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The Effect of Computer Assisted Instruction (CAI) on Students' Academic Achievement in Basic Science: Implication for Socio-Economic Empowerment

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ABSTRACT

The study was aimed at investigating the effect of computer assisted instruction (CAI) on students' academic achievement in Basic Science. Quasi experimental research design was used. The study was carried out in Anambra State of Nigeria. The population of the study compromised of all the Jss 11 students in Nnewi Education zone. A simple random sampling with replacement was used to draw the sample. 148 Jss 11 students in 4 intact classes were use as sample. Two research questions were answered and one hypothesis was tested. The instrument for data collection was teacher made test and questionnaire which utilized 4-point likert rating scale. Data generated was analyzed using mean and t-test. The result of the study showed that CAI facilitates the understanding of basic concept in Basic Science and that CAI also enhances economic empowerment among students and that CAI enhances academic achievement in basic science. It was then recommended that government should provide enough computers in secondary schools to ensure easy utilization of CAI in teaching.

INTRODUCTION:

Basic science is basic training in scientific skills requirement for human survival, sustainable development and societal transformation. Basic science combines science and technology with the theme "You and Technology". This was designed to expose students to developing science and technological skills, which will assist them, make informed decision, develop survival strategies and learn to contribute and live quantitatively in the global community. The new UBE Basic Science Curriculum can be said to be carefully planned, well written and documented, having all it takes to bring socio-economic development through the achievement of the Millennium Development Goals(MDGS) and the critical target of the National Economic Empowerment and Development Strategies(NEEDS). But the workability of any curriculum depends on the effective delivery which involves the learner, the teacher, resources and methods of teaching.

The overall objectives of the new Basic science curriculum as outlined by Aderinyi (2007) are to enable the leaner to:

a) Develop interest in science and technology.
b) Acquire basic skills in science and technology
c) Apply their scientific and technological knowledge and skills to meet societal needs.
d) Take advantage of the numerous career opportunities offered by science and technology and
e) Become prepared for further studies in science and technology.

f) Basic science curriculum had built –in strategy where the learners are required to be involved in inquiry and related activities that can develop critical thinking skills. Inquiring method of teaching advocated in Basic Science curriculum is to be used to meet the critical target of NEEDS summarized as: value re-orientation, poverty eradication, job creation, wealth generation and using education to empower the people. It is more appreciative to teach students how to learn, have them acquire on their own and provide them with a foundation of skills and attitude for acquiring and processing knowledge so that they will be adequately prepared to deal with failure challenges. (Chukwuneke 2016).

Creativity is synonymous with productive thinking, critical thinking and problem solving and can be developed through training. It is the capacity to invent, reflect, analyze and synthesize (chukwuneke 2009). Nigeria's economy is largely dependent on oil and is at the moment characterized by weak economy, high unemployment rate, grinding poverty high crime rate, high child and maternal mortality and low life expectancy etc. the most feasible way of solving these myriad of problems is to provide access to quality education to a large percentage of the citizenry. STM through Basic Science is of particular interest here. The economy which should of necessity be diversified will be run by citizens who are skilled and knowledgeable enough to compete globally. Basic Science is geared toward the lofty goal of the National Economic Empowerment and Development Strategies (NEEDS) which will go a long way in ensuring economic, social and environmental sustainability. Based on these objectives of basic science, teachers should adopt instructional strategies that emphasis active role of the learner which will enable them construct their own understanding, meet the objectives offered by science and technology and therefore be economically empowered and help to eradicate poverty in the society. The recipients of this type of education, are not only employable, but are happy, self reliant and also a functional citizen who are able to apply skills to improve the quality of life. (Chukwuneke, 2016). In order to facilitate the achievement of such goals, the recent moves of information revolution and knowledge explosion in technology have brought about changes in the educational systems. Ochoyi and Ukwumunu (2008) reported that the use of and increasing growth of technology in the classroom provides new opportunity for delivery of instruction. Over the years, various machines have been invented by man in technology. The major and most influential technology in the last millennium is the introduction of computer.

