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EFFECTS OF COMPUTER ASSISTED INSTRUCTION ON INTEGRATED SCIENCE STUDENTS' INTEREST AND ACHIEVEMENT IN UYO, AKWA IBOM STATE.

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Abstract

This study investigated the effect of computer-assisted instruction on students' interest and achievement in integrated science. Quasi-experimental design, specifically, the pre-test, post-test non-randomized control group type was adopted for the study. A sample of two hundred junior secondary school two students, purposively sampled from two (2) schools, participated in the study. Integrated Science Achievement Test (ISAT) with a reliability coefficient of 0.82 and Integrated Science Interest Scale (ISIS) with a reliability coefficient of 0.76 were used for data collection. Mean and standard deviation were used for answering the research questions while the hypotheses were tested at the 0.05 alpha level using ANCOVA. Findings indicated a significant difference in the mean achievement score and interest rating of students in experimental group unlike their counterparts in the control group and it also shows that that there is no significant difference in the mean achievement scores of male and female students taught Integrated Science using Computer Assisted Instruction method. It was recommended among others that computer assisted instruction be adopted in schools to facilitate students' achievement and interest.
***Key words**: Computer-Assisted-Instruction, Interest, Gender, Achievement, Integrated Science*

Introduction

Understanding nature is the primary goal of science, a structured system of knowledge and an investigation process that seeks to enhance human quality of life. There are many different perceptions and understandings of science and technology among scientists. Science, according to Bichi's (2008) definition, is the search of understanding of the natural environment in which we exist and the development of techniques for categorizing this knowledge for the good of mankind. Accordingly, science primarily focuses on collecting data with a primary objective of

deriving order from natural phenomena and current events. Longshaw (2009) argues that science consists of:

a. systematically studying natural situations and phenomena, learn facts about them, and then create rules and principles according to this knowledge.
b. an established body of information developed from such findings that can be examined or confirmed by additional investigation.
c. a particular branch of this broad body of knowledge, like biology, chemistry, physics, geology, or astronomy.

Basic science formally known as Integrated Science is a subject taught at both public and private schools at Junior Secondary School level Nwafor (2012). It is an introduction to the study of the sciences in the Senior Secondary Schools. Basic Science is the study of elementary biology, anatomy, earth/solar system, ecology, genetics, and physics as a single science subject in the junior secondary school (Answers.com). It offers the basic training in scientific skills required for human survival, sustainable development and societal transformation. Basic Science studies involve bringing together traditionally separate subjects so that students grasp a more authentic understanding.

According to the Science Teachers Association of Nigeria cited in Anaekwe (2019b), the objectives of Integrated Science (Basic Science) should enable students to be able to:

- Observe carefully and thoroughly
- Report completely and accurately
- Organize information acquired
- Generalize on the basis of acquired information
- Predict as a result of the generalization
- Design experiments (including controls, where necessary to check the prediction).
- Use models to explain phenomena, where appropriate and
- Continue the process of inquiry when new data do not conform to predictions.

To achieve these objectives, it is suggested that the teaching and learning of Basic Science should involve the use of innovative methods in teaching; methods like discovery, problem-solving, computer assisted instruction, field trip and laboratory method among others.

These suggested methods of teaching have been utilized for many years now. However, Nwafor, (2012) stated that results from previous researchers showed that the teaching and learning of Basic Science in Nigeria in general and Akwa Ibom State in particular have not been encouraging. However, present day statistics on the students' performance tend to show that the output from teaching and learning of Integrated Science as a subject at the Junior Secondary School is still discouraging. The proportion of students with ordinary Pass and Failure grades relative to the Distinction and Credit grades, are still on the increase in recent times, as shown in

table 1.

Table 1: **Results of Basic Science, 2016 - 2018 in Akwa Ibom State**

YEAR	DISTINCTION	CREDIT	PASS	FAILED	ABSENT	TOTAL
2016	1470	11136	14418	448	250	27,722
2017	1744	10823	19165	270	116	32,118
2018	1486	8520	18902	450	260	29,618

Source: Ministry of Education, Uyo, Akwa Ibom State, 2015.

