International Journal of Interdisciplinary Research in Medical and Health Sciences
ISSN: 2837-9969| Impact Factor : 7.03
Volume. 10, Number 3; July-September, 2023;
Published By: Scientific and Academic Development Institute (SADI)
8933 Willis Ave Los Angeles, California
https://sadijournals.org/index.php/IJIRMHS|editorial@sadijournals.org

EFFECT OF COMPUTER ASSISTED INSTRUCTION ON UPPER BASIC (JSS) STUDENTS' ACHIEVEMENT IN HEALTH EDUCATION

[1]Onuoha Ogwe I. (Ph.D) and C. M. Ugwuegede (Ph.D)[2]
[1]UNICEF Nigeria, Enugu Field Office, Enugu
[2]Department of Human Kinetics and Health Education, Enugu State University of Science and Technology (ESUT), Enugu State, Nigeria
DOI: https://doi.org/10.5281/zenodo.8311207

Abstract: The purpose of the study was to investigate the effects of CAI on Upper Basic Education (Junior Secondary School) students' achievement, interest and retention in health education. Quasi-experimental design was adopted in the study. Two research questions and three hypotheses guided the study. The study was conducted in Abia state of Nigeria. The population for the study consisted of 16381 Upper Basic Education (Junior Secondary School) students in the 36 public secondary schools in urban and rural locations in Umuahia Education Zone, Abia state. A sample of 414 Upper Basic Education (Junior Secondary School two) students was used for the study. The sample consisted of 229 urban schools' students and 185 rural schools' students. Also the sample consisted of 210 students in experimental group and 204 students in the control group. Health Education Achievement Test (HEAT) was validated by three research experts. HEAT yielded a reliability coefficient of .89 obtained through Kuder-Richardson's formula 20 (KR-20) The researcher administered the instrument to the respondent's hand to hand and received back the completed copies same way with the help of three trained (3) research assistants. Mean and standard deviation were used to answer the research questions while test of hypotheses was done using Analysis of Covariance (ANCOVA). Findings showed that the group taught CAI recorded higher mean scores than their counterparts in the control group, taught Health Education with lecture method. Furthermore, there was no significant effect and interaction between teaching methods and school location on the students' achievement in Health Education. Based on the findings of the study, the following conclusions were drawn and recommendations made, which includes that the use of CAI for teaching secondary school health education should be adopted by all urban and rural secondary schools in Abia State.

Keywords: Computer Assisted Instruction (CAI), Health Education, Location.

Introduction

Health Education was aimed at training Health Educators that is, professionally prepared individuals who serves in a variety of roles and is specifically trained to use appropriate educational strategies and methods to facilitate

the development of policies, procedures, interventions, and systems conducive to the health of individuals, groups, and communities. The term health education may mean different things to different people or groups of people. Health Education is the education which is related to health. Health Education is a process of educating people about health. Areas within this profession encompass environmental health, physical health, social health, emotional health, intellectual health, and spiritual health, as well as sexual and reproductive health education. Lema (2012) defined Health Education as the principle by which individuals and groups of people, learn to behave in a manner conducive to the promotion, maintenance, or restoration of health.

In Nigeria, Health Education is a subject studied at the basic education level (Basic 1 –Upper Basic 3). Also, a similar subject, health science, is offered at senior secondary level. However, Health Education is studied at tertiary levels up to Doctor of Philosophy (Ph.D) level. In the context of the study, Health Education refers to the health subjects offered at upper basic education (junior secondary school) level. Unfortunately, research evidences from scholars like Obi (2016), Otobo (2014), Akinsola, Olude & Oluwi (2012), Mayo (2011) have consistently shown that students achieved poorly in Health Education especially at upper basic education (junior secondary school) level. According to Obi (2017), the average students' achievement in West African Senior Secondary School Certificate Examination in Health Education was from 2014 to 2017 was 48.94%. This unfortunate and reoccurring trends have led researchers make case for the use of innovative teaching methods to improve students' achievement in Health Education. Such methods include laboratory techniques, discovery, delay formalization, learner autonomy, self-regulated learning, programmed instruction and Computer Assisted Instruction (CAI), among others. However, the study is concerned with CAI method of instruction. Computer Assisted Instruction (CAI) that deals with the use of computers in teaching. Computer Assisted Instruction (CAI) is the general term used to describe virtually, any learning activity that is promoted by computer or in which a computer is involved (Keko, 2014). Evidently, Computer Assisted Instruction (CAI) is one of the innovations that is in tune with the most recent technology. Computer assisted instruction has features that offer the learner amusement and pleasure. Yet, these amusement and pleasure are designed to combine with instruction (intended lesson).

