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EFFECT OF GENDER ON PRIMARY FIVE (5) PUPIL'S ACHIEVEMENT IN BASIC SCIENCE USING COMPUTER-ASSISTED INSTRUCTION IN IBADAN OYO STATE, NIGERIA

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The Effect of Computer-Assisted Instruction on Pupils' gender and Achievement in Basic Science in Primary Schools in Ibadan Oyo State, Nigeria

ABSTRACT: *The use of instructional materials may not be limited to a particular field of study. Effective teaching and learning of basic science at primary school level may depend to a large extent on adequate use of instructional materials. This is because children at this age level tend to learn better when taught with real objects that they can see and touch. However, available evidence indicates that, despite previous efforts and methods used in teaching, performance in basic science is still very low Hence; this study investigated the effect of computer assisted instruction (CAI) and gender as they predict primary five (5) pupil's achievement in basic science. Pretest-posttest, control group quasi-experimental design study involving a 2 x 2 factorial matrix was adopted. Purposive sampling technique was use to select 40 primary five (5) pupils' in two private schools in Ibadan north LGA, of Oyo state. Valid and reliable instrument of twenty-five 25 items on basic science test (p= 0.83) were used for data collection. Data were analyzed using Analysis for Covariance (ANCOVA) at 0.05 level of significance. While Sidak post hoc test was used to explain the direction of significance between the groups. There is a significant difference in the performance of experimental and control group after treatment on primary school pupil's achievement in Basic science ($F_{(1,39)}$ =11.015 ; p< 0.5), there is no significant main effect of gender on basic science of participants (($F_{(1, 39)}$ = .462; p< 0.5). Findings revealed that majority of boys achieve more in basic science when they use computers than the girls in school.*

KEYWORDS*:* Computer Assisted Instruction (CAI), Gender, Achievement in Basic Science. Number of word (260).

INTRODUCTION

Instructional materials as educational inputs are vital to the interpretation of the school curriculum. This is because it tends to aid understanding and recall of facts better. For instance, Osam and Inah (2004) opine that instructional aides facilitate learning of abstract concepts and ideas. That is, they help to ease ideas and stimulate learner's imagination, by bringing to life the concept during instructional delivery. Esu and Ntukidem (2003) added that instructional materials are teaching-learning aids that supplement teaching strategies and perfect learning experiences. To them, instructional aides keep the learners busy and active, thus increasing their participation in the lesson especially in a situation where audio-visual materials are utilized. Therefore, a well-planned and creative use of instructional materials in lessons could do much to supplement inadequacy of books as well as arouse and sustain learner's interest to basic science.

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A unique position of the school curriculum is to serve as foundation for preparing scientist who will be useful to the society as specified in the National Policy on Education (2004). It therefore appears that, this could only be achieved by giving learners something practical to see and do. Such practices will help inculcate in learners critical thinking skills that may aid them solve certain problems themselves without waiting for the teacher. Adegbile (1999) opine that teaching becomes more effective and meaningful if the teaching method is complimented with good and relevant instructional materials. Moallem (2007) emphasized that learners' individual differences are very important in learning and instruction. Therefore, it would be very important to consider learners' needs when organizing instructional delivery activities such that a reasonable number of learners would attain the envisaged mastery of the objectives (Zheng and Smaldino 2003) Instructional objectives are those skills, behaviors' and knowledge that the learners are expected to develop, upon completion of the instructional unit.

In recent times, visual aids therefore appear to be used in every subject area and children tend to like using technological tools like computer and television. Also, it appears that supporting instructional materials with different sounds, images and simulations, tend to encourage more lasting, pleasurable and effective learning. This is because most of the children understand the information better through what they see and hear especially with materials like computers and televisions, which are used in our daily life. Computer Assisted Instruction (CAI) involves the use of computers to perform different tasks, such as calculations, electronic communication, under the control of a set of instructions called a program. These program results are stored or routed to output devices, like video display monitors, printers etc. It also performs a wide variety of functions that are reliable, accurate, and fast activities entails hands-on activities, discovering of new ideas through the use of computer assisted instructions and sometimes the display of animation packages.