It can be deduced from the above information that the performance of the students in Integrated Science in Akwa Ibom State in particular is not encouraging. This status has been attributed largely, to over-reliance on ineffective teaching techniques (Chieke& Anaekwe, 2019). Towards improving the situation, there had been efforts to explore innovative and activity-based approaches to teaching science subjects.

Nwike & Chukwudum (2011) assert that one of the byproducts of information technology and a successful teaching strategy is CAI (Computer Assisted Instruction). It is noteworthy that CAI has the great advantage of personalizing learning, providing a varied and flexible experience to individual learners and facilitating learner engagement. It also uses search and guided discovery techniques to help learners use effective learning techniques. It follows that unless students are employed successfully during the teaching and learning process, ICT-based teaching aids cannot have an impact on students' academic achievement. Accordingly, the computer is provided a sequence of what to teach, what steps to take, how to judge success, and when and how to complete additional classroom activities when the CAI teaching technique is employed(Chieke& Anaekwe, 2019).

Gender is an important variable in teaching and learning science in schools. Nwosu (2011) argued that gender is a dimension of social organization that shapes how people interact with others and how people behave, act and think about themselves. Ellah (2014) found that gender is socially constructed to assign powers, duties, responsibilities, status and roles in any social context. Gender is the social meaning attributed to men and women, each having a specific role. Gender sensitivity has been observed in the field of basic sciences as one of the factors affecting the performance of students in basic sciences. Most male students performed better than female students in science subjects due to the psychological ability of male students to cope with difficult tasks compared to their female peers who choose to experience easier or less boring tasks (Bichi, 2002). Aniugwu quoted in Okolo (2018) claimed that gender issues in basic sciences are a source of aversion and that science subjects are stereotyped by men as they are seen as an abstract and difficult subject and have characteristics that attract boys. Male students outperformed female students in the fundamental sciences, according to Ani et al. (2020). The

gender of the participants in this study is a variable since it may have an impact on the academic achievement of the students, which often correlates with their interest.

Interest is a persistent tendency to focus on and enjoy a particular activity. Interest is considered an emotion-oriented behavioural channel that determines the student's motivation and motivation to participate in an educational program or other activity (Chukwu cited in Chukwudeozie 2016). Ogwo and Oranu (2006) statedthat in situations where teachers do not arouse students' interest in learning, thestudents will lose interest in learning. Abande (2010) suggested that curiosity is interest or concern about something or focusing on something. Magnus (2008), explained that interest includes the pleasant and positive feelings that a person experiences when trying to learn a subject. From the above expositions, it is evident that interests determine our feelings and levels of achievement towards certain objects or activities.Hence, the researchers investigated the effect of Computer Assisted Instruction (CAI), on the interest and achievement of male and female students in Integrated Science at Junior Secondary Schools in Uyo, Akwa Ibom State.

Statement of the problem

Basic science is a foundational science subjectthat plays a vital role in initiating scientific thought-processes among learners whether at primary or post-primary levels.It is pivotal in technological and socio-economic development of a nation. However, there is evidence in literature that students' achievement in the subject follows a downward trend. The declining achievements in Basic science have been attributed to teachers' use of ineffective teacher-centred methods which make students passive in the teaching / learning process.

Researchers have recommended that teachers should adopt learner-centred methods that will actively engage the students in the teaching / learning process. One of the learner-centred methods that can engage students actively and stimulate their interestin Basic science is Computer AssistedInstruction (CAI). Some Professional organizations like STAN, MAN had earlier observed, that students are underperforming in basic science because of the predominant use and abuse of traditional teaching methods (Anaekwe, 2019).Perhaps, the CAI strategy would help to enhance hands-on activities, re-awaken students' interest, engender their curiosity towards better achievement in science. The important question for which answer was sought in this study was: what is the effect of computer assistedinstruction on male and female students' interest and achievement in basic science?