On classification, two different types of computer use in education could be identified as class use of computers and supportive use of computers. Class use of computers include computer as tool for presentation, encouraging students to train skills and instruct pupils in the possibilities of computers, while supportive use of computers include administration, preparing work sheet for the pupils, looking for information on the internet for lesson preparation (Van-Braak, 2013). The computer assisted instruction which is the crux of the study falls within the category of class use of computer described above. Interestingly, as CAI may sound, educators still vary in their opinions as regards its use in teaching and learning.

A number of educators believed that computer programmes have tremendous potential for the enhancement of the teaching and learning of some concepts (Ellis and Marks, 2014). Others maintain that animations and computer software inhibit students' achievement (Tsui & Solloway, 2014). However, the findings of scholars like Obi (2016) revealed that there were no significant difference between the students who were taught Health Education with lecture method and their counterparts taught with Computer Assisted Instruction (CAI) on Students' achievement in Health Education. Since, none of these scholars have ever investigated such related studies in Abia state, the researcher deemed it necessary to determine the efficacy of Computer Assisted

Instruction (CAI) on Students' achievement in Health Education. In addition, the study determined the influence of school location on students' achievement in Health Education.

Location in this context would be categorized into two viz; urban and rural. In the urban areas, barely all the basic infrastructures are inadequate in supply, hence, the struggle for and consequent over stretching of the available few (Igunma, 2014). Therefore, in the school system, the story has remained that of over-crowded classrooms, insufficient and obsolete equipment, absenteeism occasioned by the use of school children for street hawking even during the school hours, truancy on the part of the teachers as they hassle to survive the high cost of living, among others (Ngopi, 2012). The emergence of urban congestions has worsened things and created more unmanageable social problems. The problems of urbanization are many and they constitute a big threat to teaching and learning in our school. This is because learning must take place in very conducive environments.

On the other hand, the situation in the rural areas is not in any way better. Ngopi (2012), reports that although the rural locations may never be known for over-population, they have definitely suffered neglect and abandonment. Hence, schools in the rural areas are marked by dilapidated buildings, where they even exist at all and lack of necessary equipment to enhance teaching and learning. Hence, the researcher was worried on which students (urban/rural) would learn better with CAI. More worrisome to the study is the conflicting report of researchers on the influence of location of schools on students' achievement. Some researchers like Idowu (2013), Hagal (2013), Ibe (2019), found that students in urban schools outperformed their counterparts in rural schools when taught with computer assisted instruction while others like Mbela (2017), Nichole (2018) found the contrary. Yet, some still found no significant difference between the achievement of urban and rural schools' students taught with CAI. This no definitive answer further justifies the need for this present study.

Statement of the Problem

Many researchers have revealed that the average students' achievement in Health Education was 48% which is very poor. Many scholars have revealed that the poor achievement of students' achievement in Health Education. Evidently, research results have continued to implicate teaching methods as a major factor causing this ugly menace. A lot of innovations have consequently been introduced as teaching methods for secondary school health education; these include discovery, laboratory, concept mapping and self-regulated. Yet there seems to be no significant improvement in students' interest, achievement and retention in health education related topics. This suggests the need to look for other teaching method. Undoubtedly, a Computer Assisted Instruction (CAI) is in tune with the most recent scientific and technological developments. Yet, research evidences have reported conflicting findings on the efficacy of CAI in enhancing secondary school students' achievement, interest and retention in Health Education. Also disturbing is the no definitive status of research findings on the influence of school location on upper basic students' achievement when taught with CAI. Therefore, the problem of the study, put in question form is: How does CAI affect upper basic (Junior Secondary School) students' achievement in Health Education? Again, how does location of schools influence upper basic (Junior Secondary School) students' achievement in health education when taught with CAI?