The introduction of computer in education has not only been found to improve access to learning by all and quality knowledge delivery, its implication has also been in teaching – learning process. This may improve student achievement in some subjects such as Basic Science. It is not worthy that the school are not only to equip learners with basic knowledge to science content but also the practical skills needed for enhancing self development. In order to achieve this, the pedagogical approach which is centred on teachers' method of imparting facts and concept of the subject is important. The implication this is that Basic Science teaching must be effective and meaningful to achieve this goal. The conventional instructional method may not be able to achieve this goal. NTI (2008) remarked that the conventional instructional methods is teacher centered while Adeyemi (2012) also

commented that the conventional method is characterized by emphasis on instructor behavior rather than students behavior, minimal responses of students to the instructional material and delayed feedback on students performance. In order to facilitate the achievement of such goals the recent moves of information revolution and knowledge explosion in technology have brought about changes in educational system. Technology is utilized in enhancing instruction thus shifting from teacher centered conventional method attitude to technology based instruction which has increased across many countries and have proved to be effective (Adedamola,2015).

Technology has been described by Abimbade, Aremu, and Adedoja (2003) as a systematic and integrated organization of a man, machine, idea and procedure to achieve a desired goal. Over the years, various machines have been invented by man in technology the major and the most influential technology in the last millennium is the introduction of computer. Computer Assisted instruction (CAI) is an area of education that involves training technique in which a student interact with a computer system (Nwoji 2002). It is interactive, the students using computer as a mode of delivering instructions responds to instruction presented to him/her by the computer. CAI involves the learner and the teacher it is an active not passive instructional medium. The computer takes the role of the teacher. CAI also allows the students to review or practice skills previous taught (Awalua-Efebo, 2001). In science classroom, the micro-computer can be used for a number of purposes such as; lesson planning, science instruction management of science instruction and evaluation. The microcomputer as a powerful teaching aid can be used by a good science teacher who is computer literate to enhance the teaching and learning process. Today, it is not uncommon to find microcomputers in our school science classrooms. Computers because of their speed, efficiency, flexibility and adaptability are indispensable tools in almost all facts of the human endeavor. In a computer age such as ours, the computer finds immense use in our homes, school, offices, stores, banks, hospitals, military, radio and television houses. The compute can be used to aid science instruction.CAI enables a lesson to be delivered through a computer without constant teacher interaction. To make the science learning interesting and worthwhile, the computer assisted programme must be carefully planned. Good planning should give serious consideration to the content, methodology, instructional objectives and evaluation of a science lesson. Thus in selecting computer programmes, a good science teacher should pay a great deal of attention to those programmes that are relevant meaningful and worthwhile. Such programmes will, to a large extent motivate and simulate students (Chukwuneke, 2013). As a computer assisted instruction must be carefully planned, it is essential that the students be given list of both performance and process objectives. This will help them know what is required of them as they work with the micro-computer (Aniodoh, 2001). In a review of empirical studies on CAI, Cotton (1997) found out that the use of CAI as a supplement to conventional instruction produces higher achievement than the use of convectional instruction alone; students learn instructional contents faster with CAI than with conventional instructions alone. Mill (2001), findings revealed that CAI was found to be as effective for topics requiring critical thinking or mathematical problem solving.

The objectives of basic science which include enabling the learner develop interest in science and technology, apply their scientific and technological knowledge and skill to meet their social needs, take advantage of numerous career opportunities offered by science and technology and lastly become prepared for further studies in science and technology (NERDC, 2007). Based on the objectives, teachers should adopt instructional strategies that emphasize an active role of the learner that will enable them construct their own understanding and thereby become self reliant leading to socio-economic empowerment. It is likely that computer-assisted instruction (CAI) can help students learn meaningfully, achieve maximally academically and likely enhance socio-economic growth. Based on this, the present study goes to investigate the effect of Computer Assisted Instruction (CAI) on students' achievement in Basic Science: implication for socio-economic empowerment.

