

**EFFECT OF COMPUTER SIMULATION TEACHING METHOD ON SECONDARY SCHOOLS STUDENTS PERFORMANCE IN BASIC TECHNOLOGY**

BY

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**Abstract**

The research was designed to determine the need for computer simulation in teaching basic technology course in Junior Secondary Schools. Two research questions and two null hypotheses guided the study. Four (4) secondary schools and 110 participants were randomly selected for the study. Two schools each were randomly assigned to experimental and control groups. The research questions were answered using means and Standard deviation while hypotheses were tested at 0.05 level of significance using Analysis of covariance (ANCOVA) the result show that, computer simulation was superior to the demonstration method in enhancing student performance. The interaction effect between teaching methods and gender of the subjects was not significant. Bases on the findings of this study, the use of computer simulation should be encouraged to utilize computer simulation techniques to cater for diverse learning styles of student in basic technology.

**Introduction**

Computer simulation gives students the opportunity to observe a real world experience and interact with it. Simulating labs that are impractical, expensive, impossible or too dangerous to run (Nice 2001). Simulations can be contribute to conceptual change (Ajagun 2003) provide open-ended experiences for students (Nweji 2003) provide tools for scientific and technological inquiry (Ogwo & Oranu 2006, Udouo 2005) and problem solving experiences (Adebayo 2006) computer simulations also have potential for distance education (Hallak & Poison 2000).

Table 1 Displays the connection between types of simulations and main pedagogies, instructive and constructive. The types and examples of computer simulations.

Table 1 Types of simulations and related pedagogies

	INSTRUCTIVE	CONSTRUCTIVE
Thomas & Hooper	Information simulations reinforcing simulations experiencing simulation	Integrating simulations
Gredler	Symbolic simulations	Experiential simulation
De Jong & Vain Jooling	Operational simulations	Conceptual simulations

The role of technology in teaching and learning is rapidly becoming one of the most important and wide discussed issues in contemporary education policy (ogwo & Oranu 2006) most expert in the field of education agree that when properly used, technology hold great promise to improving teaching and learning in addition to shaping opportunities for the workforce. The emergence of new technology pushes education to understanding and leveraging these technologies for classroom use. Computer simulation is one of the most promising innovations to improve teaching an learning with the help of modern information and communication technology.

Basic technology according to the National Policy on Education (NPE 2004) is a pre-vocational subject offered at the Junior Secondary Schools level. It is an integration of topics from woodwork, Metal work, Electricity and electronics, food, Rubber, Plastic and ceramic technology.

Its aims includes among other, to enable youth to have intelligent understanding of the increasing complexity of technology. Basic technology is therefore a preparatory aspect of vocation education.

which according to (Owo & Oranu 2006) is any form of education whose primary purpose is to prepare individuals for employment in recognize occupations.

However, performance in Junior Secondary schools basic technology has not been encouraging, several factors ranging from the abstract nature of the subject, the learners themselves, the teachers, curriculum, method of instruction and instructional materials and the schools environment have been identified through earlier studies (Ogbuanya & Hassan 2010).

Inadequate teaching methods have been identified as some of the factors responsible for technology student's poor performance in basic technology (Hassan 2005) a number of educational reforms have been introduced for redressing this problem. For example various innovative methods of instruction have tried with mixed result (Sokunbi 2008).

There are generally observed pattern of females out performing male sin most subjects but less so in science and technology (Riding, Grimley, Daharaci and Banner 2003). They noted that males have make grater ability in basic technology science while females have a greater ability in language and verbal skills. However, Hassan (2005) contended that boys are better than girls in spatial task and large motor skills. From the above contention, when method of teaching is geared towards meeting students varying styles of learning the gap in academic achievement between boys and girls is bridged. As more demands are put upon education in today's world of rapid technological changes, it may be important to recognize that there is need for a novel method of teaching in basic technology. These challenges therefore, necessitate a shift from traditional approach of teacher directed to students cantered approach of which computer simulation techniques is based.

