

Effect of Computer Simulation on Students Academic Achievement and Interest in Educational Technology in Colleges of Education in Niger State

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Abstract: This study was designed to investigate the effect of Computer Simulation on students' academic achievement and interest in Education Technology in Colleges of Education in Niger State. A quasi-experimental design was adopted for the study. 334 (162 males and 172 females) Educational Technology Students from the two colleges of education in Niger State were involved in the study. Two instruments Educational Technology Achievement Test (EDTAT) and Educational Technology Interest Inventory (EDTII) were used for the study. The two instruments were subjected to face and content validation. The instruments were also trial tested in two schools outside the population using test retest method and from the data collected, the reliability coefficient of the instrument were obtained. The EDTAT had 0.83 using Pearson Product Moment Correlation Coefficient while EDTAT had 0.80 with Kuder- Richardson 20 (K-R 20) for internal consistency. The Cronbach's Alpha Technique was used to establish the reliability coefficient of EDTII with the coefficient of 0.90. The validated instruments were administered as both pre-test and post-test while the data obtained were analyzed using mean and standard deviation for the research questions and Analysis of Covariance (ANCOVA) for the hypotheses. The findings among others showed that teaching Education technology with computer simulation enhanced the students' acquisition to construct knowledge and career skills and interest in education technology better than conventional teaching method (CTM). The implication of the findings include that technical teachers should use computer simulation so that the students can acquire knowledge for construction and be able to develop in their technological skill. Based on the findings, among others it was recommended that workshops, seminars and conferences should be organized for teachers in order to sensitize them on the need to use efficient learning approach such as Computer Simulation in teaching Education Technology.

Keywords: Educational Technology, computer simulation, Academic Achievement, Interest

I. INTRODUCTION

The need to offer Educational Technology in tertiary institution in Nigeria most among colleges of education was triggered as technological development has given information and communication sector a new gear. With this teachers trainee need to be trained on how to use this technology to pass instructions in collaboration with already existing instructional strategies. The student of technology

education in Nigeria have not being full equipped with the knowledge of use of technological tools for learning and teaching, which may be as a result of teaching strategies employed by the lecturers (Atueyi & Ikemelum, 2014).

Colleges of Education have not discharged their duties well in equipping present day youths with relevant teaching skills necessary for effective instructional delivery in the 21st Century (Emmanuel *et al.*, 2014). The inability to integrate recent digital technologies in instructional delivery in may put the Colleges of Education at a global competitive disadvantage as the colleges would probably be producing low quality lecturers at higher cost. The danger here is that if analog and absolute facilities remain in instructional delivery in the Colleges of Education, the objectives of Technical Education in Nigeria may became an illusion and may have a ripple effect on higher education. This situation will eventually bring the Colleges of Education to a halt and eventually pose serious limitations to students' learning (Emmanuel *et al.*, 2014).

In this information age, technology is changing the work place, the home and daily life activities. As these changes occurs, there is need to develop EDT students thinking skill and knowledge construction skills to meet the challenges that technology is bringing to the society. Technological development in every sphere of life is in a constant state of instability and change. For this to be achieved, lecturers who are the facilitators and executors of government policies on any educational programme that will bring positive changes and portray the good image of Niger State and the nation at large now and in future need to consider the teaching approach been used. For these reasons, lecturers are therefore expected to use the best teaching approach that will boost students' interest to attain better academic achievement.

Despite the needs for adjustment, lecture method and demonstration method which are based on behavioural learning theories are still the main teaching/learning strategies employed for implementing the curriculum in Colleges of Education. Lecturers are set as the only active participant in the class while students are made observers or admirers throughout the class. Ifeanacho (2012), said the methods are

content driven and certainly not learner-centered. These methods referred to as conventional methods which are predominantly used in teaching Educational Technology in Colleges of Education cannot achieve the best desired for the learners. These conventional methods of teaching may also account for poor performance of vocational education students at public examinations (Nworgu 2016). This could be responsible for the poor performance of Educational Technology students at both internal and public examinations being taken by these EDT students that reflect their performance at school.

Computer simulations (CS) have become a popular method of instruction in the last 15 years (Chen et al., 2013) and this is because of commercially available software that is based on scientific and technological models which replicate actual situations. In addition, Bukunola (2012) who reviewed 51 articles from 2001 to 2010 show that traditional classroom can be improved by using computer simulations. These simulations enable learners to view events, processes and activities that otherwise may not have been available to them (Christmann & Badget, 2010).

