as a preparatory ground for human development, where career abilities are groomed, potentials and talents discovered and energized (Federal Republic of Nigeria, 2009). In recent times, Biology pervades literally in every field of human endeavour and plays a fundamental role in educational advancement. This is seen in all the technological advancement in the world today, which is because of scientific investigations. However, the issue of poor achievement in Biology remains the case in most secondary schools in Nigeria.

The level of achievement or success is measured with an achievement test and the scores obtained from it are then indices of the level of achievement. Achievement of students in Biology as stated by the West Africa Examination Council Chief Examiner's report (2018), shows that the performance of candidates was slightly poorer than that of 2017 with a raw mean score of 30 and standard deviation of 9.00 when compared with the raw mean score of 31 and the standard deviation of 11.92 of WASSCE for 2017. Poor achievement in Biology can be attributed to many factors such as: unavailability of laboratory facilities, lack of instructional materials, inadequate time allocation, large class size and lack of students' interest in the subject. One of the major remedies suggested by WAEC chief examiners' to help solve this problem is that, teachers should be engaged in seminars and several trainings to aid their teaching. This may lead to teachers' exposure to varieties of innovative teaching strategies that can arouse students' interest in the subject. Rennie, Dieking and Falk (2013) were emphatic that, students' active participation in the learning process will enhance achievement since participation encourages and provides students with the opportunities to utilize the knowledge of science in different situations and not just at examination. Interest is often thought of as a process that contributes to learning and achievement. That is, being interested in a topic is a mental resource that enhances learning which then, leads to better achievement

Students' interest in science is very important as it motivates students to learn. Musa (2006) defines interest as zeal or willingness to participate in an activity from which one derives some pleasure. According to Derek (2018), individual interest in school science lessons can be defined as a relatively stable and enduring personal emotion comprising affective and behavioural reactions to events in the regular science lessons at school. Interest can be seen as a positive feeling of a student towards a subject. If a student is interested in any subject, such a student will spend more time studying that subject. Such devotion of time to the learning of a subject may most likely, crystallize in greater achievement. However, it is worrisome that studies have shown a decline in interest of students especially in science as the child grows (Bae 2007, Laad, 2011). The authors pointed out clearly that, it is boring for a student to study science topics and difficult to appreciate its value without interest. These perceived problems and lack of interest on the part of the student is caused by in-appropriate use of teaching strategies by the science teachers (Igboko & Ibeneme, 2006). It could also be possible to investigate the gender dimension on students' interest and academic achievement in Biology.

Gender plays a major role in students' interest and achievement in biology. The issue of gender and gender stereotyping permeates every aspect of human endeavor. Okeke (2007)

observed that the consequences of gender stereotyping cut across social, economic, political and educational development, especially in the areas of science and technology. The school knowingly or unknowingly creates gap in gender activities. For example, grouping of subjects in schools encourages stereotyping in the choice of subjects. The grouping of Food and Nutrition/Technical Drawing, Physics/Home management compels the females to choose Food and Nutrition and Home management while the males go for Technical Drawing and Physics (**Bajon, 2015**). However, there have been conflicting reports in respect to gender and achievement in science. Some studies show that, there is a significant difference in achievement of male and female students (Ugwu and Nzewi, 2015) while some, show that there is no significant difference in achievement of male and female students (Godpower-Echie, 2017 and **Mberekpe, 2013**).

It is therefore paramount that, the issue of underachievement in Biology has been a source of worry to parents, policy makers, examination bodies, teachers and the nation as a whole. Efforts have been made by several research bodies like STAN-Science Teachers' Association of Nigeria and individuals to avert this situation but they seem not to have achieved the desired results, judging from the current results published by Examination bodies like the West African Examination Council (WAEC) and the National Examination Council (NECO). Research findings have shown that, several factors militate against improved interest and academic achievement of male and female students in biology. These include the application of wrong and ineffective teaching strategies in schools. Therefore, students' interest and gender as correlates of senior secondary school students' achievement in biology is worth investigating hence, the justification for this study.

Purpose of the study

Generally**,** the study focuses on students' interest as correlates of students' achievement in Biology in Senior Secondary Schools in Udenu Local Government Area of Enugu State. Specifically, the study sought to determine the:

1. Relationship between students' interest in Biology and students' Biology Achievement Test scores.
2. Moderating influence of gender on the relationship between students' interest in Biology and their achievement in Biology.

Research questions

1. What is the relationship between students' interest in Biology and students' Biology Achievement Test scores?
2. What is the moderating influence of gender on the relationship between students' interest in Biology and their achievement in Biology?

Hypotheses

1. There is no significant relationship between students' interest in Biology and their achievement in biology.
2. There is no significant moderating influence of gender on the relationship between students' interest in Biology and their achievement in Biology.

Method

A correlational survey research design was adopted for this study. The study was conducted in Udenu Local Government Area of Enugu State, Nigeria. The population of the study consists of 1452 students (500 males and 952 females) in the 2018/2019 academic session. The students that constituted the population are the SS 1 Students from the above mentioned

Local Government Area of Enugu State, Nigeria. The sample size of this study is 163 Biology students comprising of 71 males and 92 females students. The instruments used for data collection were the Biology Interest Scale (BIS) and the Biology Achievement Test (BAT). The Biology Interest Scale solicited responses on students' interest in Biology while the Biology Achievement Test revealed the students' academic standings. The BIS is made up of 20 items in a four point Likert scale with four response options. They are; Like Very Much (LVM), Like Much (LM), Dislike (D) and Dislike Very Much (DVM). Each item of the BIS has a minimum of one mark and a maximum of four marks which gives a total score of 20 and 80 marks respectively. The BAT was developed using table of specification and has 30 items with four multiple choice options (A-D). Each item carries two marks with a total score of 60 marks.

The two instruments BIS and BAT were subjected to face and content validity by three lecturers in the Department of Science Education, University of Nigeria, Nsukka. Two of them were experts in Biology Education while one was from Measurement and Evaluation. All the corrections given were reflected in the final draft. The BIS and BAT were trial tested on 35 students outside the sampled schools and the data collected were analyzed using Simple Linear Regression and Kuder–Richardson Formula 20 (K-R20). A reliability index of 0.79 and 0.81 were obtained respectively.

The Biology Interest Scale and Biology Achievement Test were administered to the students by their regular biology teachers in the four secondary schools used for the study in Udenu Local Government Area. The instruments were retrieved after students' responses and was marked by their teachers and returned to the researchers. The data collected was analyzed using Simple Linear Regression.

Results

Research question 1: What is the relationship between students' interest in Biology and students' Biology Achievement Test scores?

Table 1

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.569[a]	.323	.319	3.93050

a. Predictors: (Constant), Students' Interest

Data on table 1 shows that the correlation coefficient between students interest and achievement in biology is 0.569 with a coefficient of determination of 0.323. This shows that, there is a positive relationship between students' interest and achievement in biology. Besides, the coefficient of determination of 0.323 means that 32.3% variation in students' achievement can be attributed to their interest in biology.

Ho_1: There is no significant relationship between students' interest in Biology and their achievement in biology.

Table 2

ANOVA [a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1188.754	1	1188.754	76.948	.000[b]
	Residual	2487.258	161	15.449		
	Total	3676.012	162			

a. Dependent Variable: Students Achievement in Biology
b. Predictors: (Constant), Students' Interest

Data on table 2 indicates that there is a significant relationship between interest and achievement. F (1, 161) = 76.948, P=0.000. This is for the fact that the P value of 0.000 is less than level ofsignificance.

Research question 2: What is the moderating influence of gender on the relationship between students' interest in Biology and their achievement in Biology.

Table 3

Gender	R	R^2	Beta	t	Sig.
Male	.248	.061	.248	0.879	0.928
Female	.253	.064	.253		

a. Dependent Variable: Students Achievement
b. Predictors: (Constant), Students Interest

Data on table 3 shows that the correlation coefficient between male students' interest and achievement in biology is 0.245 with coefficient of determination of 0.061 while that of the female students' interest and achievement in biology is 0.253 with coefficient of determination of 0.064. The coefficient of determination of 0.061 and 0.064 for the male and female indicates that 6.1% variation in male students' achievement in biology can be attributed to their interest while 6.4% variation in female students' achievement in biology can also be attributed to their interest.

Ho_2: There is no significant moderating influence of gender on the relationship between students' interest in Biology and their achievement in Biology.

Table 3 reveals that there is no significant moderating influence of gender on the relationship between students' interest and achievement in biology, t(161) = 0.879, P = 0.928.

Discussion

Analysis of data for research question one and the testing of the corresponding hypothesis showed that there was a positive relationship between students' interest and achievement in

Biology. This is expected because it is normal for students' achievement in any subject to be affected by their interest towards the learning of the subject. When students show interest towards learning of Biology, it will definitely make the students to achieve high in the subject and vice versa. This finding is in agreement with the finding of Bae, (2007) whose findings were that there was a significant relationship between students' interest and academic achievement in science. The implication of this finding is that, when students have interest in Biology, their academic achievement improves and vice versa.

The analysis of data for research question two and the testing of the corresponding hypothesis showed that there was no significant moderating influence of gender on the relationship between male and female students' interest and achievement in Biology. This implies that gender does not play a significant role in students' academic achievement in Biology, since they were taught by the same teacher and exposed to same classroom environment. This finding is in agreement with the findings of Godpower-Echie, (2017) and **Mberekpe, (2013)** whose findings are that there was no significant difference between the scores of the male and female students' academic achievement in Biology. This also implies that students' academic achievement in Biology is not majorly dependent on their gender.

Conclusion

This study emphasizes the need to be mindful of students' interest in a subject especially Biology. It established the fact that:

1. Students' interest in Biology correlates with their academic achievement.
2. There is a positive relationship between students' interest scores and their academic achievement scores in Biology.
3. non-significant moderating relationship was found between the scores of male students' interest in Biology and scores of female students' interest in Biology.
4. Non-significant relationship was found between the scores of the male and female s tudents' Biology achievement test scores.
5. The notion of gender disparity in Biology achievement test scores was dismissed.

Recommendations

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

1. Biology teachers need to foster male and female students' interest towards the learning of Biology by engaging students in activity oriented lessons, as this will help to improve students' academic achievement in Biology.
2. Counsellors, parents and guardians should t ry to encourage their children/wards to develop interest towards Biology in secondary schools.
3. Students should be counselled and provided with all the necessary materials like good textbooks that will help arouse their interest in studying Biology.

References

Bae, M. (2007). *Interest in science education.* Edwardsville: Illinois University Press.

Bajon, R. H. (2015). *Effect of mode of laboratory work on senior secondary school students' achievement in Biology in jalingo local government area.* (Unpublished master's thesis). University of Nigeria, Nsukka.

Derek, C. (2018). The key factors affecting students' individual interest in school science lessons. *International Journal of Science Education, 40* (1), 1-23

Federal Republic of Nigeria (2009). National policy on education. Abuja: NERDC Press

Godpower-Echie, G. I. S. (2017). Influence of gender on interest and academic achievement of students in integrated science, Obio Akpor local government area of Rivers State. *European Scientific Journal 13*(10) 272-279.

Igoko, K.O. & Ibeneme, O.T. (2006).Effects of some cognitive constructivist instructional approaches on students' achievement and retention in the study introductory technology in Nigeria. *Journal of the Science Teachers Association of Nigeria, 41 (1&2), 37-43.*

Laad, M. (2011). Causes responsible for declining interest of students in learning physics at higher level. *International Journal of Pure and Applied Physics, 7*(2), 151-158.

Mberekpe, A. C. (2013). *Effect of students improvised instructional materials on senior secondary school students' achievementinbiology.* (Unpublished master's thesis). University of Nigeria, Nsukka.

Musa, D. C. (2006). *Effect of incorporating practical into mathematics education on senior secondary school students' achievement and interest in mathematics*. (Unpublished M.Ed thesis), Department of Science Education, University of Nigeria, Nsukka.

Okeke, E. A. C. (2007). Making Science Education Accessible to all. 23rd Inaugural Lecture Series, University of Nigeria, Nsukka.

Rennie, S., Dieking, P. & Falk, S. (2013). *Level of students' participation in senior secondary practical physics.* Retrieved from http://www.sc.world.res.ref.

Ugwu, C. B. & Nzewi, U. M. (2015). *Effects of two instructional delivery approaches on senior secondary school students' achievement and retention in Biology.* (Unpublished M.Ed thesis). University of Nigeria, Nsukka.

Umar, A. A. (2011). Effects of biology practical activities on students' process skill acquisition in Minna, Niger State, Nigeria. *Journal of Science Technology, Mathematics and Education,7*(2), 118–126.

West African Examination Council (2011). Chief Examiners' reports. Lagos: WAEC

WAEC (2018). *West African Examination Council*. May/June Chief Examiner's response retrieved 10/09/2019.

MATHEMATICAL ANALYSES OF DIFFERNTIAL EFFECTS OF TYPING TUTOR SOFTWARE ON PUBLIC AND PRIVATE SECONDARY SCHOOLS STUDENTS' SPEED AND ACCURACY IN COMPUTER KEYBOARD OPERATIONS IN EBONYI STATE

BY

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Abstract

The purpose of this study was to mathematically determine the Effects of Typing Tutor Software on Public and Private Secondary School Students' Speed and Accuracy in computer keyboard operations in Ebonyi State. Quasi experimental research design was adopted for the study. Four research questions and six hypotheses guided the study. Proportionate stratified random sampling techniques were used to draw 287 senior secondary school two (SS2) students from four secondary schools in Ebonyi state. Computer Keyboard Operations Speed and Accuracy Test (COKOSAT) was used for data collection. The instrument was validated by three research experts. Mean and standard deviation were used to answer the research questions while analysis of covariance (ANCOVA) was used to test the hypothesis at .05 level of significance. Major findings of the study revealed that students taught computer keyboard operations with typing tutor software attained higher speed and accuracy than those taught with expository method, with no significant difference between the speed and accuracy of students in public and private schools. It was recommended among other things that use of typing tutor software for teaching secondary school computer keyboard operations should be adopted by all public and private secondary schools in Ebonyi State.

Introduction

The importance of computer in present day education cannot be over emphasized. John (2017) averred that computer might be brought into play to handle the incredibly complex ventures that are keys for more individualized learning. The computer can present definite test, give extended programs to suit solitary needs, and outfit prescriptive assignments that may suggest the understudy/student to a course book, an examination of laboratory or an advice with the teacher. John added that the computer is determined and consistent in its strategy for operation, as it doesn't encounter the evil impacts of tiredness or nonappearance of attentiveness like people. Computer carries out multi-valuable parts in teaching and learning strategies at all levels. At the vital and higher levels of education, students can research and make learning through computer program. In schools, computer can be brought into play to store the step by step or week by week impression of examinations. It can be exercised to mix and separate shading or colors, scan, draw, layout diverse things and make graphs and outlines for instructional purposes. Information can be secured in manual records in the computer magnetic disks and recouped when required, (John, 2017).

Undoubtedly, secondary school students cannot harvest these benefits of computer except they master the computer keyboard operations. This is because the keyboard is the primary or most commonly available computer input device. A computer keyboard is a typewriter-style device which uses an arrangement of buttons or keys to act as mechanical levers or electronic switches. Neso (2015) narrated that following the decline of punch cards and paper tape, interaction via teleprinter-style keyboards became the main input method for computers. Keyboard keys (buttons) typically have characters engraved or printed on them, and each press of a key typically corresponds to a single written symbol. However, producing some symbols may require pressing and holding several keys simultaneously or in sequence. While most keyboard keys produce letters, numbers or signs (characters), other keys or simultaneous key presses can produce actions or execute computer commands.

Gbemisola (2016) stated that in normal usage, the keyboard is used as a text entry interface for typing text and numbers into a word processor, text editor or any other program. In a modern computer, the interpretation of key presses is generally left to the software. A computer keyboard distinguishes each physical key from every other key and reports all key presses to the controlling software. Keyboards are also used for computer gaming either regular keyboards or keyboards with special gaming features, which can expedite frequently used keystroke combinations. A keyboard is also used to give commands to the operating system of a computer, such as Windows' Control-Alt-Delete combination.

Mastery of computer keyboard operations according to Nuhu (2016) can be seen in a student's speed and accuracy in handling the keyboard. This mastery, Nuhu argued is a predictor of students' speed and accuracy in computer studies. Nuhu therefore alleged that students perform poorly in computer studies mainly because they lack adequate keyboard operational skills. Ilyasu (2016) further collaborated Nuhu's view and further blamed the problem of students' computer keyboard operations inefficiency to inadequate teaching strategies adopted by secondary school teachers. According to Ilyasu, most secondary school computer teachers adopt lecture method for teaching computer studies.

Lecture method of teaching refers to that teaching method in which the teacher gives a comprehensive description or explanation of an idea or a topic to a listening audience (class).

As a remedy to problems of use of lecture teaching methods in secondary schools, Nneji (2011) recommended the use of effective teaching method which is in tune with the modern scientific and technological dispensation. Nneji specifically recommended the use of any computer aided instruction. Evidently, the typing tutor software is one of the innovations that is in tune with the most recent technologies. Similarly, Byke (2017) described typing tutor software as social situations where-in the teacher and/or the pupils perform moves, counter moves and other maneuvers which are by certain rules prescribed as agreed upon. Typing tutor software combine amusement and pleasure with instruction in order to make the subject more interesting. However, as interesting as typing tutor software may sound in teaching computer studies, researchers still vary in their opinions as regards its effects on secondary school students' interest, speed and accuracy in computer keyboard operations.

The typing tutor software is a combination of self-based instructor and again. Typing tutor software has an activity or a sport with rules in which people or teams compete against each other or a social activity with a set of rules in which the hallmark is to win. Typing tutor software are, thus, recreational activities which teach students how to utilize their leisure time in constructive manner, (Hanks, 2017). Audu (2015) and Hanks (2017) found it to be very useful in promoting secondary school students interest, speed and accuracy in computer keyboard operations. Contrarily, Nuhu (2016) and Byke (2017) reported that typing tutor software distracted the students hence, inhibiting the students' interest, speed and accuracy in computer keyboard operations. More so, Gbemisola (2016) and Rabbat (2017) found no significant difference between the computer keyboard operations speed and accuracy of students taught with typing tutor software and their counterparts taught without it. These conflicting findings justify the need for another study such as this present one to determine the actual effect of typing tutor software on secondary school students' speed and accuracy in computer keyboard operations.

Purpose of the Study

The purpose of this study was to mathematically determine the Effects of Typing Tutor Software on Secondary School Students' Speed and Accuracy in computer keyboard operations in Ebonyi State. Specifically, the study aimed at determining the effects of Typing Tutor software on Senior Secondary School Two (SS2) Students';

1. Speed in computer keyboard operations
2. Accuracy in computer keyboard operations
3. Speed in computer keyboard operations with regard to their school ownership (public/private) and
4. Accuracy in computer keyboard operations with regard to their school ownership (public/private)

Research Questions

The following research questions guided the study

1. What are the mean computer keyboard operations speed score of the students in both treatment and control groups in pretest and posttest?
2. What are the mean computer keyboard operations accuracy scores of the students in both treatment and control groups in pretest and posttest?

3. What are the mean computer keyboard operations speed scores of the students in public and private secondary schools in both treatment and control groups in pretest and posttest?
4. What are the mean computer keyboard operations accuracy scores of the students in public and private secondary schools in both treatment and control groups in pretest and posttest?

Hypotheses

The following research hypotheses were tested at .05 level of significance

1. There is no significant difference between the mean computer keyboard operations speed scores of students in the treatment and control groups.
2. There is no significant difference between the mean computer keyboard operations accuracy scores of students in the treatment and control groups.
3. There is no significant difference between the mean computer keyboard operations speed scores of students in public and private secondary school in treatment and control groups.
4. There is no significant difference between the mean computer keyboard operations accuracy scores of students in public and private secondary school in treatment and control groups.
5. There is no significant interaction between teaching strategy and school ownership on students' mean speed scores in computer keyboard operations.
6. There is no significant interaction between teaching strategy and school ownership on students' mean accuracy scores in computer keyboard operations.

Methodology

Quasi experimental research design was adopted for the study. Purposive stratified and simple random sampling techniques were used to draw 287 (SS2) students from eight intact classes in four secondary schools from the area of study. instrument used for data collection was Computer Keyboard Operations Speed and Accuracy Test (COKOSAT) constructed by the researchers and validated by three research experts. The instrument yielded a reliability coefficient of .71. The researchers trained four regular computer teachers in the four secondary schools that was used in the study for a period of two weeks on the use of typing tutor software. Foremost, COKOSAT was administered to all the subjects of the study as pretest. Thereafter, the treatment was administered for a period of six weeks. Treatment group in each school was taught with typing tutor software, while the control group was taught with lecture method. At the expiration of the treatment period, the COKOSAT was re-administered to all the students as posttest. All the tests administered were scored by the researchers using already made marking scheme. Research questions were answered using mean with standard deviation while the hypotheses were answered using analysis of covariance (ANCOVA).

Results

Research Question 1

What are the mean computer keyboard operations speed score of the students in both treatment and control groups in pretest and posttest?

Table 1: Mean speed scores and standard deviation of treatment and control groups in pretest and posttest.

Group	n	Pretest		Posttest	
		Mean	SD	Mean	SD
Treatment	146	28.07	10.21	59.27	1.01
Control	141	29.11	11.46	41.04	6.77

From table 1, the pretest mean speed score and standard deviation of the treatment group were 28.07 and 10.21 respectively and the posttest were 59.27 and 1.01 respectively. For the control group, the pretest mean speed score and standard deviation were 29.11 and 11.46 respectively while the posttest were 41.04 and 6.77 for mean speed score and standard deviation respectively.

There was not much difference between the two groups in the pretest but there was an appreciable difference in the posttest. The treatment group attained higher speed than their counterparts in the control group. The standard deviation values of both groups in pretest did not differ much however; the treatment group had lower standard deviation value than the control group in posttest, indicating that the mean speed score for treatment group was more reliable.

Research Question 2

What are the mean computer keyboard operations accuracy scores of the students in both treatment and control groups in pretest and posttest?

Table 2: Mean accuracy scores and standard deviation of treatment and control groups in pretest and posttest.

Group	n	Pretest		Posttest	
		Mean	SD	Mean	SD
Treatment	146	33.45	6.51	70.22	0.34
Control	141	34.23	7.04	50.70	3.61

From table 2, the pretest mean accuracy score and standard deviation of the treatment group were 33.45 and 6.51 respectively and the posttest were 70.22 and 0.34 respectively. For the control group, the pretest mean accuracy score and standard deviation were 34.23 and 7.04 respectively while the posttest were 50.70 and 3.61 for mean accuracy score and standard deviation respectively.

There was not much difference between the two groups in the pretest but there was an appreciable difference in the posttest. The treatment group was more accurate than their counterparts in the control group. The standard deviation values of both groups in pretest did not differ much however; the treatment group had lower standard deviation value than the control group in posttest, indicating that the mean accuracy score for treatment group was more reliable.

Research Question 3

What are the mean computer keyboard operations speed scores of the students in public and private secondary schools in both treatment and control groups in pretest and posttest?

Table 3: Mean speed scores and standard deviation of public and private schools' students in pretest and posttest.

Group	n	Pretest		Posttest	
		Mean	SD	Mean	SD
Public (Treatment)	76	27.93	8.41	59.01	1.22
Private (Treatment)	70	29.00	7.13	60.46	1.04
Public (Control)	80	30.04	9.23	40.81	3.04
Private (Control)	61	28.76	8.33	42.10	3.11

From table 3 above the posttest mean speed score of the public (Treatment) was 59.01 while that of private (Treatment) was 60.46. Similarly, the posttest mean score of the public (control) was 40.81 while that of private (Control) was 42.10. This result suggests that both treatment groups (public and private) attained equal speed and both control groups (public and private) attained equal speed.

Research Question 4

What are the mean computer keyboard operations accuracy scores of the students in public and private secondary schools in both treatment and control groups in pretest and posttest?

Table 4: Mean speed accuracy and standard deviation of public and private schools' students in pretest and posttest.

Group	n	Pretest		Posttest	
		Mean	SD	Mean	SD
Public (Treatment)	76	33.05	6.24	69.81	0.91
Private (Treatment)	70	32.66	6.08	70.11	0.48
Public (Control)	80	33.44	7.01	51.29	4.24
Private (Control)	61	44.18	6.21	50.03	3.71

From table 4 above the posttest mean accuracy score of the public (Treatment) was 69.81 while that of private (Treatment) was 70.11. Similarly, the posttest mean score of the public (control) was 51.21 while that of private (Control) was 50.03. This result suggests that both treatment groups (public and private) attained equal accuracy and both control groups (public and private) attained equal accuracy.