The use of computers in schools seems to help pupils to be creative in problem solving, thereby developing positive interest in their studies. In this respect, the whole purpose of education in a country like ours is to develop and enhance the potentials of human resources and progressively transform them, into a knowledge society. Jones (2002) emphasizes that professional development in the effective use of computers, as in most fields of study, assumes that pupils will be able to return to a classroom and use the skills, training, and knowledge acquired to earn a living and contribute meaningfully to the advancement of society.

Computers have become universal at all levels of schooling in many developed countries, and in information and communication technologies (ICT) in particular. In our educational system, there is increasing concern that young children are being "fast forwarded" through the basics of educational uses of ICT. It is possible that because of lack of appropriate professional development, some teachers of young children are emphasizing technical skills and the completion of products to the detriment of independent self-paced exploration and understanding of lesson. Haugland (1999) argues that computers and ICT can be used in developmentally appropriate ways with very young children learn. Discussing when children are ready to learn using ICT she states, he says "It is my recommendation that computers be introduced to young children when they are about three years of age".

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Computer as instructional material has made a significant contribution to a wide range of group-learning activities. They can, for example, be used to manage or structure a group-learning process, by guiding the group through a simulation exercise of some sort. This can provide a vehicle through or with which a group of learners interact, and gain access to information, investigate simulated situations, which can lead to creativity Indeed, virtually all these are ways in which computers can be used to determine pupils interest in learning. It can also be used in group-learning situations. Learners in groups thus, do not only benefit from the feedback they receive from the computer, but also from the feedback they receive from one another. Considering the views of Izzet and Ozkan (2008) many research studies abound that, investigated the efficacy of computer assisted instruction (CAI) using different variables: different groups of student, different ability levels, gender among others. For instance, Izzet and ozkan (2008) in their study found that CAI both increases motivations towards learning and developments of academic achievement of students.

Halis, (2002) pointed out that, the use of computers in Science and Math subjects as an instructional aid makes the lessons more interesting and encouraging and so makes the more complex Science concepts be learnt easily in an effective way. In contrary, the findings of Karen indicate that there is a negative relationship between the use of computer-assisted instruction and mathematics achievement scores. Shade and Watson (1990) conclude that, only when computers are integrated into the curriculum as a vital element for instruction and applied to real problem for a real purpose, will children gain the most valuable skills and ability to use the computer to learn better.

Krapp (2004) use the terms “individual interest” and” situational interest” when expanding on Dewey’s ideas on direct and indirect interest. Individual interest is defined as a long-lasting person-object relationship which develops over a period of time. To him, such relationship manifest in behaviors such as highly focused attention, display of pleasure, and high degree of persistence in a task. However, situational interest refers to a state of interest generated externally or formed as a result of on-going interactions between a person and the environment. He added that for the development of pupil’s interest, the child should experience both feelings-related experiences--enjoyment, involvement in using the computer or doing an activity-- and cognitively represented factors-goals and values together in a positive way. Hidi and Harackiewicz (2000) individual and situational interests are distinct; but they seem to interact and influence each other’s development. Moreover, Basic Science lesson as one of the core subject encourages students to think creatively and it helps them know and love the environment they found themselves. Jessica (2012) Elementary school pupils are naturally curious, which makes science an ideal subject for them to learn. Science allows students to explore their world and discover new things. It is also an active subject, containing activities such as hands-on labs and experiments. This makes science suitable for active younger children.

Also, science is an important part of the foundation of education for all children. Meaning that, the effective means of providing new information and clarifying existing information to a large group of learners in a short period of time can provide the basic scientific principles to children in a smooth and graded way by building a scientific base and structure appropriate for the achievement of the pupils. Importance is much debated as to how to measure good teaching. No one is exactly sure how to define excellent teaching, because no one ever finishes the process of

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becoming a master teacher, just as no one ever finally reaches the goal of becoming a truly educated person. No single style or formula for good teaching can be passed on to become good.