Purpose of the study

The purpose of the study is to investigate the effect of computer assisted instruction on students' interest and achievement in integrated science concepts. Specifically, the study was geared towards determining:

i. the mean achievement score of students taught integrated science using computer assisted instructions and those taught using conventional teaching method;
ii. the mean interest rating of students taught integrated science using computer assisted instruction and those taught using the conventional teaching method;
iii. the difference between the mean achievement scores of boys and girls taught integrated science using computer assisted instructions.

Research Question

The following research questions guided this study

1. What is the mean achievement score of students taught integrated science using computer assisted instructions and those taught using conventional teaching method?
2. What is the mean interest rating between students taught integrated science using computer assisted instruction and those taught using the conventional teaching method?
3. To what extent does the mean achievement score of boys and girls taught integrated science using computer assisted instructions differ.

Hypotheses

The following hypotheses were formulated to guide the study

1. There is no significance difference between the mean achievement score of students taught integrated science using computer assisted instructions and those taught using conventional teaching method.
2. There is no significance difference in mean interest rating between students taught integrated science using computer assisted instruction and those taught using the conventional teaching method.
3. There is no significance difference between the mean achievement scores of boys and girls taught integrated science using computer assisted instruction.

Methodology

This study adopted a quasi-experimental study design that included a pre-test, post-test non-randomized control group design. The population of the study comprised of seven thousand three hundred and ten (7310) Junior Secondary School three (JSS2) students; offering basic science in thirteen (13) public secondary schools for the 2019/2020session. Random and purposive sampling techniques were used for the study. A sample of two hundred Junior Secondary School two students was purposively selected from two (2) schools that participated in the study. The instrument that was used for data collection for this study was Integrated Science Achievement Test (ISAT) with a coefficient of reliability of 0.82 indices and Integrated Science Interest Scale (ISIS) with coefficient of reliability of 0.76 indices. Mean and standard deviation were used for

answering the research questions while the hypotheses were tested at the 0.05 level of significance using Analysis of Covariance (ANCOVA).

Results

The results of the study are presented in accordance with the research questions and hypotheses.

Table 2: Mean and standard deviation of students' pre-test and post-test achievement scores classified by treatment groups

		Pretest		Posttest		
Groups	N	Mean	SD	Mean	SD	Mean Gain Score
Computer Assisted						
Instruction	102	23.82	5.18	68.77	7.75	44.95
Conventional	98	24.03	5.31	29.34	6.91	5.31

The data presented in table 2 shows that the experimental group taught with computer assisted instructions with mean achievement score gain of 44.95 ahead of the control group with a mean gain score of 5.31.With this result, the students in the experimental group performed better in the achievement test than the students in the control

Table 3: Mean and standard deviation of students' interest pre-test and post-test scores classified by treatment groups

		Pretest		Posttest		
Groups	N	Mean	SD	Mean	SD	Mean Gain Score
Computer assisted						
instruction	102	17.10	1.50	48.83	7.14	31.73
Conventional	98	17.14	1.55	19.35	2.03	2.21

The data presented in table 3 shows that the experimental group taught with computer assisted instructions with mean achievement score gain of 31.73 ahead of the control group with a mean gain score of 2.21.With this result, the students in the experimental group performed better in the achievement test than the students in the control group.

Table 4: Mean and standard deviation of students' pre-test and post-test scores classified by computer assisted instruction based on gender

		Pretest		Posttest		
Computer Assisted Instruction	n	Mean	SD	Mean	SD	Mean Gain Score
Boys	53	23.77	5.09	68.77	7.72	45.00
Girls	49	23.88	5.33	68.78	7.87	44.90

The post-test, pre-test mean score differences by gender for the computer-assisted instruction group are shown in Table 4, with the mean gain score for boys being 45.00 and the mean gain score for girls being 44.90. The boys performed very slightly better than their female counterparts, as seen from the table.