Hypothesis 1

There is no significant difference between the mean computer keyboard operations speed scores of students in the treatment and control groups.

Hypothesis 3

There is no significant difference between the mean computer keyboard operations speed scores of students in public and private secondary school in treatment and control groups.

Hypothesis 5
There is no significant interaction between teaching strategy and school ownership on students' mean speed scores in computer keyboard operations.

Table 5: ANCOVA analyses of the students' Speed scores

Source	Sum of Squares	DF	Mean Square	F	Sig.	Remark
Corrected Model	811.233	3	270.411	8.384	0.000	
Intercept	702.001	1	702.001	21.765	0.000	
Method	881.031	1	881.031	27.315	0.001	Significant
School ownership	333.101	1	333.101	10.327	0.101	Not significant
Method*School ownership	412.384	1	412.384	12.786	0.111	Not significant
Error	9031.202	280	32.254			
Total	12170.952	287				

Method (treatment and control) as main effect gave an f value of 27.315 and this significant at 0.001. Since 0.001 is less than .05, this means that at .05 significant level, the f value of 27.315 is significant. Therefore, hypothesis 2 is rejected as stated, indicating that there is a significant difference between the mean speed scores of students in the treatment and control groups.

School ownership as main effect gave an f value of 10.327 and this is significant at 0.101. Since 0.101 is greater than .05, this means that at .05 significant level, the f value of 10.327 is not significant. Therefore hypothesis 5 is not rejected as stated, indicating that there is no significant difference between the mean speed scores of public and private school students.

The interaction effect (method*school ownership) gave an f value of 12.786 which is significant at 0.111. Since 0.111 is greater than .05, this means that at .05 significant level, the f value of 12.786 is not significant. Therefore, hypotheses 8 is not rejected as stated, indicating that there is no significant interaction effect between method and school ownership on students' speed in computer keyboard operations in this study.

Hypothesis 2
There is no significant difference between the mean computer keyboard operations accuracy scores of students in the treatment and control groups.

Hypothesis 4
There is no significant difference between the mean computer keyboard operations accuracy scores of students in public and private secondary school in treatment and control groups.

Hypothesis 6
There is no significant interaction between teaching strategy and school ownership on students' mean accuracy scores in computer keyboard operations.

Table 6: ANCOVA analyses of the students' Accuracy scores

Source	Sum of Squares	DF	Mean Square	F	Sig.	Remark
Corrected Model	201.188	3	67.063	1.723	0.011	
Intercept	97.203	1	97.203	2.496	0.010	
Method	79.111	1	79.111	2.032	0.010	Significant
School ownership	350.002	1	350.002	8.991	0.092	Not significant
Method*School ownership	203.404	1	203.404	5.225	0.100	Not significant
Error	10900.011	280	38.929			
Total	11830.919	287				

Method (treatment and control) as main effect gave an f value of 2.032 and this significant at 0.010. Since 0.010 is less than .05, this means that at .05 significant level, the f value of 2.032 is significant. Therefore, hypothesis 3 is rejected as stated, indicating that there is a significant difference between the mean accuracy scores of students in the treatment and control groups.

School ownership as main effect gave an f value of 8.991 and this is significant at 0.092. Since 0.092 is greater than .05, this means that at .05 significant level, the f value of 8.991 is not significant. Therefore hypothesis 6 is not rejected as stated, indicating that there is no significant difference between the mean accuracy scores of public and private school students.

The interaction effect (method*school ownership) gave an f value of 5.225 which is significant at 0.100. Since 0.100 is greater than .05, this means that at .05 significant level, the f value of 5.225 is not significant. Therefore, hypotheses 9 is not rejected as stated, indicating that there is no significant interaction effect between method and school ownership on students' accuracy in computer keyboard operations in this study.

Discussions

The findings of this study imply that teaching computer is not just transmitting an immutable body of knowledge that students have to accept as a perennial fact without any reasoning. Since computer is an empirical activity, computer learners are in position of constructing their own knowledge regardless of how different the methodology may be. Computer teachers should strive to teach for understanding of computer concepts and procedures. The 'why' something works and not only the 'how' should be emphasized. Computer teachers should bear in mind that it is often possible for learner's to learn the 'how' (that is procedures) mechanically without understanding 'why' it works (that is conceptual knowledge). Procedures learnt this way are often forgotten easily. Conceptual and procedural understanding actually help each other. Conceptual knowledge is important for the development of procedural fluency. While fluent procedural knowledge supports the development of further conceptual understanding. The findings of this study show that typing tutor software in computer can facilitate both conceptual and procedural understanding when properly utilized.

Furthermore, the findings of this study and the conflicting results of reviewed empirical studies imply that well designed typing tutor software have the potentials to promote students' speed and accuracy in computer keyboard operations. Hence, designers should bear in mind that the arousal features of typing tutor software need not overshadow the

intended lessons. The play and amusement features of typing tutor software should elicit both emotional and cognitive interest of learners. Seductive details should be eliminated. Typing tutor softwares should be designed as simple as possible. Hence, with minimum computer literacy or proficiency, a computer teacher can use it to teach profitably. Moreso, the findings of this study imply that students taught computer keyboard operations with typing tutor software can achieve very well regardless of their school type (public or private). To survive in this competitive generation, all school proprietors have to adopt computerization both in administration and the teaching/learning process. The era of buying computers and keeping them without putting them to use should be over. Adequate provisions (both financial and human) must therefore be made to ensure that students are taught with typing tutor software.

The findings of this study have serious implications to the student. This is because the typing tutor software, as a constructivist process, is a student-centered instructional method. In student-centered instructional methods, generally, the students are in charge. The teacher offers minimal guides and allows the students to construct their own understanding by seeing relationships between incoming information and their previous knowledge. Students thus, determine their own knowledge based on their own way of processing information and according to his or her own beliefs and attitudes towards learning. From the foregoing, students taught computer keyboard operations with typing tutor software are expected to develop skills for indepth analysis of any given computer problem. These skills will enable them think reflectively, creatively and productively. Since typing tutor software is student-centered, it implies that if the process fails, s tudents should bear commensurate blames.

Conclusions

Based on the findings of this study, the following conclusions were made;

1. The students taught computer keyboard operations with typing tutor software attained higher speed than those taught with expository method.
2. The students taught computer keyboard operations with typing tutor software achieved higher accuracy than those taught with expository method.
3. Public and private secondary schools students taught computer keyboard operations with typing tutor software did not differ significantly in their speed.
4. Public and private secondary schools students taught computer keyboard operations with typing tutor software did not differ significantly in their accuracy.
5. There was no significant interaction between teaching methods and school ownership on the student's speed and accuracy in computer keyboard operations.

Recommendations

From the finding of this study, the following recommendations are made:

1. Use of typing tutor software for teaching secondary school computer keyboard operations should be adopted by all public and private secondary schools in Enugu State.
2. Nigerian computer teacher education curriculum should emphasize use of typing tutor software in teaching practice exercises to avail teachers more practical knowledge during their training.
3. Periodic practical oriented workshops and seminars should be organized for computer teachers on use of typing tutor software for teaching computer keyboard operations.

4. Computer sets, projectors, electricity generating sets, impress for petrol or diesel and fortified security networks should be provided for all secondary schools by their proprietors.

References

Audu, O.B. (2015) Effect of Typing Tutor Software on Students' Performance in Computer Keyboard Operations in Secondary Schools in Kogi state. *International Journal of Science and Technology, 3(2),* 661-678. www.ABSTRACT/IJSC/133231004/IOURNEWWORLD.com

Byke, W.S. (2017) Effect of Typing Tutor Game on Students' Interest, Speed and Accuracy in Manipulating the Computer Keyboard demonstration high school in New Jersey. *Journal of Interdisciplinary Research in Information and Communication Technology,17 (3), 488-501*.scienceworld.net

Gbemisola, B.H. (2016) Effect of Typing Tutor on Students' Interest, Speed and Accuracy in Computer Keyboard Operationsin LekiPennisular Lagos state. *Journal of Multi-disciplinary Research in Computer and Informatics, 11 (2), 705–722.* http://www.synopses @JMIRCI.hi-techmedia.org

Hanks, M. (2017) Effect of Typing Tutor Software on Students' Performance in Computer Keyboard Operations in Scottish high schools. *Journal of Interdisciplinary Research in Information and Communication Technology, 17(3), 103-119*.scienceworld.net

Ilyasu, T. (2016) *Teaching Computer Creatively.* Kaduna: Tudunwada press.

John, F.C. (2017) *Techniques in Computer Keyboards Operations*.www.amazonbooks.org

Neso, Y. (2015) Challenges and Prospects of Computer Education in Developing Nations. *International Journal of Science and Technology, 3(2),* 159-177. www.ABSTRACT/IJSC/133231004/IOURNEWWORLD.com

Nneji, S.O. (2011) Mathematics, a Veritable Tool for Facilitating Creative Thinking: Imperatives for Tertiary Education for Sustainable Development. *ESUT Journal of Education (ESUTJE) 5(3).*pp 103-114

Nuhu, A.H. (2016) Effect of Typing Tutor Software on Secondary Students' Interest, Speed and Accuracy in Manipulating the Computer Keyboard in Ilorin Education Zone of Kwara

Rabbat, D. (2017) Effect of Online Typing Tutor on Students' Interest, Speed and Accuracy in Computer Keyboard Operations in New Delhi, India. International *Journal of Computer Sciences, 5(1),* 292-314. http://www.IJCS/ICTedu.org

EFFECT OF VISUAL BASIC COMPUTER AIDED INSTRUCTION ON ACADEMIC ACHIEVEMENT OF JUNIOR SECONDARY SCHOOL STUDENTS IN MATHEMATICS IN AGBANI EDUCATION ZONE OF ENUGU STATE

BY

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Abstract

This paper investigated the effect of Visual Basic Computer Aided Instruction (CAI) strategy on the academic achievement of JS students in mathematics. Two research questions and two null hypotheses guided the study. Quasi-experimental pre-test and post-test, non-equivalent group design was adopted for the study. A sample of 150 JS1 students drawn by both purposive and random sampling techniques from secondary schools in Agbani education zone of Enugu state was used for the study. The instrument for data collection was the Mathematics Achievement Test (MAT) which was face and content validated by experts. It had a reliability coefficient of 0.98 using K-R20 and SPSS reliability analysis-scale (alpha). Mean and standard deviation were used to answer the research questions, while Analysis of Covariance (ANCOVA) was used to test the hypotheses at 0.05 level of significance. The result of the data analyses showed that there is a significant difference in the achievement of students taught using Visual Basic CAI approach and those taught using the conventional method in favour of Visual Basic Computer Aided Instruction approach; also it revealed that there is no significant difference between the males' and the females' achievement in mathematics when exposed to the Visual Basic CAI strategy. Sequel to the above findings, it was recommended that both the state and federal governments should adopt the Visual Basic CAI strategy for junior secondary schools in the country since it promotes academic achievement in mathematics and is also gender friendly. Researchers should also explore more of the CAI strategies in other parts of the country.

Key words: Mathematics, CAI (Computer Aided Instruction), Visual Basic

Introduction

The role of mathematics in science, technology and national development can never be over emphasised. Mathematics is the systematic treatment of magnitude, relationships between figures and forms, and relations between quantities expressed symbolically (Koirala, 2005). It thus uses signs, symbols and proofs. It is the science of numbers and shapes (Hornby, 2015). The branches of mathematics include arithmetic, algebra, geometry and trigonometry. The applications could be seen everywhere and in all walks of life; kitchen, market and education to mention but a few. Mathematics Education is a major factor for success in all secondary schools whether at the lower basic or upper basic level. This so important core subject has become paramount to technological

development and vocation in our nation-Nigeria(Ejakpovi and Uveruveh,2013). This is the reason Okafor and Anaduaka(2013) asserted that every individual requires the knowledge of mathematics to function effectively and efficiently in today's world irrespective of one's job or profession.

Despite the importance of mathematics in education and national development, students' academic achievement in mathematics in internal and external examinations remains low. For example, in Nigeria, remarkable poor performance in mathematics was observed by the West African Examination Council's chief examiners over the years (WAEC, 2007-2011). In May/June 2011, only 38.93% of the candidates obtained credit and above in Mathematics, while 55.34% obtained credit and above in English language (Uwadie, 2011). Also, the reports from the WAEC chief examiner indicate that the general performance of the candidates in Mathematics for the May/June 2011, 2013, and 2015 examinations did not differ significantly from those of the preceding years. Kurumeh and Imoke(2008) stated earlier that this ugly trend in achievement in mathematics at the secondary school level is attributed to a very weak mathematics foundation, which begins in the primary level and is carried over to the junior secondary level, and culminated in senior secondary. The conventional methods of teaching which include lecture, demonstration, individualized instruction, discussion, inquiry approach, field trips, projects method, textbook, and questioning method(Akubuilo, 2010) seem not effective enough to equip the students with the necessary knowledge, skills and abilities required to perform effectively in examinations. The conventional teaching methods have been used to teach mathematics by qualified and dedicated teachers, yet the problem of low achievement in mathematics internal and external examinations persisted especially in mensuration and geometry aspects of mathematics. Some innovative strategies have also been used, yet the problem continued. There are speculations about the efficacy of some computer innovative strategies. Some of them are yet to be investigated.

Having tried the conventional and some innovative methods, and having found and adopted none outstandingly, there is no other option than to continue to investigate more innovative strategies. The Computer Aided Instructions (CAIs) are among the novel strategies. There are many claims and speculations about their efficacy in teaching and learning. Most of them are yet to be verified, especially in this part of the country. Now that computer is taking over everything, these claims could be investigated, to see if they would solve our mathematics problems. Hence, this study sought to investigate one of these innovative strategies, 'Computer Aided Instruction (CAI) - developed with visual basic programming language' called Visual Basic CAI, to find out its impact/effect on the academic achievement of students in geometry (plane and three dimensional figures).

Geometry is an important branch of school mathematics. Specifically, research reports revealed that most students haphazardly attempted geometry questions or avoided them completely especially those of the essay test items and problem solving type(WAEC,2007). Many people such as Odogwu(2002), Kurumeh(2007), and Gambari, Ezenwa and Anyanwu(2014) have explored the effects of some novel methods on students' achievement and interest on geometry but got varied results especially on male and female performance. In the light of this, more innovative methods or strategies should be investigated in geometry.

Computer Aided Instruction(CAI) is a novel strategy. It is a software device that assists the teaching and learning process(Saddiq,2004). Ipso facto(By this single fact mentioned, "assists the teaching and learning process"), it is also called Computer Assisted Instruction. There are different types of educational computer use, and not every use of a computer in the classroom is considered computer assisted instruction(Harris, 2013). The educational uses of computers that are considered to be computer assisted instruction(CAI) are those cases in which either instruction is presented through a computer program to a student, or the computer is the platform for an interactive and personalized learning environment. For example, the use of power point to present or deliver a lesson is not CAI. CAIs come in different modes and forms. They are developed using different programming languages by experts. This can influence their efficacy. Examples of the programming languages are Java, C++, Python, PHP, SQL, Pascal, QBASIC, Ruby and Visual Basic(Ozo-china, 2016). Quality CAIs like many Visual Basic CAIs have many distinctive features which can be incorporated into the teaching of mathematics. The advantages of quality CAIs in general include firstly, Immediate feedback: The immediate feedback provided by interactive terminals keeps students interacting and eager to keep trying. Secondly, Active participation: Even weaker students are obliged to participate actively. They used to remain passive in lectures. Thirdly, No annoyance: The computer will wait patiently for an answer and does not express annoyance with wrong response. Fourthly, Graphics facility: Interactive graphics make it possible to sample many more illustrations that could not easily be shown in a textbook. Fifthly, Accurate data: Large volumes of data can be handled with accuracy and without drudgery; and lastly Enrichment of course: The novel technique/strategy provides enrichment of course through added variety(Sen, 2010). Since many conventional methods and some innovative methods have been used to teach mathematics, yet the problem of poor performance continued, what strategy then could be used to increase achievement and promote learning of mathematics among our students? Sequel to this problem put as a question, the investigation of this novel strategy,-Visual Basic CAI becomes imperative in this part of the country.

Visual Basic is a high level computer programming language. It is derived from BASIC programming languages. It is the most successful programming language in the history of programming(Mabbutt, 2017). The main reason for the first version of visual basic was to make it a lot faster and easier to write programs for the new graphical windows operating system. It is a Microsoft window programming language. Visual basic programs are created in an integrated development environment(IDE), which allows the programmer to create, run and design visual basic programs conveniently(Hassan, Abolarin and Jimoh, 2007). Through several enhancements to BASIC languages and with the development of Microsoft windows graphical user interface(GUI) in the late1980's, visual basic emerged finally in 1991 by Microsoft corporation. Visual Basic provides powerful features such as graphical user interface, events handling access to Win 32 API, object-oriented features, error handling, structured programming, and supports Rapid Application Development(RAD). QuickBasic + Ruby =Visual Basic. Soffar(2017) on the other hand stated that it nevertheless has some shortcomings. For instance, programs written in

visual basic cannot easily be transferred to other operating systems. Also, more memory space is required to install and work in Visual Basic as visual basic(VB) is GUI based.

In the light of the above persistent problems of mathematics achievement, teaching and learning, and the claims on CAI efficacy, the exploration of the above described innovativeVisual Basic CAI strategy becomes imperative since Visual Basic CAI has numerous distinctive features which can be injected into the teaching of geometry. This study therefore sought to find out: (i) if this visual basic CAI would make the students achieve significantly higher in geometry tests, and (ii) if this visual basic CAI would favour the males and females equally.

The purpose of this study was to investigate the effect of Visual Basic Computer Aided Instruction on academic achievement of junior secondary school students in mathematics. Specifically, the study sought to:

1. determine the effect of Visual Basic CAI on the mean achievement of JSS students in geometry.
2. determine the effect of Visual Basic CAI on the mean achievement of male and female JSS students in geometry.

The study was guided by the following questions:

1. What is the effect of Visual Basic CAI on the mean achievement scores of JSS students in geometry ?
2. What are the mean achievement scores of male and female students taught geometry using Visual Basic CAI?

The following null hypotheses were tested at 0.05 level of significance

1. There is no significant difference between the mean achievement scores of students taught geometry using CAI(visual basic) and those taught using lecture method.
2. There is no significant difference between the mean achievement scores of male and female students taught using the CAI(visual basic) strategy.

Research Method

This is a quasi-experimental study. It was conducted in Enugu South Local Government Area, Agbani Education zone of Enugu state. This area was chosen because no evidence of such study in that area or zone has been found. Intact classes were used. The population of the study comprised all the 7,656 JS1 students of the public schools in the zone. The sample consisted of 150 students (77 in Visual Basic CAI group and 73 in lecture group) from the schools used. The choice of JS1 was because a positive outcome/result of this study calls immediately for the application of the novel strategy at the grass root level of the secondary school education. The earlier it is introduced in schools, the better the students' result at the senior and WAEC/NECO stage, since this problem of mathematics, -this ugly trend in achievement in mathematics at the secondary school level is attributed to a very weak mathematics foundation, which begins(even) in the primary level and is carried over to the junior secondary level, and culminated in senior secondary(Kurumeh and Imoke, 2008).Four(4) schools were used for this study.They were purposively selected based on the schools that met the requirements for the study in the area. The requirements include availability of functioning computers and steady electric power supply. Intact classes were used. They were randomly assigned to the treatment and control groups after the purposive selection of the qualified schools for the study. The experimental group (taught with Visual Basic

CAI) was made up of one male and one female school. The control group(taught with lecture method) was also made up of one male and one female school.

The instrument for data collection was the Mathematics Achievement Test (MAT). It contained twenty five multiple choice questions developed from the content (plane and three dimensional figures) according to JS1 mathematics curriculum for the term. The instrument for data collection was both face and content validated by experts. The content validity was ensured using the test blue print(table of specification with reference to the scope of the study). The reliability of the instrument was established through pilot test on a group of JS1 students not used in the study. It had a reliability coefficient of 0.98 using Kuder-Richardson formula 20 (K-R20) and SPSS reliability analysis-scale(alpha).

Experimental Procedure: The MAT was first administered to the subjects, sample experimental and control groups, as pre-test and collected back before the start of the experiment proper. The treatment lasted for five weeks. It was followed by the administration of the post-test to both groups. The scripts for the pre-test and post-test were marked and the scores recorded.

Control of Extraneous Variables: Necessary precautionary measures were taken to control extraneous variables. For instance, Teacher bias: The normal class teachers were used. Teachers differ in the way they present materials to the subjects. To control this variable, the researcher organized a pre-experimental briefing or meeting with the teachers that were used for the experiment. The researcher also drew a clear instructional material for the study and trained all the class teachers whose classes form the sample for the study. They were told exactly what to do. Furthermore, the researcher demonstrated, illustrated and explained as much as possible to see that the teachers comply with the specifications of the study. They conducted the experiment in their individual schools and classes. Thus, the subjects' class teachers were prepared and used as the research assistants for the exercise to check teacher bias. Hawthorne-placebo effect: This is the effect of subjects having the knowledge that, they are participating in an experiment. Definitely, they would be biased and this will affect the result of the experiment. To control this, the researcher used the regular teachers of the different groups to administer the treatment in addition to the precautions and the strategies or measures applied for the first variable (teacher bias). Maturation effects: The duration of the experiment was five weeks to check maturation effect; also the students were reminded from time to time that roll calls would be taken at the beginning and at the end of each lesson of the experiment, to check experimental mortality and irregular participation.

Mean and standard deviation were used to answer the research questions (Tables 1 and 2 below), while Analysis of Covariance (ANCOVA) was used to test the hypotheses at 0.05 level of significance(Tables 3 and 4 below).The decision rule was to reject the null hypothesis when the level of significance exceeds the given probability level.

Results

Research Question 1

What is the effect of Visual Basic CAI on the mean achievement scores of JSS students in geometry ?

Table 1: Mean Score and Standard Deviation of Students' Achievement for the two groups in Geometry.

Groups	N	Mean	Standard dev.
Visual Basic CAI approach	77	19.16	2.81
Lecture method	73	12.10	3.22

Table 1 above shows the mean achievement scores of students taught Geometry with CAI (visual basic) approach and those taught with lecture method. Students taught with CAI approach have mean score of 19.16 while students taught the same topics in Geometry with conventional (lecture) approach have mean score of 12.10. The result showed that students taught with CAI approach performed significantly better in Geometry than those taught with conventional approach.

Research Question 2

What are the mean achievement scores of male and female students taught geometry using CAI (visual basic)?

Table 2: **Mean Score of males and females taught with Visual Basic CAI approach**

Students	Mean	Standard deviation	N
Male	18.91	2.79	38
Female	19.42	2.91	39

In table 2 above the male students taught Geometry with Visual Basic CAI approach had mean score of 18.91 with standard deviation of 2.78 while the female students taught same topics in geometry with the same Visual Basic CAI approach had mean score of 19.41 with standard deviation of 2.90. The female students performed slightly better than their male counterparts taught the same topic with the same Visual Basic CAI approach.

Hypotheses 1

There is no significant difference between the mean achievement scores of students taught geometry using Visual Basic CAI approach and those taught using lecture method.

Table 3:***Analysis of Co Variance of Students'Overall Achievement scores by teaching methods.***

Source of variation	Sum of squares	DF	Mean square	F cal	f-probability
Covariates (Pretest)	475.145	1	475.145	80.371	.000
Main Effects	2196.138	2	1098.068	185.742	.000
Method	2695.431	1	2194.964	371.288	.000
Residual	975.442	165	5.912		
Total	3670.873	169	21.721		

For hypothesis 1, the ANCOVA table shows that at the level of significance (0.05), F calculated is greater than the F-probability value (.000). The decision rule is to reject the null hypothesis when the level of significance exceeds the given probability level. Since the level of significance is greater than the f-probability value, the null hypothesis was rejected. This implies that there is a significant difference in the mean achievement scores of students taught Geometry using Visual Basic CAI approach and those taught Geometry using the conventional (lecture) approach.

Hypothesis 2

There is no significant difference between the mean achievement scores of male and female students taught using the Visual Basic CAI strategy.

Table 4: **Analysis of Co-Variance of Mean Achievement Scores of male and female students taught geometry using Visual Basic CAI approach(experimental groups)**

Source of variation	Sum of squares	DF	Mean square	F cal	F-probability
Covariates (Pretest)	184.893	1	184.893	30.821	.000
Main Effects (Gender)	2.935	1	2.935	.489	.485
Explained	187.827	2	93.914	15.655	.000
Residual	503.918	84	5.999		
Total	691.745	86	8.043		

For hypothesis 2, Table 4 reveals that F-probability (.485) is greater than the alpha level (0.05). Since the level of significance is less than the f-probability value the null hypothesis is upheld. Therefore, there is no significant difference between the mean achievement scores of male and female students taught Geometry using the novel Visual Basic CAI approach.