### Statement of the Problem

Irrespective of the fact that government, educators and teachers alike, have recognize technical education structure as an importance one in our educational system, not much has been achieved to make it work as reported by Hassan (2005) People have pointed accusing fingers at a variety of possible causes.

The declining performance of students in basic technology at J.S.C.E examinations has been a matter of great concern to many educators. Some teachers in teaching the subject the subjects attribute this to the abstract nature of the subject and teaching method (s) adopted. This study therefore attempts to determine the effect of using computer simulation in basic technology instruction on student's performance for globalization of human capacity building.

### Research Question

This sought to provide answer to the following questions:

1. Will the use of Computer Simulate in basic technology teaching improve the student's performance?
2. Will the use of Computer Simulate Result in Differential performance of boys and girls in basic technology?

### Hypothesis

Based on these research questions, the following hypothesis were formulated in null form and tested at 0.05 level of significance

$H_{01}$ : there will be no significant difference in the performance of experimental and control groups in the basic technology.

$H_{02}$ : There will be no significant difference in the performance of boys and girls taught basic technology using computer simulation.

### Methodology

#### Design of the Study

The design of the study was Quasi- Experimental According to Kurumeh (2007) this design is often adopted when it is not possible to have complete randomization of the subjects. Consequently, the



researchers has to use these subjects as groups already in existence. Intact classes were therefore used in the study. The specific design was pre-test, post test, non-equivalent control group Design.

#### Area of the Study

The Study carried out in Kontagora Local Government Area of Niger State. The local government consists of Secondary Schools. The choice of this educational zone was based on the fact that not much work has been done in terms of educational research in the area, especially on methods of Instruction (Hassan 2008).

#### Population of the Study

The target population comprised of 220 J.S.S II Students in all the 9 Schools offering Basic Technology. This is made up of 148 boys and 72 girls.

#### Sample and Sampling Techniques

The Sample size for this study was 110 J.S.S II basic technology students comprising of 82 boys and 28 girls. 110 J.S.S. II Students were selected through stratified random sampling technique. (i.e. 20 in woodwork and metal work etc). In the same vein (4) secondary schools were selected for the experimental through stratified Sampling and another four (4) Secondary School for control Group.

#### Validation of Instrument

The validation of MCTIOBT took the following procedures: the content validation of the MCTIOBT was accomplished by making sure that the test items reflected the specifications on the test blue print. The first draft of MCTIOBT consisting 40 items was subjected to face validation by giving it to two experts in technology education, (who are familiar with technology activities) one from the department of Industrial and technology Education, Federal University of Technology, Minna and the other from a school of technical education, Niger State College of Education, Minna. The experts were asked to examine the (MCTIOBT) items in terms of

- Clarity of instruction to the subject
- Proper wording of test items and
- Appropriateness and adequacy of the items in measuring what they were supposed to measure.

After the validation of MCTIOBT 10 items were dropped leaving a total of 30 items.

#### Trial Testing

A trial testing of MCTIOBT was conducted using 38 J.S.S I basic technology students of Government Secondary School, Minna, Niger State. They were not part of the study; this was done in order to determine the time it would take to complete the test trial. The trial testing also enabled the researchers to determine the clarity of wordings, reliability, appropriateness and adequacy of the items. The data obtained from the responses of the subjects in this test was used to estimate the reliability of the instrument.

#### Reliability of the Instrument

The Scores obtained from the trial testing were used to determine the reliability coefficient of the instruments. A Split-half reliability technique was used to estimate the reliability of MCTIOBT. The split-half was done by splitting the test into two (2) equal halves using odd and even numbers. 20 scripts used in the trial testing were scored by the researcher. The scores awarded were correlated using Spearman Rank Order coefficient of correlation. The split half reliability coefficient was found to be 0.91.

**Instrument for Data Collection**

The instrument used for data collections was multiple choice test items on basic technology (MCTIOBT) develop by the researchers. The test instrument consist of 30 multiple choice test items on basic technology MCTIOBT drawn from J.S.S.II Syllabus.