Purpose of the Study

The purpose of the study was to investigate the effect of Computer Assisted Instruction on upper basic (JSS) students' achievement in Health Education. Specifically, the study aimed at determining the effect of Computer Assisted Instruction on upper basic students';

1. Achievement in health education;

2. Achievement in health education with regard to location of their schools' (Urban/Rural).

Significance of the Study

The results of the study have both theoretical and practical significance. Theoretically, the study is anchored on Ausubel's theory. Ausubel (1963) theory centers on the process of meaningful and Rote learning. Meaningful learning occurs when new knowledge is consciously linked to existing concepts (that is subsumers) the student already knows. But where the "subsume" does not exist, the theory recommends the use of what he called "advance organizers". Advance organizer is in the form of introductory material presented in advance of the learning itself to link already known materials to the new materials to be learnt. In contrast to meaningful learning, rote learning occurs when one acquires new information without specific association with existing concepts in his cognitive structure (i.e. knowledge store). This theory is related to the study in the sense that CAI is used by the Health Education teacher as an advanced organizer, which can be used for meaningful and rote learning.

Practically, the result of the study, especially when published and implemented shall be of inestimable value to the government, curriculum developers, school administrators, health education teachers, health education students, parents and researchers/authors.

Research Questions

The following research questions guided the study

1. What are the mean health education achievement scores of students taught using Computer Assisted Instruction (CAI) (Experimental group) and those taught using Lecture method (Control group) in both pretest and posttest?
2. What are the mean health education achievement scores of urban and rural schools' students in experimental and control groups in both pretest and posttest?

Research Hypotheses

The following research hypotheses were tested at 0.05 level of significance;

1. There is no significant difference between the mean health education achievement scores of students in the experimental and control groups.
2. There is no significant difference between the mean health education achievement scores of urban and rural schools' students in the experimental group.
3. There is no significant interaction effect of location and methods on students' achievement in health education.

Research Method

The research design adopted in the conduct of this investigation was non-equivalent quasi-experimental was used. According to Eze (2005), the design is a set of activities that make possible the observation of the effects of a variable (independent variable) on another variable (dependent variable) in a controlled situation. Here, the researcher deliberately manipulated the independent variable, controlled the extraneous variables and observed the effects on the dependent variables. Area of the study was Abia State of Nigeria. The study was conducted in Umuahia Education Zone of Abia State, covering Umuahia North local government area, Umuahia South local government area and Bende local government area. Umuahia Education Zone has the highest concentration of secondary schools than any other in Abia State. Hence, the choice of this area for the study is most significant as the impact of the study will spread to other parts of Abia State.

The population for the study was sixteen thousand three hundred and eighty-one (16,381) Upper Basic II (Junior Secondary School 2) students in the 36 public secondary schools in urban and rural locations within the Umuahia Education Zone, Abia State (Secondary Education Management Board, Umuahia Education Unit Records, 2019). A sample of four hundred and fourteen (414) Upper Basic II (Junior Secondary two (JSS2)) students was used for the study. The sample was 229 urban schools' students and 185 rural schools' students. Also, the study sampled 210 students in experimental group and 204 students in the control group. The sample was drawn from eight intact classes in the two urban and two rural secondary schools randomly drawn from Umuahia Education zone. By purposive sampling, the researcher drew all the urban and rural secondary schools in the area of the study with facilities for Computer Assisted Instruction (CAI). Computer Assisted Instruction (CAI) was used because not all schools in the Umuahia education zone that have CAI and CAI is the study's main research variable.

The instrument used for data collection was Health Education Achievement Test (HEAT). HEAT was used to collect pretest and posttest achievement scores. This instrument was developed by the researcher. It is made up of (30) multiple choice questions with four options each. The items were drawn using a table of specification to ensure adequate coverage of the content area to be covered in the study as well as maintain even spread across the different levels of the cognitive domain to be tested. HEAT was administered to Upper Basic II (JSS 2) students in a different school outside the schools sampled for the study; the scores obtained were used to analyze the original 31 items using item difficulty index, item distractor index and item discrimination index after which only 30 items survived the analysis. Likewise, HEAT was administered to Upper Basic II (JSS 2) students in a school outside the schools slated for the study and the students were not timed but they were left to answer the questions conveniently. The time taken by the first student to finish and the time taken by the last student to finish were recorded. The average of these two timings was calculated and used for HEAT, hence 45 minutes was allotted for students to answer HEAT.