Discussions

Table1 revealed that the students taught with Visual Basic CAI approach performed glaringly better in Geometry than those taught with the conventional (lecture) method. The ANCOVA(Table 3) confirmed that, showing that there is a significant difference in the mean achievement scores of students taught Geometry using Visual Basic CAI approach and those taught Geometry using the conventional(lecture) method. These findings agree with the results of Odogwu (2002), Safo, Ezenwa and Wushishi (2013) that CAI has positive effect on students' performance.

Table 2 indicated that the female students performed slightly better than their male counterparts taught the same topics with the same Visual Basic CAI approach. The ANCOVA(Table 4) in supportrevealed that there is no significant difference between the mean achievement scores of male and female students taught Geometry using the novel Visual Basic CAI approach. So, the strategy goes well with the boys and the girls.This result is in linewith Yusuf(2006), Ebele and Abigail(2008), and Gambari, Ezenwa and Anyanwu (2014) who observed no significant difference between the boys' and the girls' achievement in mathematics when exposed to the same novel learning conditions. It disagrees with Eribe and Sensugh (2006) and Kolawole (2007) who found significant differences in favour of the males in science achievement and Kurumeh(2007) who found significant difference in favour of the females.

Conclusions

This study has shown that Visual Basic Computer Aided Instruction strategy of teaching is superior to the conventional (lecture) method in fostering students' achievement in mathematics. This novel strategy is also gender friendly. It fosters learning equally among the students(male and female).

Recommendations

In the light of the above findings, the following recommendations were proffered:

1. Government and teachers should adopt Visual Basic Computer Aided Instruction approach in teaching mathematics in Junior Secondary Schools in Nigeria.
2. Teachers of mathematics should be exposed to the process of developing CAIs using programming languages.
3. Teachers of mathematics should be involved and indeed lead the CAI production team by preparing the lesson plans that would be transformed into software in line with the curriculum.
4. Government should support this strategy by financing the CAI production.
5. Researchers and scientists should explore more of the Computer Aided Instruction strategies that can close the gap between the males' and females' achievement in mathematics in this country.

References

Akubuilo, D.U. (2010). *General Teaching Methods*. Enugu: Count Int'l Publishing Press.

Ebele, C.O. and Abigail, M. O.(2008). Effects of Using Mathematics Laboratory in Teaching Mathematics on the Achievement of Mathematics students.*Nigeria Educational Research and Review.* 3(1), 257-261.

Ejakpovi, S.U. and Uveruveh, F.O.(2013). The Influence of Gender Equity in

Mathematics Achievement on Information and Communication Technology Vocations in Secondary Schools.*Proceedings of September 2013 Annual National Conference of MAN.Pp 262-269.*

Encarta (2009).*What is mathematics?* Microsoft® Encarta® 2009 [DVD], Redmond, WA: Microsoft Corporation

Eribe, J. O. And Sensugh, A.(2006). Gender differences in achievement in calculating reacting masses from chemical equations among secondary school students in Makurdi metropolis.*Educational Research Review* 1(6) 170-173.

Gambari, I. A., Ezenwa, V. I., and Anyanwu, R. C.(2014). Comparative Effects of Two Modes of Computer- Assisted Instructional Package on Solid Geometry Achievement. Federal University of Technology, Minna Nigeria: *Contemporary Educational Technology, 5*(2), 110-120. Retrieved from http://www.cedtech.net/articles/52/522.pdf 28/05/2017

Harris, B. (2013). *What is Computer Assisted Instruction?* Retrieved from http://www.wisegeek.org/what-is-computer-assisted instruction.htm

Hassan, A. B., Abolarin, M.N. and Jimoh, O.H.(2007). *The Application of Visual Basic Computer Programming Language to Simulate Numerical Iterations*.Department of Mechanical Engineering, Federal University of Technology, Minna. Retrieved from http://Ijs.academicdirect.org/A09/get_htm.php?htm =125_136

Hornby, A. S.(2015). *Oxford Advanced Learner's Dictionary*. Oxford: Oxford University Press.

Koirala, H.P.(2005). Effects of Mathemagic on the Algebraic Knowledge and skills of Low-performing High School Students.*Proceedings of the 29th Conference of the International Group for the Psychology of Mathematics Education, 3(2),2 09-216.*

Kolawole, E. B. (2007). Effects of Competitive and Cooperative learning strategies on academic performance of Nigerian students in mathematics.*Educational Research Review*, 3(1), 33-37

Kurumeh, M. S. &Imoke B.I. (2008). Universal Education: A way forward for the Development of primary school pupils in Mathematics Education. *ABACUS*, 33(1),49-56

Mabbut, D.(2017). Visual Basic with Definitions, History and Background. Thought Co: Science, Tech, Math › Computer Science. http://www.thoughtco.com/about-vib-and-about-this-site-3424549

Odogwu, H. N.(2002). *Effect of Computer Assisted Instruction on Students' Performance in Mathematics*. MAN Proceedings, pp1-9 No.1.

Okafor, C. F. &Anaduaka, U.S.(2013). **Nigerian school children and mathematics phobia: How the**

mathematics teacher can help.*American Journal of Educational Research*, 2013 1 (7), pp 247-251.
DOI: 10.12691/education-1-7-5

Ozo-China, E. S.(2016). New General Computer Course& ICT: Theory & Practice for Students & others. Enugu: His Glory Publications

Saddiq, J. O. (2004). *How Computer Technology Influences Mathematics Teaching and Learning*. MAN Proceedings pp76/77.

Safo, A.D., Ezenwa,V. I. and Wushishi, D. I. (2013). Effects of Computer Assisted Instructional Package on Junior Secondary School Students Achievement and Retention In Geometry in Minna. *International Journal of Humanities and Social Science Invention,2* (5), 69-74. ISSN(Online): 2319-7722, ISSN(Print): 2319-7714: Retrieved from www.ijhssi.org

Sen,V. (2010). JA TELINE. What are the Advantages of Computer-Assisted Instruction (CAI)? http://www.preservearticles.com/201112220186 19/what-are-the-advantages- of- computer- assisted-instruction- cai.html Copyright © 2019 . All Rights Reserved. Designed by JoomlArt.com

Soffar, H.(2017). Visual Basic programming language advantages and disadvantages.https://www.online-_GoBack_GoBacksciences.com/programming/visual-basics-programming-language-advantages-and-disadvantages

Uwadiae, I. (2011, August 10). Address by the head of the national office WAEC.*The Nigerian Voice*,(Abuja): Retrieved from www.thenigerianvoice.com/nvnews/581

WAEC (2007).*Chief Examiner's Report*. Lagos: West African Examinations Council.

WAEC (2015).*Chief Examiner's Report*. Lagos: West African Examinations Council.

COMPARISON OF MATHEMATICS ACHIEVEMENT OF SECONDARY SCHOOL STUDENTS UNDERDIFFERENT PRINCIPAL'S ADMINISTRATIVE STYLES IN AGBANI EDUCATION ZONE OF ENUGU STATE

BY

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Abstract

The purpose of this study was to compare mathematics achievement of secondary school students under different principal's administrative styles in Agbani education zone of Enugu state. Expost facto research design was adopted for the study. Four research questions and four hypotheses guided the study. Proportionate stratified random sampling technique was used to draw 837 senior secondary school two (SS2) students from eight secondary schools in Agbani education zone. Two instruments, a 20-item questionnaire and a form were used for data collection. The instruments were validated by three research experts. Mean and standard deviation were used to answer the research questions while z-test statistic was used to test the hypothesis at .05 level of significance. Major findings of the study revealed that students under principals with charismatic administrative style had the highest mean mathematics achievement score. It was recommended among other things that secondary school principals should adopt charismatic administrative style for better results.

Introduction

The concept of principalship can best be understood with reference to who a teacher is. Ikechi argued that since principals are made from among high ranking teachers, the definition of the term principal must stem from the definition of a teacher. In discussing the concept of principalship in this work, therefore, the definition of a teacher is of utmost usefulness. Rex (2011) defined a teacher as one who is involved in the guidance of pupils through planned activities to enable them acquire valuable skills while reflecting on their experiences. Davidson (2011) defined a teacher as a person who helps someone to learn. Udoh (2012) posited that a teacher is one actively involved in a systematic, rational and organized process of transmitting knowledge and skills in accordance with professional ethics and principles. As Ikechi (2011) stated, it is from high ranking teachers in secondary schools that principals are selected. Ikechi then defined a principal as a teacher promoted to a management position and given the task of being in charge of a secondary school.

Udoh (2012) held that the principal is the administrative head of a secondary school. The principal leads the management team of a secondary school. The principal should be regarded as an administrator and by extension

the school administrator can be regarded as a leader. Udoh explained that this is because the administrator (principal) performs certain functions that make the school to be effective. Such functions involve planning, organizing, directing and controlling. Evidently, one of the most frequently discussed aspects of principalship is leadership. Kreks (2010) defined a leader as a person who shows the way and influences someone else to think in a particular way. This implies that a leader knows the way, shows the way, goes the way and influences other people to do same. Kreks further defined principalship as the mobilization of group efforts towards the achievement of stated goals in a secondary school. Principalship, thus, is the capacity to coordinate many and often conflicting social energies in the secondary school, so adroitly that they shall operate as a unit. Adeleke (2011) collaborated this with the definition of principalship as effective coordination of resources and people's efforts for the achievement of the goals of secondary education.

In the same vein, Amusan (2012) stated that principalship involves the control of human and materials resources of the secondary school. Amusan contended that since the principal sits at the helm of affairs or the top of the management or administrative ladder of the secondary school, the principal should be seen as a leader, the executive head, supervisor, manager, school climate developer, change facilitator and the Chief Servant. The principal undertakes short, medium and long term planning as a foundation range planning. Consequently, Amusan further averred that principalship involves identification of the vision, mission, strategies and objectives of secondary school well in advance and provision of means of accomplishing them. It is evident that the major objective of secondary schools is to improve the students' achievement in school subjects.

Unarguably, the success of secondary education can be measured by evaluating the achievements of the students of secondary schools, (Segun, 2012). Segun further posited that learning outcomes or achievements of the students in core and compulsory subjects such as mathematics can be good indicators of the extent to which the overall objective of secondary education is attained. The principal, therefore, is charged with the task of ensuring that the objectives of secondary education are attained, at least, in the school. To do this, the principal adopts some administrative styles. These administrative styles, according to Adeleke (2011) include autocratic, democratic, charismatic and laiz-affair styles. Autocratic administrator according to Adeleke is also known as strict administrator and is characterized by administrators who are demanding but not responsive. Autocratic administrators allow for little open dialogue between leaders and the led and expect the led to follow a strict set of rules and expectations. Adeleke described democratic administrators as indulgent administrators who are responsive but not demanding. These administrators tend to be lenient while trying to avoid confrontation. Charismatic administrators are marked by the high expectations that they have of their staff and students but temper these expectations with understanding and support for their subordinates as well. Charismatic administrators exercise much influence over their subordinates. Laiz-affair administrators are care-free administrators. As the name applies, Laiz-affair administrative style is one in which the administrators do not care for the emotional, physical, psychological, and social needs of their subordinates. These administrators even extend the care-free attitude to disciplinary issues, (Amusan, 2012).

Research evidences such as Adeleke (2011), Amusan (2012) and Udoh (2012) implicated principals' administrative styles as

one of the factors that could influence secondary school students' academic achievement. Contrarily, Ikechi (2011) and Segun (2012) in their separate studies found no correlation between principals' administrative styles and students' academic achievement. Hence, there is no definitive conclusion on this vital issue. These conflicting findings suggest the need for more studies such as this present one. It can therefore be said that this study is not only important but it is very timely.

Purpose of the Study

The purpose of this study was to compare mathematics achievement of secondary school s tudents under different principal' s administrative styles in Agbani education zone of Enugu state. Specifically, the study aimed at ascertaining;1. 1. the mean mathematics achievement score of secondary school students under a principal with autocratic administrative style in Agbani education zone of Enugu state

2. the mean mathematics achievement score of secondary school students under a principal with democratic administrative style in Agbani education zone of Enugu state
3. the mean mathematics achievement score of secondary school students under a principal with charismatic administrative style in Agbani education zone of Enugu state
4. the mean mathematics achievement score of secondary school students under a principal with laiz-affair administrative style in Agbani education zone of Enugu state

Research Questions

The following research questions guided the study.1.

1. What is the mean mathematics achievement score of secondary school students under principals with autocratic administrative style in Agbani education zone of Enugu state?
2. What is the mean mathematics achievement score of secondary school students under principals with democratic administrative style in Agbani education zone of Enugu state?
3. What is the mean mathematics achievement score of secondary school students under principals with charismatic administrative style in Agbani education zone of Enugu state?
4. What is the mean mathematics achievement score of secondary school students under principals with laiz-affair administrative style in Agbani education zone of Enugu state?

Hypotheses

The following hypotheses were tested at .05 level of significance;

1. There is no significant difference between the mean mathematics achievement scores of secondary school students under male and female principals with autocratic administrative style in Agbani education zone of Enugu state.
2. There is no significant difference between the mean mathematics achievement scores of secondary school students under male and female principals with democratic administrative style in Agbani education zone of Enugu state.
3. There is no significant difference between the mean mathematics achievement scores of secondary school students under male and female

principals with charismatic administrative style in Agbani education zone of Enugu state.

4. There is no significant difference between the mean mathematics achievement scores of secondary school students under male and female principals with laiz-affair administrative style in Agbani education zone of Enugu state.

Method

Expost facto research design was adopted for the study, four research questions and four hypotheses guided the study. Proportionate stratified random sampling technique was used to draw 837 senior secondary school two (SS2) students from eight secondary schools in Agbani education zone. Two instruments, a 20-item questionnaire and a form were used for data collection. The questionnaire was used to identify male and female principals who adopted the different administrative styles under study. Hence, two autocratic principals (one male and on female), two democratic principals (one male and one female), two charismatic principals (one male and one female) and two laiz-affair principals (one male and one female) were identified and all the SS2 students in the eight schools from where these principals were identified constituted sample for the study. The second instrument (the form) was used to collect data on the students' mathematics achievement scores from records and vital documents in their schools. The instruments were validated by three research experts. Using the Cronbach's Alpha method, the questionnaire yielded an internal consistency reliability coefficient of .68 while the form yielded a reliability coefficient of .77. Data collection was personally undertaken by the researchers who visited the schools and administered the instruments. Mean and standard deviation were used to answer the research questions while z-test statistic was used to test the hypotheses at 0.05 level of significance.

Results

Research Question 1

What is the mean mathematics achievement score of secondary school students under principals with autocratic administrative style in Agbani education zone of Enugu state?

Table 1: Mean mathematics achievement score of secondary school students under principals with autocratic administrative style.

Gender of principal	No. of students	Mean	SD
Male	121	52.4	0.21
Female	115	58.3	0.33

From table 1, students under male autocratic principals had a mean mathematics achievement score of 52.4 with standard deviation of 0.21. Their counterparts under female autocratic principals had a mean mathematics achievement score of 58.3 with standard deviation of 0.33.

Research Question 2

What is the mean mathematics achievement score of secondary school students under principals with democratic administrative style in Agbani education zone of Enugu state?

Table 2: mean mathematics achievement score of secondary school students under principals with democratic administrative style.

Gender of principal	No. of students	Mean	SD
Male	96	60.8	0.11
Female	133	68.4	0.16

From table 2, students under male democratic principals had a mean mathematics achievement score of 60.8 with standard deviation of 0.11. Their counterparts under female democratic principals had a mean mathematics achievement score of 68.4 with standard deviation of 0.16.

Research Question 3

What is the mean mathematics achievement score of secondary school students under principals with charismatic administrative style in Agbani education zone of Enugu state?

Table 3: Mean mathematics achievement score of secondary school students under principals with charismatic administrative style.

Gender of principal	No. of students	Mean	SD
Male	101	64.1	0.18
Female	97	73.7	0.04

From table 3, students under male charismatic principals had a mean mathematics achievement score of 64.1 with standard deviation of 0.18. Their counterparts under female charismatic principals had a mean mathematics achievement score of 73.7 with standard deviation of 0.04.

Research Question 4

What is the mean mathematics achievement score of secondary school students under principals with laiz-affair administrative style in Agbani education zone of Enugu state?

Table 4: mean mathematics achievement score of secondary school students under principals with laiz-affair administrative style.

Gender of principal	No. of students	Mean	SD
Male	85	41.3	2.15
Female	89	52.5	1.87

From table 4, students under male laiz-affair principals had a mean mathematics achievement score of 41.3 with standard deviation of 2.15. Their counterparts under female laiz-affair principals had a mean mathematics achievement score of 52.5 with standard deviation of 1.87.

Hypothesis 1

There is no significant difference between the mean mathematics achievement scores of secondary school students under male and female principals with autocratic administrative style in Agbani education zone of Enugu state.

Table 5: z-test analyses for hypothesis 1

Group	N	$\bar{x}$	SD	z-calculated	z-critical	Remark
Male Principals	121	52.4	0.21	2.13	1.96	Significant (Reject hypothesis)
Female Principals	115	58.3	0.33			

From table 5, z-calculated (2.13) is greaterthan z-critical (1.96). Hence, at .05 significant level, the mean ratings of the two groups (students under male and female principals) differed significantly. Consequently, hypothesis one is rejected as stated, indicating that there is significant difference between the mean mathematics achievement scores of secondary school students under male and female principals with autocratic administrative style in Agbani education zone of Enugu state.

Hypothesis 2

There is no significant difference between the mean mathematics achievement scores of secondary school students under male and female principals with democratic administrative style in Agbani education zone of Enugu state.

Table 6: z-test analyses for hypothesis 2

Group	N	x̄	SD	z-calculated	z-critical	Remark
Male Principals	96	60.8	0.11	2.41	1.96	Significant (Reject hypothesis)
Female Principals	133	68.4	0.16			

From table 6, z-calculated (2.41) is greater than z-critical (1.96). Hence, at .05 significant level, the mean ratings of the two groups (students under male and female principals) differed significantly. Therefore, hypothesis two is rejected as stated, implying that there is significant difference between the mean mathematics achievement scores of secondary school students under male and female principals with democratic administrative style in Agbani education zone of Enugu state.

Hypothesis 3

There is no significant difference between the mean mathematics achievement scores of secondary school students under male and female principals with charismatic administrative style in Agbani education zone of Enugu state.

Table 7: z-test analyses for hypothesis 3

Group	N	x̄	SD	z-calculated	z-critical	Remark
Male Principals	101	64.1	0.18	2.09	1.96	Significant (Reject hypothesis)
Female Principals	97	73.7	0.04			

From table 7, z-calculated (2.09) is greater than z-critical (1.96). Hence, at .05 significant level, the mean ratings of the two groups (students under male and female principals) differed significantly. Consequently, hypothesis three is rejected as stated, indicating that there is significant difference between the mean mathematics achievement scores of secondary school students under male and female principals with charismatic administrative style in Agbani education zone of Enugu state.

Hypothesis 4

There is no significant difference between the mean mathematics achievement scores of secondary school students under male and female principals with laiz-affair administrative style in Agbani education zone of Enugu state.

Table 8: z-test analyses for hypothesis 4

Group	n	ẋ	SD	z-calculated	z-critical	Remark
Male Principals	85	41.3	2.18			Significant (Reject hypothesis)
				2.11	1.96	
Female Principals	89	52.5	1.87			

From table 8, z-calculated (2.11) is greater than z-critical (1.96). Hence, at .05 significant level, the mean ratings of the two groups (students under male and female principals) differed significantly. Therefore, hypothesis four is rejected as stated, implying that there is significant difference between the mean mathematics achievement scores of secondary school students under male and female principals with laiz-affair administrative style in Agbani education zone of Enugu state.

1. s under laiz-affair principals had the lowest mean mathematics achiviment score.
2. Students under female principals achieved higher in mathematics than their counterparts under male principals.

Discussions

Findings made in this study showed that students under principals with charismatic administrative styles had the highest mean mathematics achievement score. The second in achievement were students under democratic principals. Students under autocratic principals came third in mathematics achievement while students under laiz-affair principals had the lowest mean mathematics achiviment score. This result disagrees with the findings of Ikechi (2011) and Segun (2012) who in their separate studies found no significant relationship between students' academic achievement and principals' administrative styles. However, the finding authenticates the claims of Adeleke (2011), Amusan (2012) and Udoh (2012) who independently, found that principals administrative styles had significant influence on the academic achievement of students under their administration. Waheed (2016) opined that principalship entails ability to manage or economize available scarce resources through careful control, regulation or supervision of all activities in the secondary school. Principals' activities include overseeing and monitoring enrolment of students, attraction of best staff, conducting and supervising, teaching, learning and research as well as graduating secondary school students in an effective and efficient manner. Hence, Waheed held that the administrative style of the principal is capable of influencing all activities and outcomes of the school, including the students' academic achievement, especially in core subjects such as mathematics.

Buba (2018) hinted that in the course of carrying out official duties, a principal may wish to lead by giving information, suggesting alternative courses of actions and trying to stimulate self direction in the people. Contrarily, Buba further stated that when a principal sees constructive and objective criticism as a threat, and fails to give the people a chance to make

input to decision making, the principal should be held responsible for the outcome of his decision. It was also found in this study that students under female principals achieved higher in mathematics than their counterparts under male principals. This finding validates the findings of Udoh (2012) who reported that female principals provided a better learning environment for enhancing students' academic achievement than the male principals. It is interesting to find in this study that gender of school administrators can significantly influence the outcomes of their schools. Moreso, it is timely because gender issues are all over the air in the globe today.

Akan (2017) asserted that gender refers to the socially, culturally constructed characteristics and roles which are ascribed to male and female in any society. Gender is a major factor that influences career choice and subject interest of the student. According to Okeke (2018), gender or sex refers to those characteristics of males and females which are biologically determined such as possession of the male and female reproductive genital organs. Okeke further gave a broad analytical concept which draws out females role responsibilities in relation to those of males describing the males attribute as bold, aggressive, tackful economical use of words, while females are fearful, timid, gentle and submissive. Akan (2017) alleged that in schools, males are more likely to take difficult subjects areas like sciences, while the females take to careers that will not conflict with marriage chances, marriage responsibilities and motherhood.

From the foregoings, the society also encourage gender stereotype by giving different treatment to males and females. The societal biases go further to give different career guidance to males and females. The society frowns at seeing a man cooking or a female climbing a tree. Nigeria, since she gained her independence had never produced a female President. Yet, the findings of this study have shown that females can be better secondary school administrators. It is important to note that the charismatic female principals produced better result than their male counterparts. It was same for democratic, autocratic and even the laiz-affair principals. This is an eye opener for policy makers and those who are responsible for appointing secondary school principals. It is expected that the leaping experiences offered to the children in schools should not discriminate against males and females. It is therefore necessary that there is need to see that both the males and females are given equal access to education and leadership positions.

Conclusions

Based on the findings of this study, the following conclusions were reached:

1. Charismatic and democratic school administrators (principals) produced better results than their counterparts who are autocratic and laiz-affair
2. Female principals in all the administrative styles produced better results than their male counterparts

Recommendations

Consequent upon the findings made in this study, the following recommendations are deemed necessary:

1. Secondary school principals should adopt charismatic and democratic administrative styles for better results
2. Female teachers should be given priority in appointment to principal cadre since they produce better environment for teaching and learning.
3. The post primary schools management

board should organize capacity building workshops for all principals in Agbani education zone to sensitize them on effective administrative styles

4. The post primary schools management board should organize capacity building workshops for mathematics teachers in Agbani education zone to sensitize them on strategies for coping with principals of different administrative styles.

References

Adeleke, K.D (2011). Administrative styles as correlates of students academic performance in secondary schools in Ondo state. *Proceedings of 2011 educational management conference, Ekiti state university.* Pg 66-81

Akan, J.O (2017). Effective Administrative Techniques Adopted by male and female Secondary School Principals in Uyo Education Zone. *https://www.psycho.prg.com.*

Amusan, A.T (2012). Integrating leadership styles into strategies for enhancing students achievement in Mathematics. *Journal of educational resources 6(4) 208-227*. http://www.jer.infotex/vol 6.com. Retrieved 06/08/15

Buba, B.I (2018). *Principles and Practice of Education.* Ontario: Zenith publishing company Inc.