Constructivist learning theory says that all human knowledge is constructed from a base of prior knowledge and meaning from an interaction between their experiences and their ideas. Children are not blank slate that knowledge cannot be imparted without the child making sense of it according to his or her current conceptions. Therefore children learn best when they are allowed to construct a personal understanding based on experiencing things and reflecting on those experiences. It involves learning by doing what they are interested on to derive their own knowledge and meaning. Baykul (1999) has it that,

Constructivist model of instruction proposed to create environments where children actively construct their own knowledge, rather than depending on the teacher's explanation.

Accordingly, this theory holds that learning is always built upon knowledge that a student already knows; this prior knowledge is called a "schema". Because all learning is filtered through pre-existing schemata, constructivists suggest that learning is more effective when a child is actively engaged in the learning process rather than attempting to receive knowledge passively. A wide variety of methods claim to be based on constructivist learning theory. Mayer (2001) suggests that instructions are effective when verbal information is presented aurally rather than visually (the modality principle). Experiments show that replacing written text with speech increases test scores. Computer assisted instruction is one of the earliest applications in education. Effective teaching and learning of basic science at this level may depend on adequate use of instructional materials, such as textbooks, real-life objects, computers etc. over the years, children experience difficulty in learning throughout their conventional instruction which has attributed to low achievement in learning basic science. However, despite previous efforts and methods used in teaching, performance in basic science is still very low among primary school pupils. This study therefore investigated the effect of using computer assisted instruction to determine gender of primary five pupil's achievement in basic science.

Hypotheses

H_{O1}. There is no significant main effect of

(a) Treatment on primary school pupils' achievement in basic science.

(b) Gender on primary school pupils' achievement in basic science

H_{O2}. There is no significant interaction effect of Treatment and gender on primary school pupils' achievement in basic science.

Significance of the study

This study provide an empirical basis for developing more effective practical techniques on how to improve teaching and learning methods for primary school children in Nigeria in order to ensure that primary education programmes in the country are of sufficiently high quality to contribute to the country's future educational development

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The study will also be essential in assessing the state of using the conventional and CAI in teaching and learning basic science, thereby ascertaining the constraints that will be observed. It hopes to equip future primary school pupils with the essential knowledge and skills for effective use of computers. Teachers will be provided with feedback concerning the development of pupils with regard to the effective use of computers in learning. It will also be of great benefit because schools will be better informed on the importance of provision and proper usage of instructional materials in teaching– learning activities, considering the ever changing nature of our society and the outside world at large.

METHODOLOGY

Design

The study adopted a pre-test post-test control group non-randomized quasi-experimental design with 2x2x factorial design, in which the treatment operating at two levels (Computer Assisted Instruction, CAI and Conventional method) The experimental groups were exposed to treatment, using CAI. Control group were exposed to treatment but to conventional teaching method only.

Population

The target population comprised of all private primary five (5) school pupils that offer basic science and all the schools that have computers in Ibadan North L.G of Oyo State. The choice of primary five was based on the fact that they seems to have certain level of intellectual ability to answer questions and were able to respond to the use of computers.

Sampling

Purposive sampling technique was used to select primary five pupils from two (private) schools in Ibadan North L.G of Oyo State that have computers. This was based on the facts that, research on computer Assisted Instruction (CAI) should be conducted in schools were computers are available. Thus, two schools that have computer laboratories (one does not use the computers for teaching-learning activities and therefore does not allow the pupils to use them and another which uses it during classroom activities and also allows pupils access to them) were selected. In each schools selected, an intact primary 5 class of 20 pupils was used. In all, 40 primary 5 pupils' (19 males and 21 females) participated. Their ages ranged from10 to 12 years (mean 10.9).