**Method of Data Collection**

The data for both pre-test and post-test were collected immediately after the administration of MCTIOBT.

The scores were recorded for analytical purposes

**Experimental Procedure**

The researcher administered the pre-test to groups in their respective schools. In the pre-test. The exercise provided baseline data on student performance before the treatment. The experiment group was taught with four computer simulation lesson plan while the control group taught with 70 minutes (Double Period) the treatment lasted for four weeks. The post test was administered to all the treatment groups immediately after the completion of the treatment. The exercise provided post treatment data on students performance in basic technology after the treatment.

**Method of Data Analysis**

The scores obtained from the pre-test and post-test were analyzed using mean and standard deviation to answer the researcher questions while analysis of covariance (ANCOVA) was used to test the hypothesis at 0.05 level of significance.

**Result and Discussion**

**Research Question 1**

Will the use of computer simulation in basic technology teaching improve the student's performances?

**Table 1:** Mean and Standard Deviation of pre-test and post test scores mental and control groups using computer stimulation.

GROUP	N	PRE-TEST		POST-TEST		MEAN GAIN
		$\bar{X}$	SD	$\bar{X}$	SD	
Experimental	55	29.11	7.68	50.30	13.68	20.19
Control	55	30.45	7.64	48.77	14.53	18.32
<b>Total</b>	<b>240</b>					

The data in table 1 revealed that the experimental group had mean of 29.11 and a standard deviation of 7.68 in the pretest, and a mean score of 50.30 and a standard deviation of 13.68 in the post test making a pretest posttest gain of 20.19. The control group had a mean score pf 3-.45 and a standard deviation of 7.64 in the pretest and mean score of 30.45 and standard deviation of 14.53 in the posttest with a pretest gain of 18.32. the result showed that the experimental group performed better than the control group with the pretest-posttest gain of 2.88

**Research Question 2**

Will the use of computer simulate result in deferential performance of boys and girls in basic technology?

**Table 2:** mean and standard deviation of basic technology scores of boys and girls taught with computer simulation



GROUP	N	PRE-TEST		POST-TEST		MEAN GAIN
		$\bar{X}$	SD	$\bar{X}$	SD	
Boys	37	30.05	7.72	49.16	14.36	19.16
Girls	18	32.72	6.93	46.55	15.69	13.83
<b>Total</b>	<b>55</b>					

The data on table 2 showed that male students had mean scores of 30.05 and standard deviation of 7.72 in the pretest and mean score of 49.16 and a standard deviation on 14.36 in the post test score making a protest-posttest gain of 19.11 while the female students had in the pretest 32.73 and mean score and 6.93 and standard deviation, while in post test 46.55 as mean score and 15.69 as standard deviation.

This leaves the female students with pretest gain of 13.83 the difference of 5.28 in the males gains indicated that boys performed better than girls.

**Hypothesis 1:** there will be no significant difference in the performance of experiment 91 and control groups in the basic technology.

Table 2: Analysis of covariance (ANCOVA) on students (Experimental and Control) on performance of students using computer stimulation and demonstration method in basic technology.

Source	Sum of Square	df	Mean Square	f	Sig.
Corrected model	35128.433	2	17564.217	334.806	.000
Intercept	37887.449	1	37887.449	722.204	.000
Pretest	62.596	1	62.596	1.193	.276
Groups	34072.253	1	34072.253	649.479	.000
Total	636513.000	240			
Corrected Total	47561.663	239			

**P < 0.05**

The Data presented in table 3 showed that, calculated f ratio for the group treatment on the students performance in computer simulation is 649.479 with .000 level of significance thus, the null hypothesis of no significant difference between performance score of students taught using computer simulation and demonstration method in basic technology was rejected at 0.05 level of significance. This means that the f-cal was statistically significantly at P < 0.05 level. Thus, indicating that, computer simulation was significantly more effective than the demonstration method.

**Hypothesis 2:** there will be no significant difference in the performance of boys and girls taught basic technology using computer simulation.

Table 4: Analysis of covariance (ANCOVA) on performance of Boys and Girls taught with computer simulation.