Davidson, R.Y (2011). Human resource management: a paradigm shift. *Journal of personnel management 25(1). Pg 60-73.*

Ikechi, S.U (2011). Principals' Administrative Styles and Students Learning Outcomes in Secondary Schools. *https://www.scholar/ib.vtedui/ejour/ijev/1472/haynie/. html*

Kreks, K.O (2010). Gender related Coping Strategies for School Administrators. *Journal of School Administration 3(5).www.jsa/mini.edu.uk. Pg 10-28*

Okeke, W. (2018). Gender Issues: A Critic in Secondary School Administration. *https://www.educatemind.tmcp/meg.net*

Rex, C. (2011). Path-Goal Theory of leadership. *Jet Book of Reading 2(1) pg28-33.*

Segun, A.U (2012). Principals' Leadership Styles as determinants of Students Academic Achievement in selected Secondary Schools in Lagos State. *Journal of educational resources 6(4) 112-140.* http://www.jer.infotex/vol 6.com. Retrieved 06/08/15

Udoh, G. (2012). Effective Administrative Styles for Improving Students Achievement in Mathematics in Cross River State. *https://www.scholar/ib.vtedui/ejour/ijev/1472/haynie/ html*

Waheed, T. (2016). *Tropical Issues in educational management.* Ontario: Zenith publishing company

PRINCIPALS' APPLICATION OF PERSONNEL MANAGEMENT SKILLS IN SECONDARY SCHOOLS IN ENUGU STATE

By

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Abstract

This research investigated the principals' application of personnel management skills in Secondary Schools in Enugu State. The population of this study comprised of all the principals from the government secondary schools in Enugu State. Respondents were taken from two education zones randomly sampled from the six education zones of the state. Two (2) research questions and one (1) null hypothesis guided the study. The research questions were answered using a four-point modified Likert's scale while the null hypothesis was tested using the't' test. The result revealed that the principals applied the personnel management skills for effective staff orientation and staff professional development only to the least extent. It was further revealed that there was no significant difference in the level of application of personnel management skills for the effective staff professional development by less experienced and more experienced principals. Based on these findings, it was recommended that the principals themselves be trained in the skills for personnel management through seminars and workshops. It was further recommended that the principals be supervised on a more regular basis in order to discover other areas where they need more attention.

***Key words*: principals, application, personnel, management, secondary, skills**

Introduction

Personnel refer to all the people who are involved in planning and execution of organizational plans. Ebuoh (2012) refers to personnel simply as employees. In educational institutions such as the school, we have the staff personnel as well as students' personnel. Teachers are responsible for the academic activities of the school. Students are the key beneficiaries.Management is about the integration of all the various necessary resources to bring about the desired institutional goals and objectives. These resources, especially human must be available for management to be effective (Nwandu, Ani and Agbo 2003). Effectiveness in management is influenced by a high degree of participation by employees which encourages the growth of the subordinates and their ability to accept responsibilities (Oyewole and Alonge, 2012). Management is the body of knowledge of getting things done in the most effective and efficient manner (Ani, Olofin and Chukwuma, 2005). The term management is used

interchangeably with administration.

Personnel management is the effective mobilization of human resources in order to achieve the organizational laid-down goals and objectives (Ogunsaju, 2006). The success of an organization is not only determined by the quality of personnel available but also by how well these human resources are harnessed and coordinated towards realizing the goals of the organization (Owojori and Asaolu, 2010). Such services as staff orientation and training for professional competence are necessary.

The principal is the administrative head of the school. He is expected to apply some competencies and skills to provide effective leadership in schools (Sharma, 2010) and to cope with his complex role (Fullan, 2000). Specific skills are needed to cater for the problems that may arise from even the teachers due to individual differences (Luo, 2004). Skills for effective orientation and staff professional development are some of such skills. Orientation is an essential aspect of personnel management.

It is better not to assume that newly posted staff already know what they have to know even if they are not newly employed. New teachers are likely to feel insecure in their new places. They may have to deal with changes in culture as they change environment. Proper orientation clears all these doubts and gets them emotionally set for duty. Orientation programmes go beyond those that affect the school and extend to those that affect the community or locality (Edem, 2006). This is to avoid falling into any community problems especially those that have to do with their culture. Accepted life styles may differ from locality to locality. Knowledge of existing facilities is helpful, example, shopping centers and markets, health facilities, recreational centers, workshop centers and so on. Information on the school landmarks and need areas help new teachers condition their minds. Oboegbulem (2004) notes that the strength of orientation is in its ability to help staff have good impressions of the school and the entire environment, thereby boosting their willingness to maximize efforts towards performance.

Staff professional development is a means of imparting knowledge and skills into people. Training concerns itself with developing employees' skills and exposing them to new methods, techniques and procedures for performing their jobs effectively, while development is a broad-based knowledge acquisition (Eze and Anoh, 2004).Training helps to update teachers with current methodologies and ensures that at the end, students receive quality education. In-service training is one of the factors that have direct influence on the attitude of teachers to work (Udofia and Ikpe, 2012). It is an on-going type of training that helps teachers to improve their knowledge and competences (Aitken, 2004).

The principals have some roles to play in the training of teachers for professional growth and development. Well equipped school libraries are useful for updating teachers' knowledge. Principals can also provide useful references such as the newspaper, periodicals, journals and internet services. Sponsoring teachers to seminars and workshops outside their school environment provides them the opportunity to share ideas with their colleagues. Professionals can also be invited to the schools to train the teachers. The problem of the study is the effect of the non professional attitudes of most teachers. They are regularly late to school and when they are in school they are busy selling

their wares in the staff rooms. They deny students teaching and learning. Such teachers aid students to pass examinations through malpractices in order to cover up. This is of great concern.

The purpose of this study was therefore, to determine the extent of the principals' application of the skills for effective orientation and staff professional development. The following research questions and null hypothesis were used:

1. To what extent do principals apply personnel management skills for effectivestaff orientation?
2. To what extent do principals apply personnel management skills for effective staff professional development

Null hypothesis

There is no significant difference in the mean ratings of teachers with regards to less experienced and more experienced principals on the extent of personnel management skills for staff professionaldevelopment.

Method

The descriptive survey research design was adopted for the study. Nworgu (2015) opines that this design is effective for collecting data on, and describing systematically the characteristics, features or facts about a given population. This design was used to investigate the application of personnel management skills by principals of secondary schools in Enugu State. The area of study covered all the six (6) education zones in Enugu State namely: Agbani, Awgu, Enugu, Nsukka, Obollo Afor and Udi. The population was made up of all the 293 principals from the 293 Post Primary School Management Board (PPSMB) secondary schools in the State. Teachers from two education zones randomly sampled from the six provided information about the principals. Simple random sampling technique provides every member of the group equal opportunity of being included in the sample (Nworgu, 2015). The questionnaire was used to collect data for the study. It was designed to obtain information on aspects of personnel management as stated in the research questions. The questionnaire instrument was validated by three (3) experts in the area of Educational Administration and Planning and one (1) expert in the area of Measurement and Evaluation, all of the Faculty of Education of the University of Nigeria, Nsukka. The internal consistency reliability of the instrument was computed using the Cronbach Alpha co-efficient and the result was positive. The researcher worked with two research assistants to administer and retrieve copies of the instrument. Both descriptive and inferential statistics were used to analyze the data. The 't' test was used to test the null hypothesis at 0.05 significant level.

Results

The data collected from the respondents formed the basis for analysis. The results derived from the responses to the questionnaire were presented in tables according to research questions and hypothesis.

Research Question One

To what extent do principals apply personnel management skills necessary for achieving effective orientation of teachers?

Table 1: Mean ratings of teachers on the principals' extent of application of personnel management skills for effective staff orientation.

ITEMS	$\bar{X}$	SD	REMARKS
New teachers are introduced to old teachers and students	2.47	0.37	Least Extent
Introduction of new teachers is made in a cordial atmos phere	2.12	0.42	LE
School rules and regulations are made known to new teac hers	2.23	0.46	LE
New teachers are helped to get accommodation	1.94	0.39	LE
Information on general organizational structure is provided to new teachers	2.12	0.40	LE
The philosophy and goals of the school are explained to new teachers	2.13	044	LE
New teachers are introduced to all records of the school	2.08	0.31	LE
New teachers are provided with clear job descriptions	2.09	0.30	LE
Information is provided on all aspects of school programmes	2.11	0.26	LE
Ethics of the teaching profession are made known to new teachers	2.11	0.32	LE
New teachers are provided with work schedules	2.14	0.49	LE
Proc edures of operation are made known to new teachers	2.15	0.30	LE
Service load to new teachers is based on qualification	2.13	0.31	LE
New teachers are familiarized with the school layout and boundaries	2.10	0.32	LE
Information is provided on general characteristics of students	2.13	0.29	LE
Information is provided on the students' expectations	2.16	0.35	LE
Induction courses are organized to make new teachers familiar with the job	1.19	0.34	LE
Community expectations are explained to new teachers	2.10	0.30	LE
The culture of the c ommunity is explained to new teachers	2.14	0.27	LE
New teachers are taken to places of interest in the community	2.16	0.31	LE
All of the questions that new teachers have are ans wered	2.35	0.27	LE
CLUSTER MEAN=	**2.15**		**LE**

It is shown in Table 1 that all the personnel management skills in the area of staff orientation are applied only to the least extent by the principals. Each of the skills has a mean score below the 2.50 cut-off point on a four-point modified Likert's Scale. Even item 1 with the highest score of 2.47 indicates a least extent application level. Item 17 has the lowest mean score of 1.19 showing that the principals give the least consideration to induction courses to teachers. A cluster means of 2.15 shows that the principals apply personnel management skills in the area of orientation only to the least extent. That means they rarely or do not conduct orientations for their teachers.

Research Question Two

To what extent do principals apply personnel management skills necessary for providing effective staff professional development to teachers?

Table 2: Mean ratings of teachers on the principals' extent of application of personnel management skills for effective staff professional development.

N	ITEMS	X	SD	REMARKS
	Newspapers, journals, periodicals etc are provided for teachers' references	2.24	0.34	LEAST EXTENT
	School staff seminars are organized to enable teachers share new ideas	2.16	0.29	LE
	The school library is well equipped to help teachers update their knowledge	2.23	0.33	LE
	Teachers are encouraged to attend workshops/seminars outside the school environment	2.04	0.34	LE
	Professionals are invited to the school to help teachers update their knowledge on current trends	2.04	0.38	LE
	Teachers' performances are evaluated regularly	2.01	0.32	LE
	Desiring teachers have chance to attend sandwich programmes without hindrances	2.50	0.33	LE
	Study leave with pay is recommended where deserved	2.14	0.29	LE
	Study leave without pay is recommended for those who opt for it	2.21	0.28	LE
	Reinstatements after study leaves are willingly recommended	2.20	0.35	LE
	Acquired additional certificates are readily forwarded to the Board for recognition	2.24	0.31	LE
	Evaluation reports are used to correct teachers	2.17	0.29	LE
	Internal supervision reports are used to update teachers' professional competence	2.14	0.33	LE
	Teachers are encouraged to participate in professional competitions outside the school	2.18	0.28	LE
	Creativity in teachers' area of specialization is encouraged	2.21	0.37	LE
	Teachers are encouraged to use the internet for updating information	2.11	0.34	LE
	CLUSTER MEAN=	**2.15**		**LE**

In Table 2, it shows that only item 28 has a mean score up to the 2.50 cut-off point on the Likert's Scale. This shows that the principals do not hinder the teachers from attending sandwich programmers. However, each of the other items has a mean score below the cut-off point of 2.50. The cluster mean of 2.15 implies that the principals apply the personnel management skills necessary for effective staff professional development only to the least extent.

Hypothesis There is no significant difference in the mean ratings of teachers with regards to less experienced and more experienced principals on the extent of application of personnel management skills for effective staff professional development.

Table 3: Summary of't'-test (items) analysis of mean ratings of less experienced and more experienced principals' application of personnel management skills necessary for achieving effective staff professional development.

ITEMS	X_1	SD_1	X_2	SD_2	T-cal	Decision
Newspapers, journals, periodicals etc are provided for teachers' references	2.27	0.42	2.24	0.32	0.50	Accepted
School staff seminars are organized to enable teachers share new ideas	2.21	0.27	2.15	0.29	1.16	Accepted
The school library is well equipped to help teachers update their knowledge	2.11	0.33	2.24	0.33	-2.07	Accepted
Teachers are encouraged to attend workshops/seminars outside the school environment	2.04	0.37	2.10	0.33	-.81	Accepted
Professionals are invited to the school to help teachers update their knowledge on current trends	1.98	0.43	2.04	0.37	-.90	Accepted
Teachers performances are evaluated regularly	1.93	0.43	2.03	0.30	-1.68	Accepted
Desiring teachers have chance to attend sandwich programmes without hindrances	2.11	0.29	2.05	0.33	0.96	Accepted
Study leave with pay is recommended where deserved	2.17	0.28	2.14	0.30	0.45	Accepted
Study leave without pay is recommended for those who opt for it	2.11	0.32	2.22	0.27	-2.15	Accepted
Reinstatements after study leaves are willingly recommended	2.22	0.33	2.19	0.36	0.45	Accepted
Acquired additional certificates are readily forwarded to the Board for recognition	2.15	0.28	2.25	0.31	-1.25	Accepted
Evaluation reports are used to correct teachers	2.18	0.31	2.17	0.29	0.22	Accepted
Evaluation supervision reports are used to update teachers' professional competence	2.16	0.29	2.13	0.34	0.51	Accepted
Teachers are encouraged to participate in professional competitions outside the school	2.18	0.23	2.18	0.28	-.00	Accepted
Creativity in teachers' area of specialization is encouraged	0.29	0.41	2.22	0.36	-1.95	Accepted
Teachers are encouraged to use the internet for updating information	2.00	0.46	2.12	0.31	-2.00	Accepted

Table 3 shows that there is no significant difference in the mean ratings of teachers with regards to less experienced and more experienced principals' application of personnel management skills necessary for achieving effective staff professional development. The 't'-scores for each of the skills in the Table is less than the critical value of 't'. The null hypothesis is therefore upheld.

Table 4: Group analysis of hypothesis

Groups	No	X	SD	df	Sign. Level	T-cal	Critical value	DECISION
Less Exp	32	33.91	2.61					
More Exp.	221	34.48	2.31	2.51	0.05	-2.68	1.97	Accepted

The above group analysis of hypothesis (Table 4) shows that at a degree of freedom 2.51 and significant level of 0.05, the calculated't'-value of -2.68 is less than 1.97 critical value of 't'. The null hypothesis is therefore accepted. This means there is no significant difference in the mean ratings of teachers with regards to less experienced and more experienced principals' application of personnel management skills necessary for achieving effective staff professional development.

Conclusion

The conclusions drawn from the study are that:

1. The principals' level of application of personnel management skills for staff orientation and professional development is very low.
2. The principals' application of personnel management skills for staff professional development is not based on their experiences.

Recommendations

These recommendations are made based on the findings of the study.

1. The Post Primary Schools Management Board (PPSMB) should urgently begin to train their principals in the skills for personnel management.
2. The Zonal and Area Inspectors should supervise the principals regularly to find out the areas they need help.

References

Atiken, J, E. (2004). *In-Service Training for Teachers in New Zealand Schools.* NorthAmericanAssociation of Educational Negotiator (NEAN), 15(1), 3-5.

Ani, W. U. Olafin, and Chukwuma, J. (2005).*Management Information System*. Enugu M'Cal Communication internal.

Ebuoh, C. N. (2012). *Basic Issues in Education System*. Enugu: Sky Printing Press.

Edem, D.A. (2006). *Introduction to Education Administration in Nigeria. Ibadan:* Spectrum Books Limited.

Eze, F.E. and Anoh, F.A., (2004). *Fundamentals of Public Administration* (2nd Edition). Enugu: John Jacob's classic Publishers Limited.

Fullan, M. (2000).*The Role of Principals in School Reform*, Ontario Institute for Studies in Education, University of Toronto. Paper Presented at the Annual Meeting of the Canadian Association for the Study of Educational Administration

Luo, M. (2004) *Geographic Disparities of*

Chinese School Principals' Leadership Capacities: A Perspective of Teacher Perceptions. International Studies in Educational Administration, 32(3), 20-33.

Nwandu, E. C. Ani, N.B. and Agbo, O.G (2003). *Principles of Management.*Nsukka: University Trust Publishers.

Nworgu, B.G. (2015). *Educational Research: Basic Issues& Methodology*. Ibadan:Wisdom Publishers Limited.

Oboegbulem, A. (2004). *Pupil Personnel Administration.*In Mogbodile, T.O (ed). Fundamentals in Educational Administration and Planning (165-171).

Ogunsaju, T.O., (2006). *Human Capital Management for Effective Corporate Governance:* Paper Presented at a Workshop Titled "Corporate Governance for Sustainable National Development."

Owojori, A.A. and Asaolu, T.O., (2010). *Critical Evaluation of Personal Management*

Problems in the Nigerian School System. International Journal of Education Science, 2 (1), iii

Oyewole, B.K. and Alongeo, H.D., (2012). *Perception of Human Resource Management Effectiveness of Ekiti State Teaching Service Commission.*Nigeria. European Journal of Sustainable Development, 1(3),521-532.

Sharma, S. (2010).*Attributes of School Principals' Leadership Qualities and Capabilities*.Unpublished Research Work. Institute of Principalship Studies, University of Malaya, Kuala, Lumpur, Malaysia

Udofia, U.I. and Ikpe, U.N., (2012). *Administration of In-service Training and Teachers'Attitude to Work in Private Secondary Schools in Cross Rivers State of Nigeria.*International Journal of Academic Research and Social Sciences,2(10), 305-311.

SCIENCE LECTURERS' PERCEPTIONS AND SELF-EFFICACY TOWARDS USE OF COMPUTER MEDIATED TECHNOLOGIES IN COLLEGE OF EDUCATION MINNA, NIGER STATE.

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Abstract

*The study investigated science lecturer perception, self-efficacy, usefulness and ease of use of computer mediated instruction (CMT) for teaching in a college of education. The study employed survey research design with eighty (80) respondents purposively used as the sample of the study. A questionnaire was used to gathered the data of the study. The validity and reliability of the instrument was ascertained. The Instrument was pilot tested and reliability was computed which yielded .82 coefficient using Cronbach alpha computation. The data of the study was subjected to descriptive analysis. The data was analyzed using frequency and percentage, mean, and standard deviation. From the study it is evident that science lecturers found CMT useful and also easy to use and most of them have a mastery of some basic computer mediated technologies (CMT) skills but some of the computer mediated technologies are not adequately and effectively used for instructional purposes. This implies that science lecturers in college of education Minna are yet to fully adopt computer mediated technologies for teaching and learning due to other factors not considered in this study**. **It is therefore recommended that** *the curriculum developers should review the curriculum so as to make the use of computer mediated technology compulsory for teaching and learning.Also periodic training should be given to lecturers to induce use of computer mediated instruction in the teacher preparation programmes.*

Keyword: Computer mediate instruction; Perception of usefulness; ease of use; self-efficacy

Introduction

Lecturers' decision to reject or adopt technology for instructional related activities is a complex issue that remains a challenge for many higher institutions of learning the world over. Studies revealed the penetration of various technologies in educational settings, however, effective utilization of these resources in learning is still an uphill battle for many colleges and universities around the world (Ertmerr &

Ottenbreit-Leftwich, 2010; Kotrlik & Redmann, 2009; Moser, 2007; Oye, Salleh, and Iahad, 2011). As a result of superficial use of technology, researcherseek to understand the reason behind slow uptake of technology for teaching. In doing this, models are formulated and tested. Among such model is the one developed by Davis in 1986

The *Technology Acceptance Model* TAM (Davis, Bagozzi and Warshaw, 1989) is one of the most profound frameworks frequently used in studies to predict and explain the use of computer based applications and solutions. The model affirms that the adoption of a technology is determined by the user's intention to use computer technologies, which in turn is influenced by his or her attitudes towards the technology. It is very likely that the variableness in these attitudinal and behavioral constructs depends on the user's perceptions — *perceived usefulness* (PU) and *perceived ease of use* (PEU). While PU indicates the extent to which the use of the technology is promising to promote one's work, PEU represents the degree to which the technology seems to be free of effort (Davis et al., 1989). This model assumes that attitudes and behavioral intention mediate the effects of PU and PEU, the two constructs of extrinsic motivation.

Models and theories which attempt to predict and explain the acceptance and adoption of computer mediated technologies are many. For example, Rogers' *Diffusion of innovations* theory (Rogers, 2003; Straub, 2009) explains technology adoption as a process taking place over time and is dependent on factors such as attributes of the technology, nature of the social system in which the technology is to be adopted, role of change agents and opinion leaders, and adopter categories.

Computer mediated technologies (CMT) are the technologies that allows communication or interaction between people using computers or the computer network as a medium of communication (Romiszowki, 1989), also computer mediated technologies are the technologies that permits any form of communication between two or more individuals who interact or motivate each other via separate computers (Wikipedia, 2010).

Computer mediated technologies are revolutionizing the practices of teaching and learning at colleges and universities all around the world and the teaching institutions are making significant efforts in adopting the use of computer mediated technology.

However, in spite of this effort and investment the lecturers and faculty do not always use the technologies as expected and more often computer mediated technologies continue to be underutilized. However, the utilization of these technologies is sometimes prevented by some factors which according to Darell and Sellbom (2002) include economical, sociological and psychological factors. Other barriers to the utilization of computer mediated technologies are financial barriers, unavailability of computer hardware and software, lack of theoretical and technical knowledge, and lack of the acceptance of computer mediated technologies. As a result of the rapid technological change, a growing number of

institutions have adopted internet-based course delivery (Liaw, Huang & Chen, 2007) and have invested heavily in technology (Trentin, 2006; Yohon & Zimmerman, 2006). Massy and Zemsky (1995) conclude that higher education cannot become more productive or hold costs down unless colleges and universities embrace technological tools for teaching and learning. Yet, some lecturers embrace technology while others resist. In the 21st century, it is imperative for institutions to adopt technology for instructional purposes. Therefore, this study decided to look at the affective ramifications of computer mediated technology adoption, specifically perceived usefulness, perceived ease of use and self-efficacy.

This study contends that the decision to use technology is not only determined by the availability of resources and training, but also influenced by an individual's philosophical and inner feelings about such a phenomenon. Therefore, individual's perception plays a significant role in this process. Straub (2009) says "technology adoption is a complex, inherently social, developmental process, individuals construct unique yet malleable perceptions of technology that influence their adoption decisions. Thus, successfully facilitating computer mediated technology adoption must address cognitive, emotional, and contextual concerns". This study intends to provide some empirical data on lecturers' perceptions, self-efficacy and use of computer mediated technology. Oigara and Wallace (2012), Hardin (2006), and Tabata and Johnsrud (2008) "contend that the ability to use technology in teaching starts with lecturers' attitudes toward technology". Thus, the goals of this study are (1) to investigate lecturers' perceptions, self-efficacy and use of computer mediated technology, and (2) establish how these perceptions and self-efficacy can be influenced to promote positive attitudes towards computer mediated technology adoption. The study is situated within the Technology Acceptance Model.

Various models have been developed to explain acceptance of technology and usage behavior. Davis, Bagozzi, and Warshaw, (1989) developed the technology acceptance model (TAM) which suggests that two specific beliefs—perceived ease of use and perceived usefulness— determine one's behavioral intention to use a technology. Similarly, Venkatesh, (2000) developed a model of the determinants of perceived ease of use based on several anchors related to individuals 'general beliefs regarding computers and computer use i.e. computer self-efficacy, computer anxiety, and computer playfulness, and perceptions of external control (or facilitating conditions). Venkatesh, Morris, and Davis, (2003) compared eight models and their extensions on user intentions to use information technology and formulated a unified model, called the Unified Theory of Acceptance and Use of Technology (UTAUT), with four core determinants of intention and usage, and up to four moderators of key relationships. Venkatesh and Davis, (2000) developed and tested a theoretical extension of TAM (TAM2) that explained perceived usefulness and usage intentions in terms of social influence (subjective norm, voluntariness, and image) and cognitive

instrumental processes (job relevance, output quality, result demonstrability, and perceived ease of use) which significantly influenced user acceptance.

Venkatesh and Bala, (2008) proposed the Technology Acceptance Model 3 (TAM3) based on TAM by Davis, Bagozzi, and Warshaw, (1989). They reported that perceived usefulness strongly influenced peoples' intentions. On the other hand, perceived ease of use had a small but significant effect on the intentions also but this reduced over time. This study sought to investigate lecturers perceived usefulness, perceived ease of use and self-efficacy as factors affecting effective adoption of computer mediated technologies by lecturers for teaching sciences and science related courses in college of education Minna.