HEAT was validated by three research experts. Two from Department of Health and Physical Education and one from Department of Mathematics and Computer Education, all from Faculty of Education Enugu State University of Science and Technology (ESUT), Enugu. HEAT which was originally made up of 35 items was reduced to 30 items. HEAT was administered to 50 Upper Basic II (JSS 2) Students in Agbani Education zone, Enugu State. The students were made up 25 Upper Basic II (JSS2) students from secondary school located in urban (Army Day S.S. Enugu) and 25 students from rural secondary school (CSS Agbani). The scores obtained were used to obtain the reliability coefficient. Since the items of the HEAT are dichotomously scored (that is pass/fail, only one answer was correct), Kuder-Richardson's formula 20 (KR-20) was used to determine the reliability. A reliability coefficient of .89 was obtained for the instrument. The researcher trained four (4) regular Health Education teachers in the four (4) secondary schools to be used in the study for a period of two weeks on the use of Computer Assisted Instruction. The researcher provided all lesson plans used in training the regular teachers in each school. In addition, all necessary computer software to facilitate the experimental groups' lessons training was also provided. The main experiment procedure lasted for six weeks. The main experimental procedure included

HEAT was administered to all the subjects of the study before the commencement of the experiment to collect pre-test data. After six weeks of treatment, HEAT was re-arranged and administered to all the subjects to collect post-test achievement scores. Research Questions were answered using mean and standard deviation while test

of hypotheses was done using Analysis of Covariance (ANCOVA) at 0.05 level of significance. ANCOVA is usually preferred for hypotheses testing in quasi-experimental studies because ANCOVA is statistically designed to take care of the initial differences among subjects of the study especially when intact classes are used (that is no randomization).

Results

Research Question 1

What are the mean health education achievement scores of students in the experimental and control groups in both pretest and posttest?

Table 1: Mean Achievement Scores of Experimental and Control Groups in Pretest and Posttest

Group	**N**	**Pretest**		**Posttest**	
		Mean	SD	Mean	SD
Experimental	210	22.31	11.0413	71.25	5.0019
Control	204	21.84	10.5201	52.80	8.4522

From table 1, above the pretest mean score of experimental group was 22.31 with the standard deviation of 11.04 while that of control group was 21.84 with the standard deviation of 10.52. This suggested that both groups were almost of equal ability at the beginning of the experiment. In the posttest, experimental group had a mean of 71.25 with the standard deviation of 5.00 while the control group had a mean of 52.80 with the standard deviation of 8.45. Apparently, the two groups achieved higher in the posttest than the pretest indicating that learning took place. However, the mean posttest score of the experimental was higher than that of the control group. Moreso, a lower standard deviation value of 5.0019 in the posttest for experimental group indicated that there were fewer extreme scores in the experimental group than the control group.

Research Question 2

What are the mean health education achievement scores of urban and rural schools' students in experimental and control groups in both pretest and posttest?

Table 2: Mean Achievement Scores of Urban and Rural Schools' Students in Pretest and Posttest.

Group	**n**	**Pretest**		**Posttest**	
		Mean	SD	Mean	SD
Urban (Experimental)	113	20.11	10.1141	71.14	4.2201
Rural (Experimental)	97	19.82	12.0413	70.93	5.0203
Urban (Control)	116	19.71	11.1123	50.76	8.4991
Rural (Control)	88	21.03	10.0233	51.35	7.9005

From table 2 above, the posttest mean score of the urban (Experimental) was 71.14 with the standard deviation of 4.22 while that of rural (Experimental) was 70.93 with the standard deviation of 5.02. Similarly, the posttest mean scores of the urban (control) was 50.76 with the standard deviation of 8.499 while that of rural (Control) was 51.35 with the standard deviation of 7.90. This result suggested that both experimental groups (urban and rural) and control groups (urban and rural) achievement were very close.

Analysis of Research Hypotheses

Table 3: ANCOVA analyses of the students' Achievement scores

Source	**Sum of**	**DF**	**Mean**	**F**	**Sig.**	**Decision**

	Squares		**Square**			
Method	921.400	1	921.400	1.536	0.000	S
Location	98.212	1	89.212	0.149	0.340	NS
Method*Location	56.371	1	56.371	0.094	0.251	NS
Error	246600.000	411	600.000			
Total	247666.983	414				

Table 3 was used to analyze research hypotheses 1 to 3.