Table 5: Summary of Analysis of Covariance (ANCOVA) of the students' post-test achievement scores classified by treatment groups with pretest scores as covariate

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Decision at .05 alpha level
Corrected Model	122299.750[a]	2	61149.875	1140.796	.000	S
Intercept	20859.920	1	20859.920	389.157	.000	S
PRETESTACHIEVEMENT	143.952	1	143.952	2.686	.103	NS
TEACHINGMETHODS	121941.382	1	121941.382	2274.907	.000	S
Error	10559.750	197	53.603			
Total	529800.000	200				
Corrected Total	132859.500	199				

S= Significant at .05 alpha level, NS= Not significant at .05 alpha level

For Hypothesis 1, summary of results in Table 5 above shows that for the comparison of teaching methods the F-ratio is 2274.907 while the F. significance value at 0.05 is 0.000. Since the alpha level (0.05) is greater than the significance of F. value (0.000) the researchers rejects the null hypothesis and concludes that there is significant difference in the mean achievement scores of the students taught Integrated Science using Computer Assisted Instruction and those taught with the conventional approach

Table 6: Summary of Analysis of Covariance (ANCOVA) of the students' post-test interest scores classified by treatment groups with pretest scores as covariate

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Decision at .05 alpha level
Corrected Model	43456.792[a]	2	21728.396	771.182	.000	S
Intercept	1693.756	1	1693.756	60.115	.000	S
PRETESTINTERESTT	1.808	1	1.808	.064	.800	NS
TEACHINGMETHODS	43453.772	1	43453.772	1542.257	.000	S
Error	5550.563	197	28.175			
Total	285473.000	200				
Corrected Total	49007.355	199				

S= Significant at .05 alpha level, NS= Not significant at .05 alpha level

For Hypothesis 2, summary of results in Table 6 above shows that for the comparison of teaching methods the F-ratio is 1542.257 while the F. significance value at 0.05 is 0.000. Since the alpha level (0.05) is greater than the significance of F. value (0.000) the researchers rejects the null hypothesis and concludes that there is significant difference in the mean interest rating between students taught integrated science using computer assisted instruction and those taught using the conventional teaching method.

Table 7: Summary of Analysis of Covariance (ANCOVA) of students' post-test achievement scores classified bycomputer assisted instructions group and gender with pre-test scores as covariate.

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Decision at .05 alpha level
Corrected Model	142.868[a]	2	71.434	1.193	.308	NS
Intercept	25125.638	1	25125.638	419.541	.000	S
Pretest achievement gender	142.867	1	142.867	2.386	.126	NS
Gender	**.017**	**1**	**.017**	**.000**	**.987**	**NS**
Error	5928.946	99	59.888			
Total	488525.000	102				
Corrected Total	6071.814	101				

NS= Not significant at .05 alpha level, S= Significant at .05 alpha level

For Hypothesis 3, summary of results in Table 7 above shows that the F-ratio is .000 while the F. significance value at 0.05 probability is .987 Since the alpha level (0.05) is less than the significance of F. value (0.987) the researchers upholds the null hypothesis and concludes that there is no significant difference in the mean achievement scores of male and female students taught Integrated Science using Computer Assisted Instruction method.

Discussion

The findings from research question 1, as presented in table 2, shows that the experimental group had mean achievement score gain of 44.95 ahead of the control group with a mean gain score of 5.31. Similarly, the findings with regards to Hypothesis 1, table 5, showed that there was a significance difference in mean achievement of students taught integrated science using computer assisted instructions relative to the conventional teaching method in favour of the experimental group which had higher mean achievement gain score(F-ratio is 2274.907 while the F. significance value at 0.05 is 0.000).

This result could be attributed to the fact thatComputer-assisted teaching methodprovided interactive learning experiences that engage students in the learning process and helped them develop critical thinking and problem-solving skills unlike their counterparts exposed to conventional teaching method.Furthermore, computer assisted instruction compared with conventional teaching method, provided multimedia resources such as videos, animations, simulations, and virtual labs that enhanced better students' understanding of scientific concepts and phenomena as against the didactic teacher-centred approach of the conventional method.