Purpose of the Study

The aim of this study was to determine science lecturers' perceived usefulness, perceived ease of use, self-efficacy and use of Computer Mediated Technologies in College of Education, Minna. Specifically, the objectives of the study are to:

1. Determine whether science lecturers perceive computer mediated technologies to be useful for teaching and learning.
2. Determine whether science lecturers perceive computer mediated technologies easy to use.
3. Find out the state of self-efficacy of lecturers towards computer mediated technlogies
4. Determine the use of computer mediated technologies by lecturers of sciences.

Research Questions

The study sought to answer the following questions:

1. Is computer mediated technologies perceived to be useful by science lecturers?
2. Do science lecturers perceive computer mediated technologies ease to use?
3. Do science lecturers possess basic computer mediated technologies skill (self-efficacy)?

Method

Given the purpose of the study, the study employed survey research design to investigate science lecturers' perception regarding their perceived usefulness, self-efficacy and ease of use of computer mediated technologies. The population for the study comprised of all science lecturers of college of education, Minna. Purposive sampling method was used to select the sample of the study. 80 were sampled with 24 female respondents and 56 male respondents. The sample population was drawn from science lecturers belonging to various departments having a total of 56 lecturers, 24 others were selected at random from other science departments not categorized under the school of science. Each member of the population had an equal opportunity to become part of the sample, the participants were drawn at random from basically seven (7) departments in school of science of college of education Minna; department of chemistry, biology, physics, integrated science, mathematics, computer science, PHE. Lecturers of other science courses

not listed among the school of science were also sampled, such as department of agricultural science, geography, electrical electronics etc. are all classified under the field of sciences. Popper Karl R. (2002).However, the numbers from each department varied depending upon the willingness of participants to take part in the stud

The instrument used for data collection for the purpose of this study was a questionnaire which was designed to investigate the science lecturers' perceptions, self-efficacy and use of computer mediated technologies. The questionnaire consisted two sections. The first section which was section A asked questions relating to demographic details such as, gender, teaching experience, department, and highest academic qualifications. The type of data collected was ordinal data. Section B included twenty six (26) items was further divided into three sub-sections according to the research questions which are questions 1, 2, and 3 (see appendix I) using a five-point likert scale of SD= Strongly disagree, D=disagree, N=Neither, A=Agree, SA=Strongly agree for the first two research questions, and the third sub-section was the self-rating of their technology skills which is also a measure of self-efficacy and science lecturers usage of CMT for instruction using also a five-point likert scale; 1=Not confident at all, 2= Not confident, 3=Neutral, 4=Confident, 5=Very Confident and 1=Never, 2=Rarely, 3=sometimes,4=Often, 5=Very Often

The test instrument for the study was face validated by two lecturers in the department of science education, Federal University of Technology, Minna. All the necessary corrections were effected.

The instrument was pre-tested using the pilot test with thirty five respondents from lecturers in Federal University of Technology Minna (FUT) in order to detect weaknesses and assess the respondents' general understanding and ability to respond to the questions. A review was done to incorporate changes to the weaknesses identified and a final draft was produced. Reliability of the measurement scales was tested using Cronbach alpha coefficient which gave an alpha reading of 0.96 indicating a strong reliability of the test instrument.

The research instrument was administered by the researcher personally to teaching staff of the Department of Science Education and Physical science lecturers in the college of education of Minna. Out of one hundred and twelve lecturers (112) that constituted the population of the study, eighty(80) respondents representing 71% completed the questionnaire, the respondents were given 3 days in which to complete the questionnaires and returned it.

The data collected for the purpose of the study was analyzed using the statistical package for social science (SPSS) which measured the frequency and percentage, mean and standard deviation of the data.

RESULTS

Research question 1: Is computer mediated technologies perceived to be useful by science lecturers?

Table 1: Mean response of science lecturers perceived usefulness of computer mediated technologies

Items	SD F (%)	D F (%)	N F (%)	A F (%)	SA F (%)	MEAN	STD	DECISION
Computer mediated technologies enhance student's performance	1(1.3)	1(1.3)	2(2.5)	44(55.0)	32(40.0)	4.31	0.704	Agreed
Computer mediated technologies improve the quality of my academic research	1(1.3)		5(6.3)	27(33.8)	47(58.8)	4.49	0.729	Agreed
Computer mediated technologies (e.g.) video based online courses, Email enhance my dissemination of Information to students		3(3.8)	12(15.0)	46(57.5)	19(23.8)	4.01	0.738	Agreed
Computer mediated technologies can allow me to do more interesting and imaginative work	1(1.3)		10(12.5)	43(53.8)	26(32.5)	4.16	0.737	Agreed
Computer mediated technologies can be used to perform most task that I cannot do myself	1(1.3)	9(11.3)	8(10.0)	31(38.8)	31(38.8)	4.03	1.031	Agreed
Computer mediated technologies can enhance the presentation of my work to a degree which justifies the extra effort		5(6.3)	8(10.0)	38(47.5)	29(36.3)	4.14	0.838	Agreed
Computer mediated technologies make it possible to work more productively	1(1.3)	1(1.3)	3(3.8)	44(55.0)	31(38.8)	4.29	0.715	Agreed

Keys SD = Strongly Disagree, **D** = Disagree; **N** = Neither; **A** = Agree; **SA** = Strongly Agree
Decision mean=3.00

The table 4.1 shows science lecturers' perceived usefullnes of CMT for teaching. The results showed that most respondent agreed that computer mediated technologies enhance student's performance with 55% and 40% for agree and strongly agree respectively. While 58.8% strongly agree that CMT improves their academic research and 38.8% agree to it. The data on table 4.1 shows clearly that the respondents agreed with all the items with mean scores of 4.01-4.31 this implies that science lecturers perceive computer mediated technologies to be useful and as such there is likelihood they use it for teaching.

1. Research questions two: How do science lecturers perceive computer mediated technologies ease to use?

Table 2: Mean responses of science lecturers on the perceived ease of use of Computer Mediated Technologies

	Items	SD F (%)	D F (%)	N F (%)	A F (%)	SA F (%)	MEAN	STD	DECISION
8.	I find Computer mediated technologies (e.g.) wikis, web blogs, e-mail etc. easy to use	2(2.5)	10(12.5)	3(3.8)	42(52.5)		3.93	1.028	Agreed
9.	It's easy for me to assign task to Computer mediated technologies		7(8.8)	14(17.5)	44(55.0)	15(18.8)	3.84	0.834	Agreed
10	I find my interaction with Computer mediated technologies clear and understandable		3(3.8)	6(7.5)	44(55.0)	27(33.8)	4.19	0.731	Agreed
11.	I find technology (e.g. computers, data projector, learning management systems etc.) easy to use	1(1.3)	6(7.5)	12(15.0)	35(43.8)	26(32.5)	3.99	0.948	Agreed
12.	I find it easy to get technology to do what I want it to do		8(10.0)	7(8.8)	41(51.2)	24(30.0)	4.01	0.893	Agreed

Decision mean=3.00

Table 3: Shows the perceived ease of use of Computer Mediated Technologies by science lecturers. Results showed that over 55% find CMT easy to use while respondents between10 to 40 percent indicated that they don't find CMT easy to use and therefore further training is needed. The data from table 4.2 above reveals that the respondents agreed with all the items with mean scores between 3.84-4.19 this implies that that science lecturers perceive computer mediated technologies easy to use for teaching.

Research question4: To what extent do science lecturers possess basic computer mediated technologies skill?

Table 4 Mean responses of science lecturers on basic computer mediated technology skills

S/No		1 F (%)	2 F (%)	3 F (%)	4 F (%)	5 F (%)	MEAN	ST D	Decision
13.	Operate presentation software (e.g. Microsoft power point) for instruction	-------	8 (10.0)	12 (15.0)	39 (48.8)	21 (26.3)	3.91	0.903	Confident
14.	Use of project with a laptop or PC for presentation	1 (1.3)	6 (7.5)	10 (12.5)	39 (48.8)	24 (30.0)	3.99	0.921	Confident
15.	Us spread sheet on Microsoft excel to record data, computer simple calculations and represent data inform of graphs or tables	---------	7 (8.8)	15 (18.8)	40 (50.0)	18 (22.5)	3.86	0.868	Confident
16.	Use social network (e.g. twitter, instagram, Facebook etc.) to communication with your colleagues.	1 (1.3)	9 (11.3)	11 (13.8)	29 (36.3)	30 (36.3)	0.807	1.024	Confident
17.	Use email (e.g. Hotmail, Yahoo mail, Gmail etc.) to send or receive assignments from students.	1(1.3)	7(8.8)	16 (20.0)	24 (30.0)	32 (40.0)	3.99	1.037	Confident
18.	Copy text from web and page and pest it to a document in Microsoft word	1 (1.3)	1(1.3)	9(11.3)	34(42.5)	35(43.8)	4.26	0.807	Confident
19.	Use internet to search for information and resources	1(1.3)	2(2.5)	4 (5.0)	12(15.0)	61 (76.3)	4.63	0.802	confident

Table 4.3 showed all respondents possess basic computer mediated technologies skill as result shows all respondents to be confident in the use of computer mediated technologies. As such science lecturer would easily found it not difficult to deploy for teaching.

Research question 4: Are science lecturers using these technologies for instruction?

Table 5 mean response of science lecturers' use of computer mediated technologies I use……

Item	Never F (%)	Rarely F (%)	Sometimes F (%)	Often F (%)	Very often F (%)	MEAN	STD	DECISION
Computer mediated technologies for instruction to enhance students learning	6(7.5%)	10(12.5%)	26(32.5%)	28(35.0%)	10(12.5%)	3.33	1.088	Positive
Computer mediated technologies in my course to enrich my teaching	5(6.3%)	10(12.5%)	15(18.8%)	29(36.3%)	21(26.3%)	3.64	1.183	Positive
Internet for resources when developing course material	6(7.5%)	5(6.3%)	2(2.5%)	33(41.3%)	34(42.5%)	4.05	1.179	Positive
Microsoft excel spread sheet to analyze students work	8(10.0%)	11(13.8%)	17(21.3%)	28(35.0%)	16(20.0%)	3.41	1.240	Positive
Data projector during instruction	12(15.0 %)	21(26.3%)	29(36.3%)	9(11.3%)	9(11.3%)	2.78	1.180	Negative
Email to keep students up to date on grades and students' progress	12(15.0 %)	21(26.3%)	14(17.5%)	20(25.0%)	13(16.3%)	3.01	1.336	Positive
Social networks (e.g. Facebook, twitter) to communicate, en courage or collaborate with my students	12(15.0 %)	22(27.5%)	11(13.8%)	20(25.0%)	15(18.8%)	3.05	1.377	Positive

Decision mean= 3.00

The table 5 shows the usage of CMT by science lecturers. From the results it can be seen that most lecturers indicated use of CMT in items 20, 21, 22, 23, 25 and 26, while only 22.6% indicated the use of data projector in item 24 and about 41.3% indicated that they were not using data projector for instruction while the remaining 36.3% respondent were neutral. It can also be observed that respondents indicated positive use of items 20, 21, 22, 23, 25, and 26, that is to say the technology has been adopted by the lecturers with the exception of item 24 with a mean response of 2.78 which < 3.00 (the decision mean) indicating a negative response to the use of the technology i.e. the use of data projector during instruction.

Discussions

This study sought to probe the science lecturers' perceptions, self-efficacy and use of Computer Mediated Technology through the guidance of Technology Acceptance Model. According to this model and other previous studies, attitudes play a significant role in the adoption of computer mediated technology in learning (Abukhzam& Lee, 2010; Kim, Chun,& Song, 2009). This study investigated science lecturers' perceptions and self-efficacy as factors that influence this adoption as an effort to assist in cultivating positive use of computer mediated technologies among science lecturers in teaching and learning. According to TAM, attitudes towards technology are influenced by perceived usefulness and perceived ease of use.

The results of this study confirmed this proposition as it showed that science lecturers perceive CMT to be useful and easy to use. Because these two variables have had such a significant impact on attitudes, it was very important to investigate the factors themselves to determine how they could be positively influenced with the ultimate goal of promoting computer mediated technology adoption. In this study, self-efficacy was brought in as an external variable that hypothesized to have had a significant influence on people's perception on the usefulness of technology and on its perceived ease of use. However, the results of this study indicated that most science lecturers have computer self-efficacy.

The level of self-efficacy on the use of Computer Mediated Technology as shown in this study is intriguing because logically one can assume that if a person believes in his/her capability to perform an activity, then that should improve the person's perception toward its ease of use as shown by similar empirical studies (Lee & Medlinger, 2011;Uwaifo, 2010). The participants in this study reported high self-efficacy levels, which in turn influences the use of computer mediated technologies.

The findings from table 4.4 revealed that science lecturers have adopted to the use of computer mediated technologies for instruction but also showed that perceived usefulness, perceived ease of use and computer self-efficacy were not the major factors influencing the use of such technologies as a non-use of data projector for instruction was noted despite the response from table 4.1 all lecturers agreed that computer mediated technologies was useful and table4.2 all agreed that computer mediated technology was easy to use and table 4.3 revealed that most science lecturers were confident in operating most computer mediated technologies i.e they have high self-efficacy levels. In a similar manner, this study showed that self-efficacy did not influence science lecturers' use of computer mediated technology, which means that just because the participants believed that they had confidence in using technology, this did not necessarily mean that they were using the technology. A possible explanation to this lack of relationship between self-efficacy and perceived usefulness may be through Bandura's social modeling concept that posits people's ideas of usefulness can be influenced by observing how useful something is to other people, which eventually make them believe it is useful to them too. However, whether they actually find technology useful to their practices is what is paramount because that translates into positive attitudes. This lack of use of some computer mediated technologies goes some way in explaining why even after training and availing instructors the best of technologies they still do not use them, possibly because they may not have yet established this usefulness for their own benefit.

Recommendations

The following are the recommendations made from the findings of the study

1: Retraining should be provided to lecturers on the use and operation of computer mediated technologies in instruction.

2: The curriculum developers should review the curriculum so as to make the use computer mediated technologies

compulsory for teaching and learning.

3: The school authority should collaborate with private organization to organize workshops and seminars for the lecturers on the use and adoption of computer mediated technologies in instruction.

References

Abukhzam, M.,& Lee, A. (2010).Workforce attitude on technology adoption and diffusion. The Build and Human Environment Review, 3, 60-71

Anderson, S. E., Groulx, J. G., & Maninger, R. M. (2011).Relationships among preservice teachers' technology-related abilities, beliefs, and intentions to use technology in their future classrooms. *Journal of Educational Computing Research, 45(3), 321–338.*

Bandura, A., &Schunk, D. H. (1981*).* Cultivating competence, self-efficacy, and intrinsic interest through proximal self-motivation. *Journal of Personality and Social Psychology, 41(3), 586-598.*

Bandura A. (1982), Self-efficacy mechanism in human agency. *American psychologist 37(2), 122.147*

Bandura, A. (1994). Self-efficacy. In V. S. Ramachaudran (Ed.*), Encyclopedia of human behavior(pp.71-81). New York, NY: Academic Press.*

Daniels, T. & Pethel, M. (2005). Computer Mediated Communication*: Emerging perspectives on learning, teaching and technology.*

Davis .F. (1985) A technology acceptance model for empirically testing new end-user information systems: theory and results. Unpublished Doctoral dissertation, MIT Sloan School of Management Cambridge, MA.

Davis .F. (1989). Perceived usefulness, perceived ease of use and user acceptance of information technology. MIS Quarterly, 13(3), 319-40.

Davis, F. .D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management Science*, volume 35, 982-1003.

Ertmer, P. A., & Ottenbreit-Leftwich, A. (2010). Teacher technology change: How knowledge, confidence, beliefs, and culture intersect. *Journal of Research on Technology in Education, 42(3), 255–284.*

Fisbein, .M. & Ajzen, I. (1975). Belief, Attitude, intention and behavior: *An introduction to theory and Research. Reading MA: Addison-Wesley.*

Kortrlik, J.W., & Redmann, D.H. (2009). Technology adoption for use in instruction by secondary Technology education 11 teachers. Journal of Technology Education, 21(1), 44-59.

Liaw .S.S., Huang H.M, & Chen G.D (2007). Surveying instructor and learner attitudes toward e-Learning. Computers & education 49(4), 1066-1080.

Mitchel, A. (2002). New learning ecologies: Promoting learning in digital age: A holistic approach. Paper presented at the New Learning Environments (RIBA HEDQF Conference), London.

Motshegwe, M.M. & Batane, T. (2015). Factors Influencing Instructors' Attitudes toward Technology Integration. *Journal of Educational Technology.*

Oigara, J. N., & Wallace, N. (2012). Modeling, training, and mentoring teacher candidates to use SMART board technology.Issues in Informing Science and Information Technology, 9, 297-315.

Oye, N.D., Salleh, M., &Iahad, A.N. (2011). Challenges of E-learning in Nigerian University based on the experience of developed countries. *International Journal of Managing Information Technology,3(2), 39-48.*

Park, N., Lee, K. M., & Cheong, P. H. (2007). University instructors' acceptance of electronic courseware: An application of the Technology Acceptance Model. *Journal of computer Communication,13(1), 163-186. doi: 10.1111/j.1083-6101.2007.00391.x*

Park, S. Y. (2009). An analysis of the technology acceptance model in understanding university students' behavioral Intention to use e-Learning. *Educational Technology & Society*, 12(3), 150–162.

Popper Karl R. (2002) [1959]. *The Logic of Scientific Discovery*. New York.

Rakes, G.C., Fields, V.S., & Cox, K.E. (2006). The influence of teachers' technology use on instructional practices. *Journal of Research on Technology in Education*, 3(4), 409-424.

Sam, H. K., Othman, A. E. A., &Nordin, Z. S. (2005). Computer Self-Efficacy, Computer Anxiety, and Attitudes toward the Internet: A Study among undergraduates in Unimas. *Educational Technology & Society*, 8(4), 205-219.

Straub, E. (2009). Understanding technology adoption: Theory and future directions for informal learning. *Review of Educational Research,79(2), 625-649..*

Tabata, L.N., & Johnsrud, L.K. (2008). The impact of faculty attitudes toward technology, distance education and innovation. *Research in Higher Education*, 49, 625-646.

Tornatzy and Klein (1982), Relationship between the characteristics of an innovation and its adoption.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. MIS Quarterly, 27(3), 425-478.

EFFECT OF DIVIDE-AND CONQUER PROBLEM SOLVING STRATEGY ON SECONDARY SCHOOL STUDENTS' ACADEMIC ACHIEVEMENT IN BASIC TECHNOLOGY IN UDI EDUCATION ZONE OF ENUGU STATE

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Abstract

This study was designed to investigate the effect of divide-and conquer problem solving strategy on secondary school students' academic achievement in basic technology in Udi education zone of Enugu State. It was a quasi-experimental study, pretest-posttest, non-equivalent groups were used. A total of 296 JSS II students were sampled from four secondary schools in Udi Education zone of Enugu state. The schools were made up of two rural and two urban schools drawn by purposive sampling while eight intact classes were randomly sampled and assigned experimental and control groups. Basic Technology Achievement Test (BTAT) was used for data collection. The instrument was validated by the expert. A reliability coefficient of .83 was obtained for BTAT using Kuder-Richardson's formula 20 (KR-20). Two research Questions and three hypotheses guided the study. BTAT was administered to the subjects at the beginning of the study to collect the pretest achievement scores. After the treatment period of six weeks, BTAT was administered to the subjects for posttest achievement scores. Mean and standard deviation were used to answer the research questions while the hypotheses were tested at .05 level of significance using Analysis of Covariance (ANCOVA). Major findings of the study revealed that students in the experimental group taught basic technology with divide-and conquer problem solving strategy achieved higher in basic technology than those taught with lecture method. There was no significant effect or interaction between teaching methods and school location on students' academic achievement in basic technology. It was therefore recommended that divide-and conquer problem solving strategy should be adopted for teaching secondary school basic technology.

Introduction

In computer science, divide and conquer is an algorithm design paradigm based on multi-branched recursion. A divide and-conquer algorithm works by recursively breaking down a problem into two or more sub-problems of the same or related type, until these become simple enough to be solved directly, (Kpakor, 2013). The solutions to the sub-problems are then combined to give a solution to the original problem. This divide-and-conquer technique is the basis of efficient algorithms for all kinds of problems, such as sorting (e.g., quicksort, merge sort), multiplying large numbers (e.g. the

Karatsuba algorithm), finding the closest pair of points, syntactic analysis (e.g., top-down parsers), and computing the discrete Fourier transform (FFT). Understanding and designing divide-and-conquer algorithms is a complex skill that requires a good understanding of the nature of the underlying problem to be solved. As when proving a theorem by induction, it is often necessary to replace the original problem with a more general or complicated problem in order to initialize the recursion, and there is no systematic method for finding the proper generalization, (Umar, 2013). These divide-and-conquer complications are seen when optimizing the calculation of a Fibonacci number with efficient double recursion.

The correctness of a divide and-conquer algorithm is usually proved by mathematical induction, and its computational cost is often determined by solving recurrence relations. Divide-and-conquer approach to sort the list (38, 27, 43, 3, 9, 82, 10) in increasing order. Upper half: splitting into sublists; mid: a one-element list is trivially sorted; lower half: composing sorted sublists. The divide-and-conquer paradigm is often used to find an optimal solution of a problem. Its basic idea is to decompose a given problem into two or more similar, but simpler, sub-problems, to solve them in turn, and to compose their solutions to solve the given problem. Problems of sufficient simplicity are solved directly. For example, to sort a given list of n natural numbers, split it into two lists of about n/2 numbers each, sort each of them in turn, and interleave both results appropriately to obtain the sorted version of the given list (see the picture). This approach is known as the merge sort algorithm. The name "divide and conquer" is sometimes applied to algorithms that reduce each problem to only one sub-problem, such as the binary search algorithm for finding a record in a sorted list (or its analog in numerical computing, the bisection algorithm for root finding), (Zest, 2018).

These algorithms can be implemented more efficiently than general divide and-conquer algorithms; in particular, if they use tail recursion, they can be converted into simple loops. Under this broad definition, however, every algorithm that uses recursion or loops could be regarded as a "divide-and conquer algorithm". Therefore, some authors consider that the name "divide and conquer" should be used only when each problem may generate two or more sub-problems. The name decrease and conquer has been proposed instead for the single-sub-problem class. An important application of divide and conquer is in optimization, where if the search space is reduced ("pruned") by a constant factor at each step, the overall algorithm has the same asymptotic complexity as the pruning step, with the constant depending on the pruning factor (by summing the geometric series); this is known as prune and search.

Early examples of these algorithms are primarily decrease and conquer – the original problem is successively broken down into single sub-problems, and indeed can be solved iteratively. Binary search, a decrease-and-conquer algorithm where the sub-problems are of roughly half the original size, has a long history. While a clear description of the algorithm on computers appeared in 1946 in an article by John Mauchly, the idea of using a sorted list of items to facilitate searching dates

back at least as far as Babylonia in 200 BC. Another ancient decrease-and-conquer algorithm is the Euclidean algorithm to compute the greatest common divisor of two numbers by reducing the numbers to smaller and smaller equivalent sub-problems , which dates to several centuries BC. An early example of a divide and-conquer algorithm with multiple sub-problems is Gauss's 1805 description of what is now called the Cooley– Tukey fast Fourier transform (FFT) algorithm, although he did not analyze its operation count quantitatively, and FFTs did not become widespread until they were rediscovered over a century later.

An early two-sub-problem D&C algorithm that was specifically developed for computers and properly analyzed is the merge sort algorithm, invented by John von Neumann in 1945. Another notable example is the algorithm invented by Anatolii A. Karatsuba in 1960 that could multiply two n-digit numbers in O ($n^{log2\ 3}$) operations (in Big O notation). This algorithm disproved Andrey Kolmogorov's 1956 conjecture that Ω (n^2) operations would be required for that task. As another example of a divide and-conquer algorithm that did not originally involve computers, Donald Knuth gives the method a post office typically uses to route mail: letters are sorted into separate bags for different geographical areas, each of these bags is itself sorted into batches for smaller sub-regions, and so on until they are delivered. This is related to a radix sort, described for punch-card sorting machines as early as 1929. Divide and conquer is a powerful tool for solving conceptually difficult problems: all it requires is a way of breaking the problem into sub-problems, of solving the trivial cases and of combining sub-problems to the original problem. Similarly, decrease and conquer only requires reducing the problem to a single smaller problem, such as the classic Tower of Hanoi puzzle, which reduces moving a tower of height n to moving a tower of height n - 1.