Hypothesis 1

There is no significant difference between the mean health education achievement scores of students in the experimental and control groups.

From table 3, method gave an f value of 1.536 and this is significant at .000. Since .000 is less than 1.536 this means that at .05 level of significance, the f value of 1.536 is significant. Therefore, hypothesis 1 is not accepted as stated. This indicates that there is a significant difference between the mean achievement scores of the experimental and control groups. Similarly, the sum of squares arising from methods (921.400) when compared with the sum of squares arising from error (246600.000) indicated that the observed difference in the achievement of the experimental and control groups was due to the treatment administered in the experiment.

Hypothesis 2

There is no significant difference between the mean health education achievement scores of urban and rural schools' students in the experimental group.

From table 3, location gave an f value of 0.149 and this is significant at 0.340. Since 0.340 is greater than 0.149, this means that at .05 level of significance, the f value of 0.149 is not significant. Therefore, hypothesis 2 is not rejected as stated, indicating that there is no significant difference between the achievement of urban and rural schools' students. Additionally, the sum of squares arising from location (89.212) is highly insignificant when compared with the sum of squares arising from error (246600.000). This implied that any observed difference in the achievement of urban and rural secondary schools' students in the experiment may have resulted from extraneous variable(s).

Hypothesis 3

There is no significant interaction effect of location and methods on students' achievement in health education.

From table 3, the interaction effect (method*location) gave an f value of 0.094 which is significant at 0.251. Since 0.251 is greater than 0.094, this means that at .05 level of significance, the f value of 0.094 is not significant. Hence, hypothesis 7 was not rejected as stated because there was no significant interaction effect of location and methods on students' achievement in health education. Moreso, the sum of squares arising from location*method (56.371) is very insignificant in comparison with the sum of squares arising from error (246600.000). This indicated that any observed differences may be due to extraneous variable(s).

Summary of Findings

The results presented above can be summarized thus:

1. The difference between the mean achievement scores of the groups was significant with the experimental group (taught Health Education with CAI) achieving higher than their counterpart in the control group, taught Health Education with lecture method.

2. There was no significant effect and interaction between teaching methods and school location on the students' achievement in Health Education.

Discussion of Findings

Findings related to determining the mean achievement scores of the students in both experimental and control groups in both pretest and posttest, indicated that the mean pretest scores of both groups did not differ significantly. This suggests that both groups had similar entry behavior and achievement ability. Also, the wide gap between the mean pretest scores and the mean posttest scores showed that learning took place in both groups. However, the result of hypotheses testing indicates that there was significant difference between the achievements of the groups. Hence, the experimental group achieved higher than the control group.

This finding supports the findings of Muyiwa (2012), Ngopi (2012) and Idowu (2013). On the other hand, the result disagrees with the findings of Ukachi (2011), Hagal (2013) and Lema (2012). The conflicting results may be from the design or the use of the computer aided instruction in each study. Since academic achievement is the gain in knowledge of students as a result of taking part in a learning activity or program, one can say, with certainty, that the achievement of the students was as a result of the treatment administered to them. It is therefore important that the experimenters consider the design of any CAI they used. Since most experimenters do not administer the treatment (teaching) themselves, they should ensure that they properly train the research assistants (regular teachers) who are usually used to administer the treatment.

Effect of School Location on Students' Achievement in Health Education

The findings of the study revealed that there was no significant difference between the mean achievement scores of urban and rural schools students in both experimental and control groups. That is to say that there existed no significant interaction between school location and teaching strategy on the students' achievement, interest and retention in health education. This finding agrees with the reports of Ngopi (2012) who found out that there was no significant difference in the mean health education achievement scores of urban and rural schools' students. However, reports of some of the empirical studies reviewed in the study showed contrary opinions. Lema (2012) reported that rural school student achieved higher more in health education when taught with CAI than their urban schools' counterparts.

Conclusion

Based on the findings of the study, the following conclusions were made; CAI elicited higher achievement than lecture method than lecture method. In addition, school location did not significantly affect the achievement of the students in health education and the interaction effect between teaching method and school location was insignificant.