Instrumentation

The instrument used for the study were developed and validated by the researchers. The Basic Science Achievement Test (BSAT) has a reliability coefficient of .72.

Data Collection Procedures

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Prior to treatment in class, pretest on basic science was administered to test pupil's level of understanding on the selected topics to test the pupil's level of understanding and computer assisted instruction. This was used in assigning participants to groups. Those who scored highly were assigned to control group whereas those who performed poorly were assigned to treatment group.

Experimental Group: Prior to administering the treatment package, the basic science animation package was installed in all the 25 computers in the laboratory for those in the experimental group. Since it involves animation effect, the pupils participated individually with the guide of the researcher. These pupils were thought using discovery method supplemented with the aid of computer instruction.

Control Group: **T**he control group were thought using lecture method and thus restricted from using the computer in their school laboratory. During this period, both groups (Experimental and Control group) were exposed to the same content materials. Pre-test of both tests were administered on the two groups first before the experiment commenced.

The treatment lasted for six weeks of two periods of thirty-five minutes per period per week. The investigators personally handled the treatment conditions in all the classes. At the end of the treatment, the Basic Science Achievement Test was administered to the pupils.

Analysis of Data

The post- test performance scores were subjected to analysis of covariates (ANCOVA). The Sidak test and graphical illustrations were used as post –hoc measures.

RESULTS

Ho_1 There is no significant main effect of treatment (computer assisted instruction) on primary school pupils' achievement in basic science.

To test the hypothesis, analysis of covariance (ANCOVA) was employed to analyze the posttest scores of participants on treatment, using the pretest scores as covariates to find out if posttest difference was significant.

Table 1 Descriptive Statistics of Treatments Scores for Treatment Group and Control

TREATMENT	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
COMPUTER ASSISTED INSTRUCTION	19.143	.464	18.197	20.088
CONVENTIONAL METHOD	16.708	.487	15.715	17.701

a. Covariates appearing in the model are evaluated at the following values: PRETEST = 15.00.

Table 1 shows the descriptive statistics on treatment. The result shows that the participants exposed to treatment had the highest post achievement mean score (x=19.143) in basic science,

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while pupils in the conventional group had the least performance with the achievement mean score (x=16.708) this implies that the treatment intervention of participants group is effective as seen in Table 4.2.

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Table 2: Summary of Analysis of Covariance (ANCOVA) showing the effect of treatment on experimental and control groups.

Dependent Variable: ACHIEVEMENT

Source of variation	Sum of Squares	df	Mean Square	F	Sig.	Eta Squared
Corrected Model	408.830	8	51.104	14.796	.000	.792
Intercept	70.343	1	70.343	20.366	.000	.396
PRETEST	109.711	1	109.711	31.765	.000	.506
TREATMENT	38.046	1	38.046	11.015	.002	.262
GENDER	4.258	1	4.258	1.233	.275	.038
TREATMENT * GENDER	1.595	1	1.595	.462	.502	.015
Error	107.070	31	3.454			
Total	13548.000	40				
Corrected Total	515.900	39				

a. R Squared = .792 (Adjusted R Squared = .739)

The result presented in Table.2 shows that there was a statistical significant main effect of treatment (CAI and Conventional method) on pupil's achievement in the Basic Science. ($F_{(1,39)}$ =11.015 ; p< 0.5),partial eta squared^2 =.262. Therefore the effect size of (26.2%) of treatment on pupils achievement in basic science was fair, the null hypothesis was rejected. meaning there is a statistical main difference in Basic science Achievement Test scores of experimental and control group. This implies that, the treatment intervention was statistically significant.

Ho_2: There is no significant main effect of gender on primary school pupil's achievement in basic science.

To test the hypothesis, descriptive statistics, analysis of covariance (ANCOVA) is used to analyze and they are presented in the Table 4.4 to find out if test difference was significant between gender and pupils achievement.