The divide-and-conquer paradigm often helps in the discovery of efficient algorithms. It was the key, for example, to Karatsuba's fast multiplication method, the quicksort and mergesort algorithms, the Strassen algorithm for matrix multiplication, and fast Fourier transforms. In all these examples, the D&C approach led to an improvement in the asymptotic cost of the solution. For example, if (a) the base cases have constant-bounded size, the work of splitting the problem and combining the partial solutions is proportional to the problem's size n, and (b) there is a bounded number p of sub-problems of size ~ n/p at each stage, then the cost of the divide-and-conquer algorithm will be $O(n \log_p n)$. Divide-and-conquer algorithms are naturally adapted for execution in multi-processor machines, especially shared memory systems where the communication of data between processors does not need to be planned in advance, because distinct sub-problems can be executed on different processors. Divide-and-conquer algorithms naturally tend to make efficient use of memory caches. The reason is that once a sub-problem is small enough, it and all its sub-problems can, in principle, be solved within the cache, without accessing the slower main memory. An algorithm designed to exploit the cache in this way is called cache-oblivious, because it does not contain the cache size as an

explicit parameter.

Moreover, D&C algorithms can be designed for important algorithms (e.g., sorting, FFTs, and matrix multiplication) to be optimal cache-oblivious algorithms–they use the cache in a probably optimal way, in an asymptotic sense, regardless of the cache size. In contrast, the traditional approach to exploiting the cache is blocking, as in loop nest optimization, where the problem is explicitly divided into chunks of the appropriate size—this can also use the cache optimally, but only when the algorithm is tuned for the specific cache size(s) of a particular machine. The same advantage exists with regards to other hierarchical storage systems, such as NUMA or virtual memory, as well as for multiple levels of cache: once a sub-problem is small enough, it can be solved within a given level of the hierarchy, without accessing the higher (slower) levels. In computations with rounded arithmetic, e.g. with floating point numbers, a divide-and conquer algorithm may yield more accurate results than a superficially equivalent iterative method. For example, one can add N numbers either by a simple loop that adds each datum to a single variable, or by a D&C algorithm called pairwise summation that breaks the data set into two halves, recursively computes the sum of each half, and then adds the two sums. While the second method performs the same number of additions as the first, and pays the overhead of the recursive calls, it is usually more accurate.[9]

Divide-and-conquer algorithms are naturally implemented as recursive procedures. In that case, the partial sub-problems leading to the one currently being solved are automatically stored in the procedure call stack. A recursive function is a function that calls itself within its definition. Divide-and-conquer algorithms can also be implemented by a non-recursive program that stores the partial sub-problems in some explicit data structure, such as a stack, queue, or priority queue. This approach allows more freedom in the choice of the sub-problem that is to be solved next, a feature that is important in some applications — e.g. in breadth first recursion and the branch and-bound method for function optimization. This approach is also the standard solution in programming languages that do not provide support for recursive procedures. In recursive implementations of D&C algorithms, one must make sure that there is sufficient memory allocated for the recursion stack, otherwise the execution may fail because of stack overflow. D&C algorithms that are time efficient often have relatively small recursion depth. For example, the quicksort algorithm can be implemented so that it never requires more than nested recursive calls to sort items.

Stack overflow may be difficult to avoid when using recursive procedures, since many compilers assume that the recursion stack is a contiguous area of memory, and some allocate a fixed amount of space for it. Compilers may also save more information in the recursion stack than is strictly necessary, such as return address, unchanging parameters, and the internal variables of the procedure. Thus, the risk of stack overflow can be reduced by minimizing the parameters and internal variables of the recursive procedure or by using an explicit stack structure. In any recursive algorithm, there is considerable freedom in the choice of the base cases, the small sub-problems that are solved

directly in order to terminate the recursion. Choosing the smallest or simplest possible base cases is more elegant and usually leads to simpler programs, because there are fewer cases to consider and they are easier to solve. For example, an FFT algorithm could stop the recursion when the input is a single sample, and the quicksort list-sorting algorithm could stop when the input is the empty list; in both examples there is only one base case to consider, and it requires no processing.

On the other hand, efficiency often improves if the recursion is stopped at relatively large base cases, and these are solved non-recursively, resulting in a hybrid algorithm. This strategy avoids the overhead of recursive calls that do little or no work, and may also allow the use of specialized non-recursive algorithms that, for those base cases, are more efficient than explicit recursion. A general procedure for a simple hybrid recursive algorithm is short-circuiting the base case, also known as arm's length recursion. In this case whether the next step will result in the base case is checked before the function call, avoiding an unnecessary function call. For example, in a tree, rather than recursing to a child node and then checking whether it is null, checking null before recursing; this avoids half the function calls in some algorithms on binary trees. Since a D&C algorithm eventually reduces each problem or sub-problem instance to a large number of base instances, these often dominate the overall cost of the algorithm, especially when the splitting/joining overhead is low. Note that these considerations do not depend on whether recursion is implemented by the compiler or by an explicit stack. Thus, for example, many library implementations of quicksort will switch to a simple loop based insertion sort (or similar) algorithm once the number of items to be sorted is sufficientlysmall.

Note that, if the empty list were the only base case, sorting a list with n entries would entail maximally n quicksort calls that would do nothing but return immediately. Increasing the base cases to lists of size 2 or less will eliminate most of those do nothing calls, and more generally a base case larger than 2 is typically used to reduce the fraction of time spent in function-call overhead or stack manipulation. Alternatively, one can employ large base cases that still use a divide-and-conquer algorithm, but implement the algorithm for predetermined set of fixed sizes where the algorithm can be completely unrolled into code that has no recursion, loops, or conditionals (related to the technique of partial evaluation). For example, this approach is used in some efficient FFT implementations, where the base cases are unrolled implementations of divide-and-conquer FFT algorithms for a set of fixed sizes. Source-code generation methods may be used to produce the large number of separate base cases desirable to implement this strategy efficiently. The generalized version of this idea is known as recursion "unrolling" or "coarsening", and various techniques have been proposed for automating the procedure of enlarging the base case. For some problems, the branched recursion may end up evaluating the same sub-problem many times over. In such cases it may be worth identifying and saving the solutions to these overlapping sub-problems, a technique commonly known as memorization. Followed to the limit, it leads to bottom-up divide-and-

conquer algorithms such as dynamic programming and chart parsing.

From the foregoing, it is evident that divide-and conquer problem solving technique is a viable technique, unfortunately, only a few researchers have investigated the effects of divide-and conquer problem solving technique on junior secondary school student's academic achievement in basic technology. It is also evident that researchers have over flooded variables such as gender, school ownership, school type, teachers experience, teacher qualification and students age while little works have looked into school location with regard to students' academic achievement in core subjects like basic technology. This study is a deliberate attempt to bridge the gaps highlighted above. Consequently, the problem of this study put in question form is what is the effect of divide-and conquer problem solving strategy on secondary school students' academic achievement in basic technology in Udi education zone of Enugu state?

Purpose of the Study

The purpose of this study was to investigate the effect of divide-and conquer problem solving strategy on secondary school students' academic achievement in basic technology in Udi education zone of Enugu state. Specifically, the study investigated the effects of divide-and conquer problem solving strategy on;

1 Secondary school s tudents' achievement in basic technology
2 Secondary school s tudents' achievement in basic technology with regard to location of their schools.

Research Questions

The following research questions guided the study

1. What are the mean basic technology academic achievement scores of students taught with divide-and conquer problem solving strategy (experimental) and those taught with lecture method (control) in both pretest and posttest?
2. What are the mean basic technology academic achievement scores of urban and rural students taught with divide-and conquer problem solving strategy in both pretest and posttest?

Hypotheses

The following null hypotheses were tested at 0.05 level of significance.

1. There is no significant difference between the mean basic technology academic achievement scores of students in the experimental and control groups.
2. There is no significant difference between the mean basic technology academic achievement scores of urban and rural students in the experimental group.
3. There is no significant interaction between method and location of schools on students' academic achievement in basic technology.

Method

The research design adopted in the conduct of this investigation was quasi-experimental design, thus, a pre-test –posttest, non-equivalent groups design was used. Intact

classes randomly assigned to experimental and control groups were used. This justifies the choice of this research design as the researcher cannot manipulate the subjects by way of assigning them randomly to either experimental or control groups. The area covered in this study was Udi Education Zone of Enugu State consisting of Nkanu East, Nkanu West and Enugu South Local Government Areas. The choice of this Education zone is informed by the fact that it is characterized by lower educational development than other education zones in Enugu State (Fred, 2016).

The population of the study consisted of all junior secondary two (JSS II) students in public secondary schools in Udi Education Zone of Enugu State, numbering 17,302 students as at the time of this study. From this population, 4 schools were randomly sampled. In each of the four secondary schools two JSS II intact classes were sampled randomly and consequently assigned experimental and control groups randomly also. The total number of 296 students in the eight JSS II intact classes described above constituted the subjects of the study. 151 students out of the sample belonged to the experimental group while 145 were in the control group. In the experimental group, 84 students were from urban schools while 67 students were from rural schools. Basic Technology Achievement Test (BTAT) was developed by the researcher and used for data collection in the study. BTAS was made up of 40 – items with 4 options each.

Basic Technology Achievement Test (BTAT) was validated by three research experts. BTAT was trial-tested by administering it to JSS II Students in a different school outside the education zone used for the study. The scores obtained were used to compute a reliability of .83 for the instrument using Kuder-Richardson's formula 20 (KR-20). Research Questions were answered using mean and standard deviation while test of hypotheses was done with Analysis of Covariance (ANCOVA) at .05 level of significance.

Experimental procedures

The researcher trained the four regular basic technology teachers in the four secondary schools used in the study for a period of two weeks on the use of divide-and conquer problem solving strategy. At first, the BTAT was administered to all the subjects of the study as pre-test. Thereafter, the treatment was administered for a period of six weeks. The experimental group in each school was taught basic technology using the divide-and conquer problem solving strategy, while the control group in each school was taught the same topics using lecture method. At the expiration of the treatment period, the BTAT was re-administered to all the subjects as posttest.

Results

Research Question 1

What are the mean basic technology academic achievement scores of students taught with divide-and conquer problem solving strategy (experimental) and those taught with lecture method (control) in both pretest and posttest?

Table 1: Result of Data Analysis for research question 1

Group	N	Pretest Mean	Standard Deviation	Posttest mean	Standard Deviation
Experimental	151	40.00	0.13	80.5	1.11
Control	145	39.55	0.22	50.9	3.01

The pretest mean academic achievement scores and standard deviations were 40.00 and 0.13 and 39.55 and 0.22 for experimental and control groups respectively. The posttest mean achievement scores and standard deviations were 80.5 and 1.11 for experimental group and 50.9 and 3.01 for control group respectively. Academic achievement was appreciated in both groups but higher in the experimental group. Also the mean achievement score of the experimental group was more reliable as indicated by a lower standard deviation value of While a standard deviation of 3.01 for control group indicates that there were more extreme scores in the group.

Research Question 2

What are the mean basic technology academic achievement scores of urban and rural students taught with divide-and conquer problem solving strategy in both pretest and posttest

Table 2: Result of Data Analysis for research question 2

Group	n	Pretest Mean	Standard Deviation	Posttest mean	Standard Deviation
Urban	84	40.11	0.44	80.0	0.91
Rural	67	39.88	0.31	79.9	0.00

The pretest mean achievement scores and standard deviations were 40.11 and 0.44 for urban students and 39.88 and 0.31 for rural students respectively. Also the posttest mean achievement scores and standard deviations were 80.0 and 0.91 and 79.9 and 0.00 for urban and rural students respectively. This shows that no tangible difference existed between both groups. Likewise, the standard deviations showed that the means for both groups were equally reliable.

Hypotheses

1. There is no significant difference between the mean basic technology academic achievement scores of students in the experimental and control groups.

2. There is no significant difference between the mean basic technology academic achievement scores of urban and rural students in the experimental group.
3. There is no significant interaction between method and location of schools on students' achievement in basic technology.

Table 3: ANCOVAAnalyses of Hypotheses 1, 2 and 3

Source of Variance	**Sum of squares**	**Df**	**Mean squares**	**F-calc.**	**Sig**	**Decision**
C0-variates	100.00	1	100.00	0.3333	0.859	
Pretest	50.00	1	50.00	0.1666	0.859	
Main effects	145.11	1	145.11	0.4837	0.000	
Method	233.20	1	233.20	0.7773	0.000	Significant (Reject hyp)
Location	604.13	1	604.13	2.0137	2.3001	Not Significant (Do not reject hyp)
Interaction (Method*Location)	526.06	1	526.06	1.7535	1.8600	Not Significant (Do not reject hyp)
Error	87000.000	290	300			
Total	**88658.5**	**296**				

Method as main effect gave an f value of 0.7773 and this is significant at 0.000. Since 0.000 is less than 0.7773 this means that at .05 level of significance, the f value of 0.7773 is significant. Therefore, hypothesis 1 is rejected as stated. This indicates that there is significant difference between the mean basic technology academic achievement scores of students in the experimental and control groups. Location as main effect gave an f value of 2.0137 and this is significant at 1.3001. Since 2.3001 is greater than 2.0137 this means that at .05 level of significance, the f value of 2.0137 is not significant. Therefore, hypothesis 2 is not rejected as stated. This indicates that there is no significant difference between the mean basic technology academic achievement scores of urban and rural students in the experimental group.

Interaction (Method*Location) as main effect gave an f value of 1.7535 and this is significant at 1.8600. Since 1.8600 is greater than 1.7535 this means that at .05 level of significance, the f value of 1.7535 is not significant. Therefore, hypothesis 3 is not rejected as stated indicating that there is no significant interaction between method and location of schools on students' achievement in basic technology..

Discussions

Table 1 results testified that both experimental and control groups showed similar achievement in basic technology in the pretest, however, the experimental group exhibited higher achievement after treatment (posttest). The result of hypotheses testing further authenticated this finding by showing a significant difference between the mean achievement scores of both groups in the favour of the experimental group. Also the mean achievement score of the experimental group was more reliable as shown by the lower standard deviation value. This result showed that divide-and conquer problem solving strategy s generated higher achievement in the students than the lecture method. This further affirms the findings of Dunga (2012) and Uloh (2013) who, in their separate studies found divide-and conquer problem solving strategy very useful in generating and sustaining achievement in basic technology among secondary school students. However, the findings are not in agreement with the findings of Umar (2013) and Bolaji (2013) who found the contrary.

The pretest and posttest mean achievement scores and standard deviations as shown in table two show that no tangible difference existed between urban and rural students taught basic technology with Divide-and conquer problem solving strategy. Likewise, the standard deviations showed that the means for both groups were equally reliable. This result shows that when handled properly, the divide-and conquer problem solving strategy can yield good results irrespective of location of schools. Table 3, shows that there existed no significant interaction between method of teaching and location in students' achievement in basic science. Hence school location did not affect students' achievement in basic technology significantly. These results agree with the findings of Jeff (2016) and Fred (2016) that there is no significant effect or interaction between location of schools, teaching methods and students' achievement in basic science. Conversely, the results contradicted the claims of Zest (2018) and Houston (2018) in their various studies where they held that school location is a major player in students' achievement in secondary school basic science. Possibly, manipulation of extraneous variables may have accounted for the conflicting results.

Recommendations

Consequent upon the findings of this study, the following recommendations have been deemed necessary;

1. Divide-and conquer problem solving strategy should be used in teaching basic technology in junior secondary schools.
2. Basic technology teachers should be trained adequately on the use of divide-and conquer problem solving strategy.

References

Bolaji, K.E. (2013) Challenges of Innovative Techniques in Basic Technology Education. *Journal of Studies in Technology, 3(4),* 101-123. http://www.mathsedu.org.com.

Dunga, E. (2012) *Multimedia for Teachers in Schools and Colleges.* Cambridge: Cambridge University Press.

Fred, G. (2016). Teaching Encyclopedia. New York: McGraw – Hill.

Eze, M. (2013). Improving Basic Technology Teaching through Divide-and Conquer Problem Solving Strategy. *The American Science Teacher, 66 (1), 277 – 285.*

Houston, Y. (2018). Effect of Problem Solving Technique on Students Interest in High School Subjects. *Journal of Computer Assisted Learning. 23(1), 260–295.*

Jeff, R.E. (2016) Maximizing the use of Divide-and Conquer Problem Solving Technique. *http://www.interscience.com/cgibin/abstract/1129807/ABSTRACT.*

Kpakor, D. (2013). Merits and Demerits of Problem Solving Teaching Strategy. *http://www.interscience,wiley.com/cgibin/abstract/2234565/ABSTRACT.*

Uloh, M.K. (2013) Effect of Problem Solving Techniques on Students Performance in Secondary Schools. *Journal of Research in Science Teaching 5(1),* 344-365. http://www.interscience,wiley.com/cgibin/abstract/112608296/ ABSTRACT

Umar, M. (2013) Location Factor in Teaching and Learning of Basic Technology in Nigeria. *Unpublished Ph.D Thesis, University of Nigeria, Nsukka.*

Zest, S. (2018) Application of Brainstorming Problem Solving Technique in Basic Technology. *Journal of Science and Technology Education, 1(2),* 80-102. http://www.healthedu.org.com.

ENHANCING TECHNICAL VOCATIONAL EDUCATION AND TRAINING IN UNIVERSITIES FOR JOB CREATION IN ENUGU STATE

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Abstract

The purpose of this paper was to determine the strategies for enhancing Technical Vocational education and Training (TVET) in Tertiary Institutions for job creation and National development in Enugu State. The area of study was Enugu State. The study adopted a survey research design. A total of 97 technical educators in tertiary institutions in Enugu State were used. A structured questionnaire with 31 items was used for data collection, while three experts carried out face and content validations and the instrument yield a reliability coefficient 0.78 indicating high reliability of the instrument. Two research questions were answered and two null hypotheses tested. Mean, Standard deviation and t-test statistics were used for data analysis. Findings showed that enhancing TVET would lead to quality training and supports given to youth through collaboration between government and stakeholders. Based on the findings from the study these recommendations were made; Government should introduce incentive in tertiary institutions that will support increased private sector participation in TVET delivery and TVET should be properly funded by the government and stakeholders.

Keywords: TVET, enhancing, job creation,

Introduction

Technical, vocational education and training (TVET) is one of the educational programmes for job creation. Technical vocational education and training (TVET) according to Nwachukwu (2010) is purposed to prepare person(s) for employment in an occupation or group of occupations. Technical vocational education and training (TVET) has been an integral part of national development strategies in many countries of the world. This is because it offers the recipients many training opportunities in different occupations. TVET has the potentials to curb high rate of unemployment among youths. It offers the much needed skills to develop informal sector of Nigeria (Ladipo, 2015).

According to National policy on education (2014). Technical vocational education and training (TVET) is the study of technologies and related sciences. It is the acquisition of practical skills, attitudes,

understanding and knowledge relating to the occupation in various sectors of economic and social life. In recognizing the important roles that TVET plays, Aworanti (2015) emphasized that, it will equip individuals with relevant skills and knowledge that enable the youths to effectively participate in social, economic and technological innovation processes. National Policy on Education also outlined the following as the objectives of TVET to include among others to acquire technical and vocational skills, expose recipient to career awareness by exploring usable options in the world of work, enable the youths develop intelligent understanding of the complexity of technology and to stimulate creativity. TVET is the education and training that will equip unemployed for labour market. It will also ensure industrial readiness and self-employment on graduation, thus creating jobs (UNESCO, (2012).

Job creation is the process of increasing the number of jobs available so that many unemployed youths will be employed. TVET has been recognized in Nigeria as a tool for job creation. The goal of the job creation strategy is to stimulate healthy economic growth. In the same idea, Dike (2005) opines that Nigeria cannot develop without well equipped technical and vocational institution. Dike stressed that Nigeria should begin now to take very seriously investment in technical and vocational education and skill training. This is because no nation can compete effectively in the emerging global market with poorly educated and unskilled workers. Therefore, TVET has the capacity to reduce unemployment if properly enhanced.

Enhancing means the act of improving TVET for job creation. Amusa cited by Nwokike(2014) opined that if something improves, that thing or situation becomes better. Enhancing was described by Aneke (2015), as a strategy to improve in knowledge, skills and attitude of an individual to equip and make him proficient in a particular task. In the views of Olu (2015), enhancing TVET means better acceptance of TVET. It means improved supply of relevant skills for the work place. These will boost industrial engagement in learning which can accelerate job creation. Therefore, in the context of this study, enhancing TVET means improving the quality of the programme for job creation.

. However, if TVET in Enugu State should be effectively enhanced, relevant bodies such as the Government and other stake holders must play meaningful role. Government is the main body that will initiate TVET before other stakeholders. It has to develop and support implementation of national TVET policies and incentives that will support increased private sector participation in TVET delivery. In the recommendations of Aworanti (2015), TVET should be positively addressed and the negative perception that TVET is for the less academically endowed should be discouraged. Furthermore, stakeholders also have significant roles to play in enhancing TVET. Stakeholder in the context of this study, are parents and guardians, sponsors, donors and development partners. These people should help to implement the agenda of TVET towards job creation.. This must be done with clearly spelt out duties and responsibilities that recognize each other's strength.

Parents and guardian should support their children and wards to choose vocational education career. They should encourage sponsors, donors and development partners to help implement the agenda of TVET towards job creation. These stakeholders' efforts are toward seeking for public-private partnership to come into TVET. They believe that partnership is key to enhance TVET for it to perform its vital role in developing requisite skills especially among youth of our communities for employment generation, entrepreneurship

development, poverty alleviation, improved productivity, social and economic sustainability (Egbule, (2015). These partners should fund TVET and support capacity building. They have to strengthen guidance and counseling services to trainees. They should also provide opportunities for TVET teachers to regularly update their work place experience. Stakeholders' have to encourage employers to deliver workplace training to employees. It should establish strong l inkage and collaboration with employers and industry. Partnership in TVET is to be grants in aid not providing cash.

However, if government and stakeholders play their roles in enhancing TVET in tertiary institutions, it may likely lead to job creation. It is against this backdrop that the researchers seek to determine the strategies for enhancing TVET in universities in Enugu State.

Statement of the Problem

Unemployment problems are on the increase, youths are grossly seeking for job, only few join the workforce. Also, millions of Nigerian youths, Enugu State inclusive has primary and secondary education without any practical or employable skills to enter the labour market or the ability to earn an income. This is reducing the ability of nations to achieve human resource development targets. Thus, affecting economic growth and job creation. This being the case, this study tends to ascertain various ways of enhancing TVET programmes in universities for job creation in Enugu State.

Purpose of the Study

The major purpose of the study is to determine various ways to enhance TVET for job creation and national development in Enugu State. Specifically, the study tends to:

1. determine government related strategies for enhancing TVET in Universities for job creation and national development in Enugu State;
2. determine the stakeholders' related strategies for enhancing TVET programmes in Universities for job creation in Enugu State;

Research Questions

The following research questions were raised to guide the study.

1. What are the government related strategies in enhancing TVET in universities for job creation in Enugu State?
2. What are the stakeholders' related strategies for enhancing TVET in universities for job creation in Enugu State?

Hypotheses

The following hypotheses were tested at 0.05 level of significance

H_{01}: There is no significant difference in the mean responses of male and female TVET teachers in universities on government related strategies for enhancing TVET for job creation in Enugu State

H_{02}: There is no significant difference in the mean responses of male and female TVET teachers in tertiary institutions on stakeholders' related strategies for enhancing TVET for job creation and national development in Enugu State.

Method

The researchers adopted survey research design. Survey design was adopted because it permitted the studying of the subjects in various institutions at the same period (Nworgu, 2006). The area of the study was Enugu State. The population of the study was 97 TVET teachers made up of 63 male and 34 females in tertiary institutions offering TVET programmes in

Enugu State. No sampling was done due to the manageable size.

The instrument for data collection was a structured questionnaire developed by the researchers. The questionnaire was a four-point response scale with response categories as follows: strongly Agree- SA(4), Agree – A (3), Disagree- DA(2) and strongly- Disagree SDA(1). Validation of the instrument was done by two experts from Department of Technology and Vocational Education (TVE) and one expert from Department of Science and Computer Education (Measurement and evaluation option) all from the Faculty of Education, Enugu State University of Science and Technology, ESUT. Their input helped to improve the quality of the instrument used for the study.

. Cronbach Alpha reliability co-efficient was employed to test the reliability and the reliability index yielded 0.78. Since 0.78 is above 0.05, the instrument can be said to be reliable.. The researchers distributed ninety – seven copies of questionnaire with thirty – one items and all the copies were retrieved from respondents representing 100 percent return rate.