Source	Sum of Squared	f	Mean Square	f	Sig.
Corrected model	47788.223	4	11947.056	303.673	.000
Intercept	14105.107	1	14105.107	358.527	.000
Pretest	12.297	1	12.297	.313	.577
Sex.	.010	1	.010	.000	.988
Error	9205.994	234	39.342		
<b>Total</b>	<b>696301.000</b>	<b>239</b>			
<b>Corrected Total</b>	<b>56994.218</b>	<b>238</b>			

**P < 0.05**

The above table 4 on the mean scores of boys and girls computer simulation showed that the f-cal of .000 with .988 level of significance was recorded. Thus f-cal is not statistically significant at 0.05 level, thus indicating that there was no significant different between boys and girls. Hence, the null hypothesis was upheld as 0.05 level of significance.

### Findings of the Study

On the basis of the data collected and analyzed for the study, the following major findings were made with respect to the research questions and hypotheses.

1. Students taught with computer simulation scored higher in the post-test than those taught with conventional demonstration method. The higher means score was found to be significant in favour of experimental group.
2. Boys taught with computer simulation had a higher score in the post-test than girls taught with the same computer simulation. This could explain the fact that boys are naturally interested and better in technology subjects than girls.

### Discussion

The analysis of the result of the performance mean score on table 1 indicated that experimental group had higher mean score than the control group in post-test. Although the slight superiority of the control group over the experimental group in the pre-test could be attributed to the initial differences between the subjects in the groups, the analysis of covariance of the post test score presented on table 3 confirmed that the difference between the mean scores of the students in both groups in the post test is significant. These findings showed that computer simulation has proved to be more effective.

The data presented in Table 2 provided the answer to research question two. Findings revealed that computer simulation is effective in improving students performance in basic technology but the effect of computer simulation on students performance in basic technology is higher than demonstration method. At the same time, Analysis of covariance was employed to test the second hypotheses, the analysis of covariance in table four showed that there was no significant difference observed between the mean score of boys and girls in performance test. The findings showed that there is no significant difference in performed test of boys and girls is in consonance with the work of Kurumeh (2007) and Uduaodo (2005) who supported the present findings showed that the effect differences was found in favour of girls over boys in meta-analysis but the differences fall short of statistical significance.

### Conclusion

The world experiencing tremendous changes owing to advances in computer. The world has become a global village as computer interconnects communities across different parts of the globe. The contribution of computer in all aspect of human endeavour has done beyond measure. In educational research, they have brought smart innovations in terms of quality, methodology and techniques used. Based on the result of the study, the following conclusions were made. The instructional methods adopted by technology teachers greatly affect the learning of basic technology. The findings of the study showed that there is need to pay special attention to the training of basic technology students. Hence, the adoption of computer stimulation in basic technology to enhance teaching and learning. This implies that, students learn better when they are exposed to multi-sensory presentation, thus they participate actively in the class by interacting with the learning material and move at their own pace with competency base assessment of themselves.

Also, students retained their learning for a long time when they are taught with computers simulation. It was also established that, there is no significant different between boys and girls in their performance of learning in basic technology as such would not be necessary to provide different learning technique for any of the sexes.

### Recommendations

Based on the findings of this study, the following recommendations are made:

1. Technology Teachers should be encouraged to utilize computer simulation technique to cater for the diverse learning styles of student in basic technology classroom.
2. Technology Teachers in Niger State should adopt the use of the computer simulation to teach basic technology.



3. Niger State Government should provide well equipped computer laboratories in all her Junior Secondary Schools offering Basic Technology.
4. Niger State ministry of education /science and technical school board and secondary education board should organize seminars, conferences and workshops to sensitize Technology Teachers on the use of Computer Simulation.
5. Enlightenment for an increase in girls involvement in basic Technology Education must be ensured.
6. National Board for Technical Education should incorporate the technique of computer Simulation in basic technology curriculum as it holds that knowledge comes as a result of interaction, the technology teachers should ensure that learning experience is socially acquired through material students interaction.

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