Table 3. Descriptive Statistics of Gender on Pupils Achievement in Basic Science

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			95% Confidence Interval	
GENDER	Mean	Std. Error	Lower Bound	Upper Bound
MALE	18.270	.422	17.410	19.130
FEMALE	17.518	.445	16.673	18.488

a. Covariates appearing in the model are evaluated at the following values: PRETEST = 15.00

Table 3 shows the descriptive statistics on gender, result of the analysis shows that the males had higher mean score (x=18.270) than the females (x=17.581). However, as Table 4.2 shows, the mean difference of .689 is not statistically significant ($F_{(1, 39)} = 1.233$; $p < 0.5$), partial eta squared^{2,} $\eta^2 = .038$ (Table 4.2). Therefore the effect size of 3.8% of gender on pupil's achievement in basic science was moderate, only 4% was accounted for variation of gender on pupil's achievement. The null hypothesis was not rejected, meaning there is no significant main effect of gender on pupil's achievement in basic science.

Ho_3: There is no significant interaction effect of treatment (computer assisted instruction) and gender on primary school pupil's achievement in basic science.

Table 4: Descriptive Statistics of Treatment and Gender on Basic Science

				95% Confidence Interval	
TREATMENT	GENDER	Mean	SD	Lower Bound	Upper Bound
COMPUTER ASSISTED INSTRUCTION	MALE	19.702	.624	18.428	20.975
	FEMALE	18.583	.667	17.223	19.943
CONVENTIONAL METHOD	MALE	16.838	.579	15.656	18.020
	FEMALE	16.578	.719	15.111	18.045

a. Covariates appearing in the model are evaluated at the following values: PRETEST = 15.00.

The result presented in Table 4 above revealed that, there is no significant interaction effect of treatment and gender on pupil's achievement in Basic Science test scores of participants. (($F_{(1, 39)} = .462$; $p < 0.5$), partial eta squared^{2,} $\eta^2 = .015$. as a result of this finding, hypothesis 3 (b) is not rejected. This implies that, the effect of treatment on achievement of participant in basic sciences is not sensitive to gender. Meaning the teaching strategies used during the whole of this study could be used to improve participant performance in basic science whether they are male or females.

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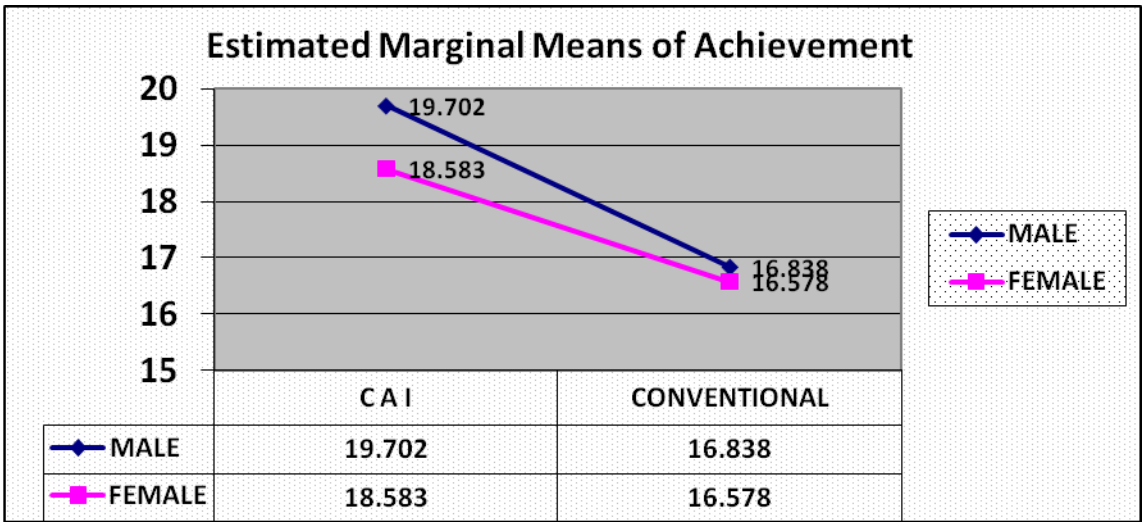