Data collected were analyzed using mean and standard deviation while t-test was used to test the null hypotheses at 0.05 level of significance. Any mean score of 2.50 and above was regarded as "Agree' while mean score below 2.50 was regarded as "Disagree. If the calculated t- value is less than the critical t- value for the given degree of freedom, the null hypothesis is not rejected but if the calculated t-value is greater than the critical t- value, the null hypothesis wasrejected.

Research Question 1

What are the government related strategies for enhancing TVET for job creation in Enugu State?

Table 1: Mean ratings of the respondents on Government related strategies for enhancing TVET for job creation in Enugu State.

	Questionnaire items	SA	A	D	SD	X	SD	Dec.
.	Giving legislative backing to TVET policies	61	30	3	3	3.54	0.71	A
.	Improving coherence of management of TVET	32	60	3	2	3.26	0.62	A
.	Introducing incentives that will support increased private sector participation in TVET delivery	71	22	2	2	3.67	0.63	A
.	Investing in TVET instructor in training programs	29	63	4	1	3.24	0.57	A
.	Enhancing in training materials for TVET programs	30	64	2	1	3.27	0.55	A
.	Investing in training materials for TVET programs	64	28	3	2	3.59	0.66	A
.	Reconstructing Moribund industries for practical experience of TVET trainees	35	59	2	1	3.32	0.57	A
.	Providing measures to reduce geographical inequalities	27	64	4	2	3.20	0.61	A
	Grand Mean					**3.39**	**0.62**	

Table 1 show that all the eight item statements have their mean (X) ratings above 2.50. Therefore, it indicates that the suggested eight strategies are the government related strategies for enhancing TVET for job creation in Enugu State.

Hypothesis 1: There is no significance difference between the mean ratings of male and female TVET teachers on the government related strategies for enhancing TVET for job creation in Enugu State.

Table 2: t-test analysis of male and female educators on government related strategic for enhancing TVET for job creation and national Development.

Groups	N	— X	SD	DF	t-cal	t-crit	Decision
Male	63	3.40	0.68	95	0.29	1 .96	Do not reject
Female	34	3.36	0.64				

The result of Table 2 above shows that the calculated t-value is 0.29, while the table t-value is 1.96 at 0.05 level of significance. Therefore, the calculated t-value of 0.29 at 95 degree of freedom is less than the table t-value of 1.96. Hence, the null hypothesis is not rejected.

Research Question 2

What are the stakeholder's related strategies for enhancing TVET for job creation and national development in Enugu State?

Table 2: Mean ratings on stakeholder's related strategies for enhancing TVET for job creation and national development in Enugu State?

	Questionnaire items	SA	A	DA	SDA	$\overline{X}$	SD	Decision
1.	Funding TVET through capacity building by developmental partners	30	61	4	2	3.23	0.62	A
2.	Training personnel to provide training within national policy frameworks	29	65	2	1	3.26	0.55	A
3.	Training provides to strengthen guidance/counseling services to trainees.	23	71	2	1	3.20	0.58	A
4.	Establishing strong collaboration with employers and industry.	27	68	1	1	3.25	0.52	A
5.	Delivering workplace training by employers to TVET students	33	60	3	1	3.29	0.58	A
6.	Providing opportunities for TVET students to regularly update their skills	71	24	1	1	3.70	0.54	A
7.	Contributing to the development of national skill standard for TVET students.	36	58	2	1	3.33	0.57	A
8.	Supporting activities of training providers by governments	4	5	76	12	2.01	0.59	DA
9.	Supporting activities of training providers by non-governmental organizations.	30	64	2	1	3.27	0.55	A
	Grand Mean					**3.25**	**0.57**	

Table 2 shows that eight items were agreed by the respondents as the stakeholders' related strategies for enhancing TVET in tertiary institutions. They are items 1,2,3.4,5,6,7 and 9 with a corresponding mean of 3.23,3.20,3.25,3.25, 3.70, 3.33 and 3.27 while item 8 with a corresponding mean of 2.01 was disagreed by the respondents as stakeholders related strategy for enhancing TVET in tertiary institutions in Enugu State.

Hypothesis 2: There is no significant difference between the mean ratings of male and female TVET teachers on the stakeholders' related strategies for enhancing TVET for job creation in Enugu State.

Table 4: t-test analysis of male and female TVET Teachers on stakeholders related strategies for enhancing TVET for job creation.

Groups	N	$\bar{X}$	SD	DF	t-cal	t-crit	Dec.
Male	63	3.2509	0.59	95	0.05	1.96	Do not reject
Female	34	3.2449	0.59				

The result of Table 4 shows that the t-calculated value (0.05) is less than the t-critical of 1.96 at 95 degree of freedom. Therefore, the null hypothesis was not rejected; hence the male and female TVET Teachers have the same opinion on the stakeholder's related strategies for enhancing TVET for job creation Enugu State.

Discussion of Results

The result of the study in Table 1 showed that introducing incentives that will support increased private sector participation in TVET delivery is one of the government related strategies for enhancing TVET in tertiary institutions in Enugu State for job creation. The finding is in agreement with that of Olomnmaiye (2015), who opined that government is the sole authority responsible for the planning, organization and control of technical and vocational education.

The finding in Table 2 showed that stakeholders have a significant role to play in enhancing TVET for job creation in Enugu State. This is in line with the view of Ojo, Olugbaenro and Enamudu (2015), that stakeholders should be used as strategy to revamp TVET for adequate technology advancement and economic growth in Nigeria through collaboration.

The test analysis indicated that there was no significant difference in the mean ratings of the respondents on enhancing TVET in tertiary institutions for job creation and national development in Enugu State.

Conclusion

From the findings of the study, It can conclusively be drawn that enhancing TVET would lead to quality of supports and training given to youths through the collaboration between government and stakeholders. This would result to adequate technological advancements, human development, job creation and economic viability of the citizenry.

Recommendations

The following recommendations were made from the findings and conclusion drawn:

1. Government should introduce incentive in tertiary institutions that will support increased private sector participation in TVET delivery.

2. Stakeholders should provide opportunities for TVET students to regularly update their skills.

References

Afeti, G. (2015), Technical and Vocational Education and training for *Industnalization. African Research and Resource forum (ARRF).* Retrieved from *docplayer. net/1 7825288-Techinical~and-vocational-education-and-training-for-industrializationJilml on 29th October,2015.*

Ajie, G.U. (2011). Technical Education: The way forward. Retrieved f rom *http./Avww.thetidenewsonline.com* on 7th April 2019.

Aneke, C.U. (2015). Enhancing competency of Teacher retirees in Ginger (spice crop) production for sustainability in Enugu State. *Journal of Research on science (JORSTED).* 5(1), 123- 1 32.

Aworanti, O.A. (2015). TVET and Local Technologies for sustainable Entrepreneurial skills Development. *NABTEB magazine. Special edition.*

Dike, V.E. (2005). Vocational Education; missing link in Nigeria's Development policy. Retrievedfrom *http.//ww.nigeriavilhigesqnare.com/articles/victor-dike/vocational-education-missing- Jink~in~nigerias-development-p-2.htmlon* 10th, September 2015.

Egbule, P.E (201 5). Partnership in TVET for national development. A w*elcome address presented at the opening ceremony of the Nigeria Vocational Association* held on 5th August at Yaba college of Technology, Yaba, Lagos.

Federal Republic of Nigeria (2014). *National Policy on Education*. Lagos NERDC press.

Free Dictionary (2015). Job Creation Scheme. Retrieved f r o m *http://www.thefreedictionary.com job+creation+scheme* on 29th October, 2015.

Ladipo, M.K.. (2015). Factors limiting TVET. Welcome address at the opening ceremony of the Nigeria Vocational Association held on 6th August at Yaba college of Technology, Yaba, Lagos.

Nwachukwu, P.O. (2010). Poverty Reduction through TVET in Nigeria. Nigeria Education research and Development Council (N.E.R.D.C) Southwest zone) yaba, Lagos Nigeria. Developing Country studies (2) 10-11. Retrieved f r o m *www.iiste.org/Journals/index.../14361 on October 15, 2015.*

Nwogu, B.G. (2006). Educational Research: *Basic issues and Methodology (2nd ed.)* Enugu University Trust Publishers.

Nwokike, F.O. (2014). Improving the entrepreneurial competencies of

business education students in the Universities in the South-South and South East States of Nigeria for self-employment. *Unpublished Ph.D thesis submitted to the Department of Technical and Vocational Education, Enugu State University of Science and Technology.*

Ogudu, P. (2013). Improving Technical Vocational education and Training (TVET) in Nigeria through the Public-Private partnership approach internationally. *Journal of research and advancement in education methods. 10(1) 7-10.*

Ojo, L.B, Olugbaenro, S.O. & Enamudu, P.G. (2015). Private-Public partnership and Technical Vocational Education and Training (TVET): A Bridge to Economic Development in Nigeria. A paper presented at the 23rd Annual International Conference of Nigeria Vocation Association held at Yaba, Lagos, Nigeria, 5th-8th August, 2015.

Okoye, K.R.E. & Chijioke, O.P (2013). Private-Public partnership and Technical Vocational Education and Training (TVET) in a Developing Economy *Arabian Journal of Business and Management review (OMAN) 2(10) 51-52*. Retrieved from *www.arabianjbmr.com/pdfs/OM.../6.pdf on October 15 2015*.

Olorunmaiye, J. (2015). Partnership in Technical Vocational Education training for National Development. Nigeria Vocational Association, 23rd Annual International Conference. Yaba, Lagos Nigeria.

Olu, A. (2015). Partnership in TVET for National Development. A Keynote Address presented at the 23rd Nigeria Vocational Association held on 5th August at Yaba College of Technology, Lagos.

Oshowole, S. (2010). Galloping Poverty in Nigeria. An Appraisal of the Government's Interventionist policies. *Journal of Sustainable Development in Africa* 12(6), 264-274.

UNESCO (2000) TVET policy review Malawi, Paris, UNESCO. Retrieved from ***www.unesdoc.org/images/0019/001902/190216e.pdf.on*** 4th November, 2015.

UNESCO (2012) youths and skills: putting to work. EFA Global Monitoring Report UNESCO. Retrieved from *http://unesco.org/images/0221/002180/21803*. On November, 4th 2015.

UNESCO (2015). Revitalizing TVET in Nigeria. Retrieve from *htt://portal.UNESCO.org/education/en.phpurl- id= 34506 & urlon* 4th November, 2015.

Ziziwa, M. (2006). Enhancing quality TVET in Malawi. Retrieved *from* ***http://sites.google.com/site/quality****intevt/enhancing-tvet-in-malawi* on 4th November, 2015.

EFFECTIVENESS OF MODELS ON STUDENTS' ACADEMIC ACHIEVEMENT IN ENGLISH LANGUAGE IN SECONDARY SCHOOLS IN ENUGU EDUCATION ZONE

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Abstract

The persistent decline in the students' achievement in English language is a source of worry to all sectors of the society. It seems that the instructional materials employed by teachers in teaching English Language in the Nigerian secondary schools had been implicated. Consequent upon these, the study was designed to investigate the effectiveness of models on students' academic achievement in English Language in secondary schools in Enugu Education zone. The researcher adopted a non-equivalent quasi-experimental design. The population for the study was all the 4,013 SS 2 students in Enugu Education zone. A sample of 240 SS 2 students was drawn from the three secondary schools used; one intact class was then sampled using simple random sampling technique. One intact class was assigned to the Experimental Group I, and the other intact class was assigned to the group II taught without models. The two groups were taught using models and without models. Two research question and one hypothesis guided the study. Relevant data for the study were collected using English Language Achievement Test (ELAT). The instrument was face validated. The reliability of the instrument was determined using Kuder Richardson 20 which was 0.86. Research question was answered using mean and standard deviations while hypothesis was tested using Analysis of Covariance (ANCOVA). It was found that the use of models in teaching English language in secondary schools in Enugu Education zone was found to be better than teaching without models. Teaching without models had no significant effect on students' achievement in English language in secondary schools. Based on the findings the researcher recommended that models be adopted for use and no teacher should teach English language without the use of models.

Keywords: E**ffectiveness of models, students' Academic Achievement, English Language, Secondary Schools, Enugu Education Zone**

Introduction

English language is a subject of study which helps in realizing the nation's educational objectives and technological aspirations. Ullyelle (2009) considered English language as a subject that encroaches into all aspects of human endeavors and further described it as the life wire in the study of various disciplines. According to Anukam (2010) English language is the study and understanding of the science of language which includes the study of nature and importance of language as a vehicle of communication of interpersonal and intergroup relations and maintenance and transfer of culture and civilization. It also

involves the study and understanding of language and the problems militating against the effective learning of language. English language is a vehicle or tool of communication. It is man's most basic tool without which it would be difficult for man and woman to live together, to think, to act and share ideas together Anukam, (2010). It makes it possible for man to engage in social conversation, to transfer ideas, thoughts and feelings through mass communication media, to develop social and linguistic units or communities. English language is the language of Britain, North America, Australia and some other countries. In other words, it is the official language of Britain, United States of America (USA), most of the common wealth countries and Nigeria in particular.

It's importance cannot be overemphasized because English language is the language of science, of aviation, computers, diplomacy and tourism. Knowing English language increases your chances of getting a good job in a multinational company within your home country or of finding work abroad. English language is the most commonly spoken language in the world. One out of five people can speak or at least understand English language (Frank, 2012). The above objectives of using English language can be realized by it with models. According to Ellington (2009) models are three (3) dimensional representation of a real thing, situation or scene. Three-dimensional instructional materials are those materials that have thickness i.e they have length, breadth and height or depth. Okwor and Ike (2002) defined model as the presentation of an artificial problem, event, situation, or object that duplicates reality but removes the possibility of injury or risk to the individuals involved in the activity. Model is a representation of manageable real events in which the learner is an active participant, engaged in learning behaviour or in applying previously acquired skills or knowledge. It can be seen as a representation of central fact or reality. Models may be bigger smaller, or the same size as the real object it represents. The globe for example, is a reduced model of the earth. The atom may be represented by an enlarged model whereas a model may be constructed to have the exact size of the human heart or kidney. Models of almost anything can be purchased from shops (example, toy shops) for class room use. When you construct a model with your students, you stimulate the spirit of inquiry, creativity, and discovery in them. Models can be made from different kinds of materials such as cardboards, woods, metals, paper, clay, plastic and plaster.

Love (2013) and Sturoges (2015), mentioned importance of using model in teaching English Language namely:

1. Using a model, the students can learn the properties of an object effectively without seeing the object itself, which can save a lot of inconveniences. Teachers resort to use of models when the real things are not easily available, or when they are too big to be brought into the classroom or too short to be observed without difficulty by the students.
2. Thus, a model may be an enlargement of the real thing or its reduction. The models make possible the detailed study of the subject. They also make possible the study of internal parts of the subject. They also make possible the study of the internal part of the object for instance, the human ear. This is because the model can be dismantled to expose the internal part and assembled again. This helps the student all the more to study the internal

and otherwise visible parts

3. With the model, a teacher could explain the relationship between the model and real things to avoid misconceptions. Make sure the students can see the object. If they cannot see it in a group, organize for individual viewing. Give the students time to examine the object before explaining. They could touch and feel the object. In this way, models simulate interest.

According to Blair (2009) to achieve is to accomplish, gain, reach by effort or do something successfully with an effort and skill. Love (2013) asserted that academic achievement concerns mental health. He explained that mental health has its basis, physical health and intellectual skills, which lead to satisfactory means of adjustment, social sensitivity and adequate self concept.

The outcomes of the Nigeria secondary school student examination in English language have been consistently poor. Despite the position of English language in the National Policy on Education as a core subject, the students' performance in the subject has remained very low (Ellington, 2009). In May/June 2015, Senior Secondary School certificate Examination in Enugu Education zone student continued to record low retention which may have resulted to poor academic achievement in the subject (WAEC, 2017). English language teachers are, therefore, concerned with the problem of how to improve the academic achievement of students in the subject hence there is need for this study. The study investigated the effects of models on senior secondary school students' achievement in English language in senior secondary schools in Enugu Education zone of Enugu State.

Research question:

1. What is the effect mean achievement scores of students taught English language using models?
2. What is the mean achievement scores of students taught English language without models?

Hypothesis

There is no significant difference in the mean achievement scores of students taught English language with models and those taught without models.

The design for this study is quasi-experimental design. The design is specially a pretest-post-test, non equivalent control group design. The choice of this design agreed with Blair (2009), Best and Kahn (2014) who observed that this design was often used in classroom experiments when experimental and non-control groups are naturally assembled groups, such as intact classes, which may be similar in the level of education. This study was carried out in Enugu Education zone of Enugu State. Enugu Education zone to the North is bounded by the Udi L.G.A, South by Nkanu West L.G.A, East by the Igbo Etiti L.G.A and West by Enugu South L.G.A. The choice of this area is because of the researcher saw the zone as thickly populated zone in terms of SS2 students among all the six zones in Enugu State.

The populations considered of all the 32 secondary schools in Enugu Education zone. The population was 4,013. (PPSMB, 2019)

The sample size for the study is 240 SS 2 students. Stratified simple random sampling technique was used to divide Enugu Education zone into Enugu East, Enugu North and Isi-uzo Local Government Areas.

English language Achievement Test (ELAT) developed by the researcher was used for data collection. The number of periods that essentially cover a particular unit and the objectives of the English language contents guided the development of ELAT items.

This implies that where more time is required to teach a unit, more items were drawn from such a unit. ELAT consisted of 50 objective test items.

The choice of objective test items was to allow the researcher to cover more topic areas. Thirty four objectives test items. The instrument was used for pre test, post test and achievement test. The items for the ELAT were written to reflect the specification in test blue print prepared. The scoring guide for the ELAT was prepared in order to guide the teachers that scored the ELAT.

The instrument went through both face and content validity.

Face validity

The items of ELAT and lesson plan were subjected to face validation by one expert in English language education, one expert in educational technology and one expert in Measurement and Evaluation. The instrument and lesson plan were validated in terms of clarity and appropriateness of the language used. Their corrections and comments were useful in modifying the items of the tests and lesson plan. The surviving items, therefore, possessed adequate face validity of the instrument for data collection. The English Achievement Test after scoring guide was also "face" validated by the experts that validated the same English language Achievement Test.

Content validity:

One expert in English language, one expert in measurement and evaluation and one expert in educational technology using the test blue print that was developed by the researcher subjected the ELAT items to content validity. The table of specification was validated by the experts to determine how effective it is in selecting questions considering the percentage allocation of the various levels of contents. Thirty-four questions survived out of 47 items after validation and these were reflected on the table of specification. The items measured objectives in the cognitive domains of Bloom's taxonomy of educational objectives. The weight of the objective levels were based on the proportion of low and high order levels of cognitive domains as suggested by Margaret (2015) in the same units of study in the senior secondary school English curriculum. This is because it was observed that students do not normally exceed the application level by the time they complete their post primary school programme in some language subjects (Sturoges, 2013).

The reliability of ELAT was determined using test re-test method. The choice is because it is most suitable and appropriate in determining the correlation between sets of scores from two administration of the test. To determine the reliability of ELAT for the study, the ELAT was trial tested in community secondary school Olo in Ezeagu LGA of Enugu State. The ELAT was re-administered to the students after two weeks and data were collected. Then the two sets of scores from first and second administration of ELAT were correlated using Pearson Product moment correlation coefficient (r) and is 0.86. The measure of internal consistency was determined using Kuder Richardson 20. (K-20). The value of Kuder Richardson value was 0.85. The choice of Kuder Richardson's 20 was the most appropriate because the items were dichotomously scored.

Three English Language teacher (research Assistants) from each of the sampled schools received briefing from the researchers on the use of model and teaching without models in English Language respectively. Prior to the treatment, the English language teachers / research Assistants in the sampled schools who received briefing on how to use the research instrument, administered the ELAT respectively to their SS2 students. At the end of the testing, the ELAT test items the answer script were collected from each student who took the pre test.

There were some extraneous or confounding variable that the researcher felt could constitute potential threats to the validity, reliability and generalization of the result s of the study. Such variable included inter-group variable, teacher variables and Hawthorne effect. They were manipulated before the commencement of the experiment.

ELAT was administered as pretest on the first week of treatment by research assistants. Scores of the students on the pretest were recorded and kept for the use after the experiment. The post test data were also generated after re-administration of ELAT to the students on the last week of treatment. For each of the groups, data for pretests and post tests were recorded separately. The test item on ELAT was scored one mark each to give a maximum mark of thirty four.

Mean ($\overline{x}$) and standard deviation were used in answering the research questions. Mean was used because it is the most appropriate statistical tool to use for such situation because such takes all measurement (observations) into consideration. Analysis of covariance was used to test the hypothesis. Analysis of covariance (ANCOVA) was used because intact classes were used and as such corrected the errors of initial differences in the ability levels among the students used in the study. Rejected the null hypothesis (Ho) if the F-calculated is greater than F-table at 0.05, then fall to reject the null hypothesis at 0.05 if F-calculated is less than F-table.

Research question

1. What are the mean achievement scores of students taught English Language using models?
2. What are the mean achievement scores of students taught English Language without models?

Table 1: Mean achievement scores and standard deviation of students taught English Language using models and those taught without models.

	Mean (X)		Standard Deviation		
Groups	Pretest	Posttest	Pretest	Posttest	**N**
Experimental 1 (taught using models)	20.08	21.07	1.06	1.36	124
Experimental Group 2 (taught without models)	20.41	18.71	1.81	1.26	116
Total					240

It was observed from table 1 above that the experimental Group 1 taught English Language using models, obtained mean achievement scores of 20.08 in pretest and 21.08 in posttest. The group had standard deviation of 1.06 and 1.36 in pretest and post test respectively. For the Group taught English Language without using models obtained mean achievement scores of 20.41 and 18.71 in the pretest and post test respectively. The group equally had standard deviation of 1.81 in pretest and 1.26 in post test. The result (in table 1 above) showed that the use of models is better than those taught without using models in teaching English Language.

Hypothesis

There is no significant effect in the mean achievement scores of students taught English language using models and those taught without models.

Table 2: Analysis of Covariance of the mean achievement scores of students taught English language using models and those taught without models.

Source of Variation	Sum of Square	Df	Mean Square	F-Cal	Sig. off	F- Table	Decision
Covariates	7463.867	1	7403.867	109.639	000		
Main effect	10836.993	2	8405.496	252.866	000		
Instructional material (models and without models)	2676.077	1	2789.076	48.630	0.000		
Error	18201.931	288	67.544			3.00	S
Residual	10226.322	4	2541.568	34.033			
Total	55405.19	295	21277.548				

S=Significance

NS= Not Significance

In the Table 2 above, the result of the Analysis of covariance showed that the F calculated (40.630) is higher than the F critical (3.00). Therefore, the null hypothesis of significant difference in the mean achievement scores of students taught English language using models and those taught without models was rejected at 0.05 levels of significance.

This means that there was significant difference in the mean achievement scores of students taught English language using models and those taught without models in favour of models. The result is in agreement with Okafor (2000), who discovered that

students exposed to treatment group (note taking) did better than those without (control) note taking in English language.

Recommendations

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

The serving teachers of English language in secondary school should adopt the use of models in teaching English language lessons-

In view of the fact that most of the serving teachers may not be familiar with the construction and use of models, courses in teacher education programmes should be made to include it in their courses.

References

Anukam, L. L. (2001). *Assessment of Learning Achievement.* Abuja: Federal Ministry of Education.

Blair, G. M. (2009) *Educational Psychology*. New York Macmillian

Ellington, I. T. (2009). *Using Games and Simulations in the Classroom.* London: Kogan Page Limited.

Frank, H. W. (2012). *The King's English Oxford.* Ganendon press

Love, B. S. (2013) *Innovation in Teaching Learning Process.* India: Vikal publishing House.

Okafor, G. (2000). *Effect of Note-taking Patterns on Students' Academic Achievement, Interest and Retention in Geography*. published Thesis science and computer department, University of Nigeria Nsukka.

Sturoges, P. T. (2013). *Effects of Instructional and Forms of Information Feedback on Retention of Meaningful Materials*. Journal of Education Psychology 63(2) 77-90

Ullyelle, U. A. (2009). *Historical View of the English Language*. Ibadan: Potan Press.

West African Examination Council (2017). *Chief Examiners Report in English Language*.

INFLUENCE OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) ON TEACHING AND LEARNING OF BIOMEDICAL ENGINEERING AND TECHNOLOGY; (A CASE STUDY OF FEDERAL COLLEGE OF DENTAL TECHNOLOGY AND THERAPY, TRANS-EKULU, ENUGU).