PURPOSE OF THE STUDY

The purpose of this study is to investigate the effect of the computer assisted instruction (CAI) on student's academic achievement in Basic Science and the implication for socio-economic empowerment. Specifically, the study goes to investigate the following:

1) Whether the use of computer assisted instruction (CAI) can improve academic achievement in Basic Science.
2) Whether the use of CAI can facilitate the achievement of entrepreneurial skills in Basic Science.
3) Whether the use of CAI can enhance socio-economic empowerment in Basic Science

RESEARCH QUESTIONS

The following research questions were formulated to guide the study.

1) To what extent does the use of CAI facilitate the understanding of Basic Science concepts
2) To what extent does the use of CAI in teaching Basic Science enhance socio-economic empowerment among students?

Hypothesis:

This hypothesis was tested in this study.

Ho: There is no significant difference in the mean achievement of students taught Basic Science with CAI and those taught without CAI.

METHODOLOGY

The study was a quasi- experimental research design. This design was considered appropriate for the study because intact classes were used to avoid disruption of normal class lessons. The subjects were pre-tested. This was too partial out initial differences in the two groups and also to control selection bias which is a trait to internal validity. The population compromised of all the Js 11 students in all the secondary schools in Nnewi Education Zone. The sample consist of 148 students in 4 intact classes in two secondary

schools in Nnewi Education Zone of Anambra State and the two schools have similar facilities and they are near each other for easy supervision of the experiment. The two intact classes were randomly assigned to treatment and control groups. The instrument for data collection was Basic Science Achievement Test (BSAT) and questionnaire. The questions were constructed by the researcher. The questions were validated by experts and also the reliability of the instrument was obtained using Pearson's product moment co-relation and a reliability co-efficient of 0.82 was obtained. The researcher considers this a good reliability characteristic. The research questions were answered using mean and the hypothesis was tested using t-test at 0.05 level of significance. In the analysis of data, mean values of 3.50 and above was taken as "Strongly Agree". Mean values of more 2.50 but less than 3.50 will be taken as "Agree". Mean values of 1.50 – 2.50 was taken as "Disagree" and mean values of less than 1.50 was taken as "Strongly Disagree".

RESULT:

These are presented in order of research questions for the study.

Table 1: Extent to which CAI facilitates the understanding of Basic science concepts

S/N	Item Statement	SA	A	D	SD	X	Decision
1.	New ideas and concepts that might be excluded from the Basic Science curriculum or learnt unsatisfactory can be explored by students and the teachers.	320	129	30	13	3.32	Agree
2.	Provides individualized, self-paced instruction with immediate feedback to the learner.	348	117	38	01	3.41	Agree
3.	Freedom to experiment with different options.	316	174	16	03	3.44	Agree
4.	Offers objective assessment of students' performance.	280	210	08	04	3.39	Agree
5.	Offers equal educational opportunities for all by using the same program for all schools.	264	288	10	01	3.80	S.A
6.	Free teachers from other classroom roles	192	168	44	20	2.86	Agree
7.	Interaction with each students at his/her own level in a way that can capitalize on his unique interest or aptitude.	304	204	04	02	3.47	Agree
8.	Improve on students' performance and interest in Basic Science.	356	168	06	00	3.58	SA
9.	Facilitate the understanding of Basic Science concepts.	356	168	06	00	3.58	SA
10.	Enhance the acquisition of entrepreneurial skills.	304	198	08	02	3.46	Agree
	Cluster mean					3.07	Agree

Table 1 above shows that all the respondents agreed on all the points presented above with mean scores of above 2.50.The cluster mean is 3.07 which shows that CAI facilitates the understanding of Basic Science concepts.

Table 2: Extent to what the use of CAI in teaching Basic Science enhances socio-economic empowerment among students'.