The result of this finding is in line with the findings of Qaiser, Ishtiaq, Naseer, & Khalid (2017) on the effects of computer-assisted instruction (CAI) on the academic achievement of secondary school students in the subject of physics which result revealed that computer-assisted instruction has a significant positive effect on students' academic achievement and retention in Physics. The result of this finding is also in line with the findings of Ode (2018) which revealed that students taught government using computer-assisted instruction significantly performed better than students taught government using conventional instruction method.

The findings from research question 2, as presented in table 3, shows that the experimental group taught with computer assisted instructions had mean interest score gain of 31.73 ahead of the control group with a mean gain score of 2.21. Again, the findings with respect to hypothesis 2, as presented in table 6, indicated that there was a significance difference in mean interest rating between students taught integrated science using computer assisted instruction relative totheir counterparts taught using the conventional teaching method in favour of the experimental group which had higher mean interest gain score, F-ratio is 1542.257 while the F. significance value at 0.05 is 0.000.

This result could be attributed to the fact that students tend to develop interest to a particular concept when they see and hear what they are taught better when they only hear about concept they are taught. Computer-assisted teaching methods provided interactive learning experiences that engaged students with hands-on activities in the learning process and help them develop interest towards what they are learning. Students exposed to conventional teaching method tended to have lower interest rating because, this method was not stimulating enough to challenge the learning process.

The result of this finding is in line with the findings of Antwi, Anderson, & Sakyi (2009) on the effect of computer-assisted instruction on students' interests and attitudes towards some selected concepts of Electricity and Magnetism in Ghana which result revealed that students' interest was highly developed and also showed a positive attitude towards the teaching and learning of physics with computer assisted instruction. The result of this finding is also in line with the findings of Agu & Esson (2017) on the effect of computer-assisted instruction on academic achievement and interest of mechanical engineering Craft Practical (MECP) students in technical colleges in Nasarawa State, Nigeria which revealed that there was a significant difference in the interest scores of the two groups in favour of the group taught using CAI.

The finding from research question 3, as presented in table 4, showed that the mean gain score for boys was 45.00 and the mean gain score for girls was 44.90. The boys performed very slightly better than their female counterparts. From hypothesis 3, table 7, it was observed that gender influence was not statistically significant given the computer assisted instruction teaching method used. This observation indicates that gender is not a strong determinant of students' academic achievements (F-ratio is .000 while the F. significance value at 0.05 probability is 0.987). By implication, teaching method used for teaching basic science , has no significant influence on students achievement and interest relative to gender. However, teachers are expected to adopt activity-based teaching techniques which are known to be productive of learning among male and female science students. The no significant influence of gender observed in this study is also in line with those of Ani, Obodo ,Ikwueze& Festus (2021), Godpower-Echie &Ihenko (2017) and Oludipe (2012).

Conclusion

The use of computers in education has become essential due to the widespread use of computer technology in all facets of human endeavours and the requirement to design learner-centered classrooms that would engage students in their academic work and improve student achievement. According to this study, computer-based training is superior than conventional instruction in terms of raising student achievement and interest inIntegrated Science.

The study also indicated that, regardless of gender, children who studied integrated science fared better academically and showed a greater interest when taught using CAI techniques. Therefore, these findings imply that the teaching of integrated science and other science subjects can be

successfully done using computer-assisted learning as an alternative to conventional teaching techniques. Additionally, computer-assisted education gives teachers and students strong tools to support the shift to student-centered learning and can make the classroom more engaged and interesting.

Recommendations

Based on the findings of this study, the researchers recommend that:

i. computer assisted instruction should be included in the curriculum of pre-service teachers to enable them master the rudiments of applying the method for effective instructional delivery.
ii. Conferences, seminars and workshops should be organized regularly by government and relevant professional bodies to educate basic science teachers on the use of computer assisted instruction instructional strategies.
iii. Teachers and all stakeholders in education should provide non-gender discriminatory strategies thereby providing equal opportunities to students irrespective of gender.
iv. Government agencies and professional associations, whose responsibilities it is to design and revise the curriculum for secondary schools, should incorporate and emphasize the use of computer assisted instruction strategies in basic science curriculum.

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