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The study investigated the influence of information and communication Technology (ICT) on teaching and learning of Biomedical Engineering and technology. Two specific objectives, two research questions and two hypotheses guided the study. Literature was extensively reviewed on related concepts. The study adopted a Descriptive research survey design. The area of the study was Enugu State. A population of the study was 80 students and 22 lecturers; making a total of one hundred and two (102) respondents. The entire population was used for the study as there was no sampling done. The instrument used for data collection was questionnaire called Assessment of information and communication technology on teaching and Learning of Biomedical Engineering and Technology Questionnaire (AICTTLBETQ). Three experts validated the instrument. Test-retest method was used test the reliability of the instrument. The reliability of 0.83 was obtained using Cronbah's Alpha. Means and standard deviation were used to analyze and answer the research question. The findings of the study revealed that information and communication technology (ICT) to a very high extent influence teaching and learning of Biomedical Engineering and Technology. Based on the findings of the study, the researcher recommended that there is need to provide a technology- enabling environment, the continues and periodic training of teachers on information and communication technology (ICT) and adequate funding through public- private partnership, so as to allow teachers and educational administrations to effectively integrate information and communication technology (ICT) in to the teaching and learning process.

Keywords: **Biomedical Engineering, Technology, Teaching, Learning.**

Introduction

In the present society, knowledge is a major component of any activity and the driving force of change and innovation (United Nations Education Scientific and Cultural Organization, 2015). Colleges and Universities have a key role in promoting high quality and reliable education and the development of knowledge , but are far being the only (or even the main) source of information and knowledge nowadays, due to the expansion of new forms of communication

(most notably the internet). From the use of information and communication technology (ICT), a global society arouses, and knowledge is now sheared without constraints of geographic proximity.

The use of information and communication technology (ICT) has changed the conventional way of teaching and learning, and has proposed the need to rethink of education in terms of a more current context (white, 2014). The capability of information and communication technology (ICT) is fundamental to the participation and engagement in modern information society. Information and communication technology used to find, develop, analyze, design and present information, as well as to model situations and solve problems (Yusuf, 2015). Information and communication technology (ICT) enables rapid access to ideas and experiences from a wide range of people, communities and culture, and allows people to collaborate and exchange information on a wide scale (Watson 2011).

Education is the first and the best key area for information and communication technology (ICT) application. It helps by providing alternative possibilities for the education (Lopez, 2013). In the institutional process, information and communication technology (ICT) involves the use of multimedia and e-learning. Multimedia technology affords teachers and students a lot of opportunities for effective teaching and learning outcome. Multimedia is a carefully woven combination of text, graphics, arts, sounds, animations and video elements. It is an integration of multiple media elements (audio, video, graphics texts, animation, etc) in to one systematic and symbolic whole that results in a more benefits for the end user than any of the media element that provide individually. These devices if use as educational instruction in teaching and learning of biomedical engineering and technology, is expected to boost the performance of students (Shelly, Cashman & **Gunter, 2016).**

Biomedical engineers work within the field of research, design, production, maintenance/ repairs and calibration activities of medical devices, and the life support systems. They produce innovative approaches to designing high- tech medical devices, methods for measurements of physiological development medical data/signal, images processing and analysis, development of artificial organs to replace malfunction natural organs. Thus Biomedical engineering deals with the application of the principles and problem-solving technique of engineering and medicine, and requires a good and sound knowledge in applying such principles (Oliver, 2012). Biomedical engineers apply an intimate knowledge of modern biological principles in their engineering design processes, which involves aspect of mechanical engineering, electrical engineering, chemical engineering, material sciences, chemistry, mathematics and computer sciences. Engineering are all integrated with human biology in biomedical engineering to improve human health, whether be it an advance prosthetic limb or a breakthrough in identifying proteins within cells (Johnson & Deborah , 2010).

Consequently, the relationship between biomedical engineering technology education and information and communication technology has a coherent link. When information and communication technologies (ICTs) are employed in biomedical education given the right condition, they can accelerate, enrich, and deepen basic skills in reading, writing, mathematics, and they can motivate and engage students to learn as they become more independent and responsible for their learning. Furthermore, information and communication technology (ICTs) help to relate academics to the practices of today's work (Butcher, 2003). Information and communication technologies, especially network technologies have been found to encourage active learning of biomedical engineering, support innovative teaching of biomedical students, reduce the isolation of many lecturers, and encourage lecturers and students to become active researchers and learners. Maldonado (2011) believe that since many undergraduate biomedical engineering students will seek jobs in medical institutions and medical engineering industries following graduation, it is therefore imperative that the biomedical engineering program should establish a learning environment that exposes the students to modern technique, tools and equipment that best prepare them for both clinical and industrial settings (Donald and Judy 2013).

Constable, George and Somerville (2013) opined that biomedical Engineering laboratories courses using computers-based virtual instrumentation programs can prepare students for real world experience with minimal cost and risk. Virtual instrumentation programes are flexible media programs that promote hand-on, real world experience by teaching biomedical engineering students, important measurement skill, as well as the underlying engineering theories and practical application to medicine and biology (Afshari, 2013). Agyeman (2014) stated that virtual instruments are common in academic and research setting and that in terms of real-world utility, there is an increasing need for academic and experimental flexibility and that it is a better option for teaching and learning of practical courses such as those of biomedical engineering.

Constable, George, Somerville and Bob (2013) believe that the emergence of social software with biomedical engineering contents has enabled lecturers to obtain adequate instructional material, while students reach out for information necessary to facilitate learning, through the connection and collaboration throughout computer mediated communication, and to easily form online communities. Galbreath, (2000) stated that since information and communication technologies (ICTs) has shifted focus from teacher-centred to student centred learning, biomedical engineering students are active participants in the learning process, produces and share knowledge, participate and learn in collaboration with others throughout the globe. Thus, teachers have become learning facilitator, collaborator, coach, mentor, knowledge navigator, and co-learner and no more the main source of knowledge. Moursund, (2015) contented that since

biomedical engineering instructional content can be delivered in textual, audio, visual, and audio-visual forms, Thus, equity can be ensured for all categories of learners (disabled, geographically disadvantaged, those who cannot attend regular school, etc).

McLoughlin (2014) stated that though networking of educational technology resources benefits students, teachers and schools by facilitating information technology learning activities giving ready access to software, allowing a variety of communications, reducing costs of equipment, increasing processing power and facilitating the management of student learning, these resources are not readily found in most tertiary institutions in Nigeria, making learning and research difficult, especially in the area of biomedical engineering. For some years now, biomedical organizations have constructed extensive image banks to help biomedical engineering students and professionals to better understand a variety of biomedical engineering issues. Literatures have shown that online images foster knowledge acquisition in a variety of scientific fields (Gulati, (2014). In biomedical engineering field, studies have shown the importance of incorporating advance graphic representations, particularly in e-learning, when the educator is not available to comment on the images (Caroline & Baillie, 2011).

Ishiyama, Arai, Sendoh, and Yamazaki, (2015) contended that three- dimensional animations, commonly known as 3D animations are some examples of advance graphic representation essentially use for pedagogic purposes in biomedical engineering education. These have the advantage of facilitating knowledge acquisition through realistic three-dimensional visualization, which is superior to the traditional two-dimensional images. When these pedagogical resources are available on the internet, learners and educators have the flexibility to use them at any time, as long as they are connected to the internet or in position of such software. Graphic representation of information appears to be central to the acquisition of good knowledge on the function of some complex medical devices or equipment produced by biomedical engineers (Hensley & Mark, 2013).

Sargeant (2015) explained that 3D representation are particularly use for teaching in class, and have shown a clear demonstrable impact on learning, although, it is evident that such as videos clips, textbooks among others. John (2016) also reported that many assessments have proven the effectiveness of this pedagogical strategy. Thus, increase numbers of biomedical faculties abroad are using 3D animations on the web in initial training, for example, Universite de Lyon in France. The concept has been pushed even further in an experiment, in which educators and students can manipulate the animation, i.e move it, pivot it or change its position , at least visually, to improve the presentation. Although, the result have not yet been published in a scientific journal, the reaction of students who participated in the experiment were able to move the intricate parts of complex devices, such as pacemaker in visual

human being using Wii remote (a.k.a.wiimote) raise interesting possibilities for the future. Harden contends that the emergence of new standard and a very active user community augurs well for the future of 3D web application for initial and continuous biomedical engineering training.

Lehmann and Justus (2014) reported that the use of simulators has grown tremendously in the field of tissues and stem cell biomedical engineering. These are biomedical engineers who are working towards artificial recreation of human organs and aid in transplants. Virtual simulators are as effective in education as they are practical training. The stimulators have been used primarily to reduce construction errors on medical device that may pose danger on human (Kent, & McNergney, 2010). Virtual simulators represent a paradigm shift in medical education, and virtual reality is expected to play a key role in initial and continuous training of biomedical engineers in future. Again according to Evans (2016), simulations facilitate learning through the provision of effective feedback, repetitive practice, multiple learning strategies, clinical variation of life support devices, controlled learning environment, and individualized learning. Sergeant (2015) provides support for this argument by contending that computer mediated multi-media instruction and the internet can effectively link learners to learning material and information resources to each others, and to instructors. Several authors have enumerated the advantages of interactive online learning systems.

The literature on virtual simulators documentations stressed clearly the advantages of using information and communication Technology (ICT) in biomedical engineering training can never be over emphasized (Grinter, 2014). However, Johnson and Deborah (2010) stressed that this is particularly true when; neophytes are trained in the use of ICT and use of the virtual simulator is not limited by lack of technological skill. Hence the importance of introducing biomedical engineers in-training to this innovation at the initial training stage cannot be over emphasized.

Statement of the problem

Biomedical engineering is the application of the principles and problem-solving techniques of engineering to biology and medicine. This is evident throughout healthcare, from diagnosis and analysis to treatment and recovery, these has entered the public conscience though the proliferation of implantable medical devices, such as pacemaker and artificial hips, to more futuristic technology, such as stem cell engineering and the 3-D printing of biological organs. Thus, literature revealed that the impact of information and communication technology in the training of biomedical engineers cannot be over emphasized. The assessment reports on the use of information and communication technology have proven the effectiveness of this pedagogical strategy. Despite all these literatures, pointing out the relevance of ICT in facilitating teaching and learning of biomedical engineering, the question still remains why most universities in Nigeria cannot provide both the teachers and the student with information and communication technology facilities

such as computers and in-campus internet to enable them assess these pedagogic instructional materials online. Some institutions that claim they have such facilities, lecturer, as well as student never get access to such felicities because of electricity to power the equipment, creating a vacuum in the state of the act of teaching and learning.

Purpose of the Study

The purpose of the study was to investigate the relevance of information and communication technology (ICT) in teaching and learning of biomedical engineering technology. Specifically, the study determined:

1. extent to which information and communication technology (ICT) influence teaching and learning of biomedical engineering technology.
2. determine the availability of information and communication technology resources for teaching and learning of biomedical engineering technology

Research Question

1. What extent does information and communication technology (ICT) influence teaching and learning of biomedical Engineering technology?
2. What extent does information and communication technology resources available for the teaching and learning of biomedical engineering and technology?

Hypothesis

1. There is no significant difference between the mean score of lecturers and students using of information and communication technology in teaching and learning of biomedical engineering and technology.
2. There is no significance between the mean score of availability of information and communication technology in teaching and learning of biomedical engineering technology.

Methods

The study adopted a descriptive survey research design; the area for the study was Federal College of Dental Technology and Therapy Enugu, Nigeria. The population for the study consisted of eighty (80) Biomedical Engineering Students and twenty two (22) Biomedical Engineering Lecturers, making a population of one hundred and two (102) respondents from the faculty of Health Technology and Engineering, Federal College of Dental Technology and Therapy, Enugu, Enugu State. The entire population was used for the study. The instrument used for data collection was questionnaire. The instrument was validated by three (3) experts, biomedical engineers and one measurement and evaluation. Test-retest method was used to test the reliability of the instrument. Cronbach's alpha was used in determining the internal consistency of the instrument. The reliability value of 0.83 was obtained. The instrument was developed on four point likert-type scale and the respondents were asked to indicate degree of their agreement with each item by ticking one of the four options. Data were analyzed using mean and standard deviation. The response options were assigned values of 4, 3, 2 and 1 respectively.

Limit of real numbers were used to take decision for the purpose of answering the research question.

1.00 - 1.49	=	VLE (Very low extent)
1.50 – 2.49	=	LE (Low Extent)
2.50 - 3.49	=	HE (High Extent)
3.50 – 4.0	=	VHE (Very High Extent)

The Z-test statistics was used to test the null hypothesis at .05 level of significance.

Research Question one:

What extent does information and communication technology (ICT) influence teaching and learning of biomedical Engineering technology?

Table 1: Mean and Standard Deviation Scores on Influence of Information and Communication Technology on Teaching and Learning of Biomedical Engineering Technology

	Status	**Lecturers, n= 22**			**Students, n= 80**		
S/N	**Items**	**X**	**SD**	**D**	**X**	**SD**	**D**
1	ICT have introduced multimedia contents which enable students' learning through the use of videos, pictures, text and video games that offer a better understanding of contents than learning in the traditional manner.	3.65	0.70	VHE	3.54	0.64	HE
2	ICT offers unlimited information to vast resources of quality content available online for both teachers and students.	3.55	0.67	VHE	363	0.72	HE
3	The use of ICT in education has led to a new concept term as mobile learning, where students can access learning modules from the comfort from their homes.	3.64	0.72	VHE	3.76	0.79	HE
4	ICT has helped students with various disabilities to learn at par with other students, such as e-book with text speech features to assist blind students or children with dyslexia to gain access to good education.	3.68	0.78	VHE	3.42	0.64	HE
5	Lecturers do utilize ICT resource to obtain instructional materials for teaching and learning of biomedical engineering, while students use it to support learning.	3.40	0.63	HE	3.56	0.67	HE
6	Does your institution have ICT resources and biomedical engineering software that can facilitate understanding during teaching and learning?	2.10	0.42	LE	2.42	0.48	LE
7	Does your institution make use of Pe- virtual instrument to prepare students for a real world experience in biomedical laboratory?	2.19	0.43	LE	2.03	0.40	LE
8	Both Lecturers and students always have access to ICT resources in their institutions and classroom whenever they need it to teach and learn.	2.01	0.41	LE	2.33	0.45	LE
9	Both Lecturers feel comfortable with the use of ICT resources when teaching and learning.	73.57	0.68	VHE	3.63	0.72	HE
10	Lecturers feel comfortable using facilities such as stimulation pictures and models to teachers and students for learning.	3.72	0.78	VHE	3.61	0.72	HE
	Grand Mean	**3.16**	**0.62**	**HE**	**3.19**	**0.63**	**HE**

Findings in the above table indicate the grand mean $\bar{X}$=3.16, SD=0.62 of lecturers and Students X=3.19, SD =0.63. The results from the table indicate that information and communication technology influences teaching and learning of biomedical engineering and technology to a high extent since the grand mean of both lecturers and that of the students is above the criterion mean of 2.50.

Research Question Two:

What extent does information and communication technology resources available for the teaching and learning of biomedical engineering and technology?

Table 2: Mean and Standard Deviation Scores on the extent of availability of Information and Communication Technology resources for Teaching and Learning of Biomedical Engineering Technology.

		Lecturers= n=22			Students, n=88		
SN	**Items**	**$\bar{X}$**	**Sd**	**D**	**$\bar{X}$**	**Sd**	**D**
1	Computer soft ware (Biomedical software)	2.22	0.64	L E	1.82	0.53	L E
2	Virtual Stimulators	1.21	0.48	LE	2.11	0.51	L E
3	Computers	2.51	0.82	H E	2.62	0.86	H E
4	Internet	2.82	0.88	H E	2.51	0.74	H E
5	3 D Study Models	1.88	0.54	L E	1.54	0. 43	L E
6	2 D Study Models	2.13	0.78	L E	2.01	0.50	L E
7	Webgraphy	1.21	0.41	L E	1.04	0.22	L E
8	Virtual encyclopedias	2.10	0.80	L E	2.21	0.82	L E
9	Social bookmarks	2.51	0.88	H E	2.61	0.89	H E
10	Semantic web	1.32	0.42	L E	2.41	0.79	L E
Grand Mean		**1.99**	**0.58**	**L E**	**2.09**	**0.63**	**LE**

Findings on table 2 above indicate the grand mean of X=1.$\overline{99}$, SD=0.58 for lecturers and Students X=2.09, SD= 0.63, indicating that the availability of Information and Communication Technology resources for Teaching and Learning of Biomedical Engineering Technology is to a low extent, since the grand mean of both lecturers and that of the students is below the criterion mean of 2.50.

Table 3: Z-test comparison of the mean rating of the significant difference between lecturers and students mean score on extent at which information and communication technology improves teaching and learning of biomedical engineering technology.

Status	n	Mean	SD	df	z-cal	z-critical p	Decision
Lecturers	22	3.16	0.62				
				316	31.43	1.960.05	Reject
Students	80	3.19	0.63				

Data in table 3 shows that the z-cal of 31.43 is higher than the z-critical table value of 1.960.05 Therefore the null hypothesis is rejected. This implies that information and communication and technology improve teaching and learning is applied to both the lecturers and the students.

Table 4: Z-test comparison of the mean rating of the significant difference between lecturers and students mean score on extent of availability of Information and Communication Technology resources for Teaching and Learning of Biomedical Engineering Technology

Status	n	Mean	SD	df	z-cal	z-critical p	Decision
Lecturers	22	1.99	0.58				
				288	29.13	1.660	Reject
Students	80	2.09	0.63				

Data in table 4 shows that the z-cal of 29.13 is higher than the z-critical table value of 1.660 Therefore the null hypothesis is rejected. This implies that the availability of information and communication and technology resources is to a low extent for teaching and learning, and is applied to both the lecturers and the students.

Discussion of findings

From the results of the findings, it is shown that information and communication technology influences teaching and learning to a high extent. This was supported by Imran and Ojewande (2013) who stated that education is the first and best key area of information and communication technology (ICT) application, They stated that information and communication technology (ICT) has changed the way teachers teaches, which is called e-teaching and also changes the way students learn, also known as e-learning. In the cases of e-teaching and e-learning, teachers prepare the contents and store them in the internet, and students can access them at anytime and anywhere, making teaching and learning flexible and easy. Yusuf (2015) stressed that with integration of information and communication technology, teachers as well as students no longer have to rely solely on printed materials, physically housed libraries, which at times are available in limited quantities for educational needs.

With the internet and worldwide web, a wealth of learning materials in almost every subject and variety of media can be accessed from anywhere at all time of the day and by unlimited number of people. Tinio (2012) stressed that thinking of information and communication technology in influencing the quality of education and training is a critical issue, particularly at this time of educational expansion. ICT can enhance the quality of education in several ways, by increasing learners' motivation and engagement even in the absence of the teacher. Despised all the enumerated benefit of information and communication technology in teaching and learning, the Nigerian tertiary institutions hardly provide such facilities to its teachers and students. McLoughlin (2014) stated that though networking of educational technology resources benefits students, teachers and schools by facilitating information technology learning activities giving ready access to software, allowing a variety of communications, reducing costs of equipment, increasing processing power and facilitating the management of student learning, these resources are not readily avaliable in most tertiary institutions in Nigeria, thus making learning and research difficult, especially in the area of biomedical engineering.

Conclusion

Though emerging ICT tools offer new opportunities in education through expanding access to formal and informal education, most countries (including Nigeria) face significant challenges in harnessing their educational systems to promote broader economic and social development plans. Nevertheless, government should articulate broad visions of the development of "information societies" in which widespread access to technology can nurture human capital, improve government services, promote culture and support economic growth. The ICT sector is being targeted as a vehicle for this growth and social development; and business education has a crucial role to play in such efforts. The challenge for educational systems moving forward, therefore, is to take advantage of the opportunities provided by ICTs to support learning outside of schools while, at the same time, incorporating ICT-related practices and models from daily life in wider society into formal educational structures and processes. Exploring and realizing the potential for ICTs help make schools more productive and efficient than they currently are, transform teaching and learning into an engaging and active process connected to real life, and prepare the current generation of young people for the future workplace may be a key determinant of the future success (or failure) of such initiatives

Recommendations

Based on the findings of the study, the researcher made the following recommendations

1. Institutions should make information and communication technology facilities a priority since it facilitates and improves quality teaching and learning, which suppose to be the priority of any educational institution.

The Government should appoint independent supervisors to monitor and evaluate the use of information and communication technology in tertiary institutions in the country, so as to enhance teaching and learning especially during this age of information and communication technology.

Reference

Afshari, M. R & Bakar, K. A (2013). Factors affecting teachers use of information and communication technology: Intenational Journal of Instruction. 2(1),77-104

Agyeman, O.T. (2014). ICT for Education in Nigeria: A Country Report, Retrieved on September 27, 2015 from www.infodev.org/en/docu. 422.

Caroline, N.R & Baillie, M. (2011). Synthesis and Lectures for Engineering students, Information and Communication Technology for Educational purpose: Long press, London.

Constable, J.K; George, L.C. & Bob, B. M (20013). Internet use by teachers: conditions of professional use and teacher-directed student use. Technology *Research and Development*, 47 (4), 83-90.

Donald, A. L. & MacKenzie, J. B. (2013) *The changing role of information and communication technologies (ICTs) for instruction in higher education institutions in Kenya*. Paper presented at Starthmore ICT Conference in Nairobi, Kenya, 1-11. Retrieved from www.digital.library.strathmore.edu on 23rd April, 2012.

Evans, A. (2016). Technology in Action: Introductry Edition. New Jersey; Pearson Prentice Hill.

Grinter**,** L. E (2014) Report on Evaluation of Engineering Education. *Journal of Engineering Education* 46(4): 25-60.

Gulati, S. (2014). Technology –enhance learning in developed nations: A Review of Research in Open and Distance Learning 9 (1), 34-62.

Hensley, M. & Mark, V. T. (2013), "*50 Years of Computer Simulation of the Human Thermoregulatory System*," ASME J. Biomech. Eng., 135(2), 35-44

Imran, A.A; Ojewande, K.A and Ola, R. (2013) Literacy in ICT for teachers preparation: Challenges and prospects; Unpublished paper presented at the 4th National Conference of School of Education, SRCOE, Kano. September 10-13,

Ishiyama, K., Arai, K. I., Sendoh, M. & Yamazaki, A., (2015), "Spiral-Type Micro-Machine for Medical Applications," *Proceedings of the International Symposium on Micro Machine and Human Science*, 6(4). 65–69.

Johnson, B. & Deborah G. (2010) Exploring the extent of ICT adoption among university teachers in Malaysia. *International Journal of Computing and ICT Research*, 2 (2), 1 9-36

Kent, T.W & McNergney, R.F. (2010). Will Technology really change Education? P53 thousand osks. Corwin press, CA.

Lehmann, R. & Justus, K. (2014) Information and communication technology (ICT) use in teaching and learning practices in Western Cape higher education institutions. *Perspectives in Education*, journal of Biomedical Engineering, 2001, 5 (9) 232-250.

Lopez, O. (2013) An exploration of the use of Information and Communication Technology in College Classrooms, College Quaterly, 13(1) 12-18.

McLoughlin, C. & Lee, M. J. (2015). Social software and participatory learning: Pedagogical choices with technology affordances in the Web 2.0 era. In ICT: Providing choices for learners and learning. Proceedings ascilite Singapore 2007. http://www.ascilite.org.au/conferences/singapore07/procs/mcloughlin.pdf

Moursund, D.G. (2015) Pedagogic benchmarks for information and communication technology in teacher education. *Technology, Pedagogy and Education*, journal of biomedical science, 12 May 1999, 14(1), 127-149.

Cashman, T.J. & Gunter, G. A, (2016). Integrating Oliver, R. (2012). The role of ICT in higher education for the 21st century. ICT as a changing agent for education, journal for biomedical Engineers, 5(8) 28-32.

Shelly, G.B; Technology and Digital media in the Classroom (4th Ed), Boston: Thomson Press.

Tinio, V.L (2012), Teachers' instructional perspectives and use of educational software. *Teaching and Teacher Education*, 17 *(*1), 15-31.

United Nations Education Scientific and Cultural Organization, (2015). Information and Communication Technology in education: a curriculum guide for schools and programs of teacher development: Division of Higher Education.

Yusuf, O.Y. (2015). Integrating Information and Communication Technology (ICT) in Nigerian tertiary Education, An online Journal of African Educational Research Networks, 5(2) 45-50

Watson, M.D. (2011). Pedagogy before Technology: Re- thinking the Relationship between ICT and Teaching. *Education and Information Technologies,* 6 (4), 252-266.

White, K.G (2014). Information and communication technology and education: analyzing the Nigeria national policy for information technology. *International Education Journal* 6 (3): 316-321

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