S/N	Item Statement	SA	A	D	SD	X	Decision
1.	CAI provides opportunities for students to repeatedly practice the skills that have previously been presented thereby leading to mastery and subsequent application of knowledge/skill which enhance their socio-economic empowerment.	356	168	06	00	3.58	SA
2.	Can be used to improve the performance of slow learners through drill and practice thereby helping all to develop technological skill for socio-economic empowerment.	264	288	10	01	3.80	SA
3.	Provides necessary repetition to achieve retention of subject matter thereby applying scientific and technological knowledge and skills to meet social needs.	348	117	38	01	3.41	Agree
4.	CAI aids students learn new skills by step-by step process thereby taking advantage of the numerous career opportunities offered by Basic Science and Technology for socio-economic empowerment.	344	114	40	02	3.34	Agree
5.	Can be used to teach and learn difficult concepts skills and information needed to live qualitatively/qualitative in a global community.	324	117	36	10	3.29	Agree
6.	Offers students freedom to experiment with different options leading to discovery and subsequent socio-economic empowerment among students.	304	204	12	00	3.51	SA
	Cluster mean					3.49	Agree

Table 2 above shows that all the respondents agreed on all the points presented above with mean scores of above 2.50. the cluster mean is 3.49 which shows that the use of CAI in teaching Basic Science enhances economic empowerment among students

Table 3: t-test comparison of experimental and control group.

Group	N	X	SD	DF	t-cal	t-crit	level of sig	Decision
Experimental group	76	76.15	14.36	146	13.49	1.96	0.05	Ho Rejected
Control group	72	49.31	19.63					

P<0.05 t-cal (13.49) > t-critical (1.96).
Key
N= Number of subjects in a group

X= Arithmetic mean
SD= Standard Deviation
DF= Degree of freedom
t-Cal= Calculated t
t-Crit= Critical t
Lev. of sig. = Significance level.

From table 3 above, it is observed that the probability (P) of the difference being due to error is less than 0.05, level; of significant, the calculated t value is 13.49 which is greater that the critical t value of 1.96.
Following the above therefore, a significant difference exists in the mean achievement of the students. The null hypothesis is hereby rejected. Accordingly students taught Basic Science with computer assisted instruction and those taught without computer assisted instruction differ significantly in achievement as measured at 0.05 statistical level of significance.

DISCUSSION OF RESULTS

Results from Table I show that Computer Assisted Instruction (CAI) facilitates the understanding of Basic Science Concepts; this leads to higher academic achievement in Basic Science. This agrees with Cotton (1997) which reveals that the use of CAI produces higher achievement than the use of convectional instrumental method alone and that students learn instructional contents faster with CAI and also retain better.
Results from Table II shows that the use of CAI in teaching Basic Science enhances economic empowerment among students. Again Orlich, Harder, Kauchak Pendergrass, Keogh and Gibson, 1990 in Aniodo, 2001 maintained that using simulation as one of the Computer Assisted Instruction permits the learner to be an active participant engaged in learning a behavior and applying previously acquired skills or knowledge. Again Tinkar (1984) said that CAI helps to engage students as active participants in learning process and can help support inquiry based learning strategies. Students have confidence to use these tools in guided exploration or in exploration of their own design. This helps the students to be self-reliant which can also enhance economic empowerment among students.

Results from Table III shows that, students taught Basic Science with Computer Assisted Instruction achieved significantly higher than those taught without Computer Assisted Instruction. The result is in agreement with Cotton (1997) that revealed that the use of CAI produces higher achievement than the use of conventional methods of instruction. Also Adedamola (2015), Yusuf, Afolabi (2010) in Biology. The findings also agrees with Philips and Moss (1993), Jegede, Okebukola and Ajewole (1992) also in Biology. The findings also agree with studies of Ajelabi, 1998 on social studies, Egunjobi (2002), in geography, Udousoro, 2000, in Mathematics, Okoro and Etukudo, 2001 in chemistry. It however contradicts the conclusion of Mill (2001).

CONCLUSION AND RECOMMENDATION

Based on the findings of this study, it was recommended that Computer Assisted Instruction should be used in teaching of Basic Science in Junior Secondary Schools. Also government should ensure availability of Computers in all public and private secondary schools to ensure easy utilization of Computer Assisted Instruction in the teaching of Basic Science. Again necessary attention should be accorded to computer literacy and operation in the secondary schools among both teachers and students, and relevant computer assisted instructional packages should be developed for use within the Nigerian school system. Further empirical studies should be carried out on the use of computer for instructional purposes on different subjects and at different levels to provide sound basis for the integration of computer in Nigerian schools for the purpose of instruction.

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