Figure1.graghic illustration of interaction effect of treatment and gender on achievement

DISCUSSIONS

The result of the first hypothesis reveals that, there is a significant difference on pupil's achievement, on different approach of the same subject content between the groups. Therefore, the treatment intervention is significantly effective than the conventional method of teaching. To consolidate this fact, Cotton's study in (1997) cited in Train, (2001) and Izzet & Ozkan (2008) maintained that, the use of CAI as a supplement to traditional instruction produces higher achievement compared to use only traditional instruction, this was also supported by (Burns and Bozama (1981) quoted in Olga. pilli 2008, Kirk (2000), who produced the results of meta-analysis of 40 students that compared the effectiveness of traditional instruction outcome with a combination of traditional instruction and CAI on students in mathematics achievement.

The result of the second Ho revealed that, there is no significant main effect of gender on pupil's achievement in Basic Science. Meaning that, the group differences was not sensitive to gender .therefore the teaching strategy used during the study could be used to improve participant performance in basic science whether they are males or females . for instance, during the pre-testing period, of the participants , it showed that , there were no differences between boys and girls in grade on basic science, but girls began to develop high interest better than boys on science class. As the researcher continues with the teaching and animation display, the boys begin to pick more interest in learning; this made the girls loss ground to boys after the intervention. Thus, Oluwadaisi (2011) in contrast, opine that, there is a significant gender difference in achievement while (Olawjaiye 2001, Olaoye 2011). claim that there is no differeces exist in acievement of male and female student.from observation, it seems Girls were lacking in confidence relative to boys because of the ways in which they are treated in school.supported by (Bello 2007, Spencer 2004) who did not find any form of influence being exerted by gender on pupil's achievement in science.

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Also, there is no significant interaction effect of treatment and gender on pupil's achievement in Basic Science test scores of participants. This implies that, the interaction effect of treatment and gender did not influence achievement of participant in basic sciences. Therefore, it is not sensitive to gender. Meaning that, the teaching strategy used during the whole of this study does not affect gender could be used to improve participant performance in basic science whether they are male or females. The finding agrees with Kaziah (2011) who found out that there is no significant difference in the performance of the boys and girls in the use of computer in the learning of science in school? A recent empirical study from Greece (Barkatsas, Kasimatis, & Gialamas, 2009) supported that, boys were found to possess significantly higher levels of confidence and likeness with computer-assisted instruction than girls. Kenndy(2012) Added that, girls seems not to be interested in the use of computers because they believe the boys sitting in front of computer monitor all day play games. That seems like a pretty boring activity that is not wrong getting involved in. Therefore, the girls do not see the possibility which computers offers in the learning process

RECOMMENDATIONS

- Since this study showed that computer can enhance pupils academic achievement, all the primary schools in the state both private and public should be encouraged to have their own computer laboratories, to enable them attain a higher level of academic achievement.
- Stockholders and NGO's should encourage and equip schools with new technology and computers for easy learning
- Children should be inspired with use of computetr assissted instruction to pursue careers in science by providing attractive models of instruction.

CONCLUSIONS

To conclude this studies , early identification of children ability can foster pupils achievement in the future. The need to measure pupils gender is an evident of an indication that learning of science is not just theoretical, nor did not have adequate evidence of psychometric properties but the results relating to this study was investigated along with other schools that has similar facilities or even without use of CAI facilities.

The finding from the study shows a significant difference between Test score for both control and experiment groups. Which implies that CAI is more effective than traditional instruction (T.I) on the academic achievement of students at Basic Science Lesson. Gender has no significant effect on pupils achievement in basic science, there is no interaction effect of treatment and gender on pupil's achievement in Basic science of experimental and control group

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