Recommendations

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

1. The Federal/State Ministry of Education should ensure that the Use of CAI for teaching secondary school Health Education should be adopted by all urban and rural secondary schools in Abia State.
2. The Federal/State Ministry of Education should ensure that the Nigerian teacher education curriculum emphasized on the use of CAI in microteaching and teaching practice exercises to avail Health Education teachers more practical knowledge during their training.
3. The Federal/State Ministry of Education should ensure that Periodic practical oriented workshops and seminars are organized for health education teachers on the use of CAI for the teaching of Health Education.

References

Akinsola, M.A., Olude D.A. & Oluwi, D.T (2006). *Postgraduate Diploma in Education Book 7 (Health science)*. Kaduna: National Teachers' Institute.

Ellis, J. D. (2013). A rationale for using computer in Science Education. *The American Biology Teacher* 1(46); 200 – 206.

Eze, B.A. (2005) *Methodology in Computer Education.* Enugu: Divine Love Printing Press.

Hagal, H.N. (2013). Effect of Computer Assisted Instruction Strategy on Students' Achievement and Retention in Health Education in Cape Town, South Africa. *Social Science Research Journal* 3(6); 81-93.*http://www.Africanquarters.org*

Hanks, F. (2011) *Education, Manpower and Economic Growth: Strategies of Human Resources Development.* New York: Vc-Mckey Press.

Ibe D.S. (2019). Effects of Computer Assisted Instructional (CAI) Package on Senior Secondary School Students' retention in latitudes and longitudes in Abuja. *The Journal of the International Educational Profession,* 43(1), 127 – 137.

Idowu, O.N. (2013). Effect of Innovative Strategies on Students' Achievement and Interest in Health Education in Oju Local Government Area of Benue state. *Social Science Research Journal* 3(6); 122-138. *http://www.Africanquarters.org*

Keko, J. A. (2014) *Meta-analytic studies of findings on computer –based instruction*; *Technology assessment in Education and training.* New Jersey: Lawrence Erlbaum Associates.

Lema, G (2012) Efficacy of Computer Assisted Instruction Strategy in promoting creative and critical thinking among secondary school students in Pankshin Local Government Area of Plateau State.*Journal of Health and Natural Sciences* 5(1), 15–32. *www.jhns.net*

Mayo, A. (2011). *Science and Technology Education for Development: Nigeria Academy of Education.* Lagos: Everlead Printing and Publishing Company Limited.

Mbela, F.D. (2017). CAI on Upper Basic One Students' Achievement and Interest in Health Education in Kwande Local Government Area, Benue State. *Journal of educational and behavioral statistics,* 22(1), 389-406.

Muyiwa S.T (2012) Effect of Computer Assisted Instruction Strategy on students, achievement and interest in Health Education in Ado-Ekiti, Ekiti State. *Journal of Health and Natural Sciences* 5(1), 180–193.*www.jhns.net*

Ngopi, C.M. (2012). Effect of Computer Assisted Instruction Strategy on Students' Achievement and Interest in Health Education in Kenya, Central Africa. *Readings in Health Education* 3(2), 410–424. *http://www.healtheducatorsforum.org*

Nichole, G.K. (2018) Comparative Effect of CAI and Constructivist Approach on the Students' Achievement, Interest and Retention in Health Education. *American-Malawian Journal of Scientific Research* 4 (2): 322-334.

Obi, C. C. (2016). Effects of Two Constructivist Instructional Models on Students' Achievement and Retention in Health Education. *An Unpublished Ph.D. Thesis, ABU*.

Otobo, S. (2014) Effect of simulation game on students' Achievement and Interest in Health science. *Unpublished M.Sc.(Ed) Thesis: Enugu State University of Science and technology (ESUT), Enugu*.

Tsui, C.Y. (2013). Motivational aspects of learning genetics with interactive multimedia. *The American Biology Teacher,* 66 (1); 277 – 285.

Terry, M. O. (2001). The "Significantly worse" phenomenan: A study of student achievement in different current Areas by school location. *Education and Urban Society* 36 (4), 467-481.

Ukachi, V.I. (2011) Effect of computer assisted instruction strategy on students' achievement and retention in health education in Ikwu-ano Local Government Area of Abia State. *Readings inHealth Education* 2(6), 333–347. *http://www.healtheducatorsforum.org*.

Van Braak, J. (2013) Towards a typology of Computer use in Primary Education. *Journal of Computer Assisted Learning 2729* 23(1); 197 – 206.