Globally, many learners experience difficulties in understanding Educational Technology concepts because of the manner in which they are taught and as a result many learners form misconceptions in this regard (Obomanu & Adaramola 2011). Studies from developed countries have mainly addressed three areas: conceptual change, skills development and content. Little is known about the effectiveness of computer simulations in developing countries. Available research indicates that computer simulations may bridge the gap between the concrete and the abstract world (Orora, 2014). In this study, the art of technology knowledge is computer simulation that may enhance students' achievement and stimulate students' interest in Educational Technology.

Achievement is the result, the successfulness, the extent or ability, the progress in learning educational experiences that the individual indicate in relation with his/her educational learning (Ogwo, 2015). Achievement is a very strong word which is often used in many areas. For example achievement in Educational Technology, which is the focus of this study, is viewed as a very important factor in teaching and learning of EDT and it refers to students' cognitive achievement, which is measured in terms of pass or fail. When achievement is below expectation, it is referred to as under-achievement or poor achievement.

Interest is a feeling of like or dislike towards an activity. Interest is concerned with choice or preference for a particular type of activity to the other. Interest is a feeling somebody has when one wants to know or learn more about something. According to Ifeanchu (2012), the interest of students is thwarted by several factors, which include negative attitude of students and influence of other people's attitude. Also, students' interest can be generated and sustained through

several methods. These include motivation, effective use of instructional approach, most especially use of computer Simulation. Therefore, the use of computer simulation is important to provide rich environment that will stimulate the interest of both male and female students of Colleges of Education in Educational Technology despite their gender differences.

Gender issue has assumed prominence in science and technology education, gender has also been identified as one of the factors influencing students' interest and achievement (Ahmad & Mahmood, 2010). Gender is a sense of awareness of being male or female. It is a behavioural pattern and attitude perceived as masculine or feminine within a culture (Swab, 2012). Gender issues as a factor or variable are not skewed to any direction. There are different findings on gender matters, some in favour of males others in favour of females and sometimes no gender differences are found. The issue of gender differences needs to be considered since a number of studies especially in Africa has reported that girls are underrepresented in the field of science and technology at secondary schools (Zakaria *et al.*, 2013).

II. STATEMENT OF THE PROBLEM

Nigerian governments has invested very huge amount on Colleges of Education programme aimed at improving technological development, the image and performance of Colleges of Education students. Despite this, the performance of the students has not been encouraging in Niger State specifically. One suspects that the poor performance could be linked to the method of instruction (FRN, 2013).

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The search for an effective method of teaching Educational Technology in Colleges of Education has necessitated the need to employ more interactive and knowledge construction approach for the improved teaching and learning. The teaching approach that advocates knowledge construction approach is the computer simulation. However, several studies have been conducted in the area of gender-related differences in achievement and interest of students in vocational education employing computer simulation. It has been noted that males performed better than females in technical related subjects while others reported no gender difference in students' achievement and interest. The contradictory evidences in achievement and interest due to gender has resulted in the need to verify how Computer Simulation can influence students' achievement and interest by gender and location in EDT. Against this point, the effect of computer simulation on academic achievement and interest of EDT

students in Colleges of Education in relation to their gender and locations was designed.

Purpose of the Study

1. Determine the effect of computer simulation on students’ academic achievement in Educational Technology.
2. Determine the comparative mean achievement test scores of males and females taught Educational Technology using computer simulation.
3. Determine the influence of gender on mean interest scores of students taught Educational Technology using computer simulation as against conventional teaching method.

Research Questions

The following research questions were formulated for the study.

1. What is the effect of computer simulation on students’ academic achievement in Educational Technology as against those taught with conventional teaching method?
2. What are the comparative mean achievement test scores of males and females taught Educational Technology using computer simulation?
3. What is influence of gender on mean interest scores of students taught Educational Technology using computer simulation as against conventional teaching method?

Hypothesis

The following null hypotheses are formulated for the study and were tested at 0.05 level of significance:

1. There is no significant difference between the mean achievement scores of students taught EDT with computer simulation and those taught with conventional method.
2. There is no significant difference between the male achievement scores of male and female students taught EDT using computer simulation.
3. There is no significant difference between the mean interest scores of students taught EDT using computer simulation and those taught using conventional teaching method.

III. METHODOLOGY

The design of the study was quasi-experimental research design. The research made use of pre-test and post-test non-equivalent control group design. The population for this study comprised all students of Educational Technology in Colleges of Education in Niger State. Multi-stage sampling technique was used to select the sample size of 334 educational technology students from two colleges of education in Niger State. Two colleges of education each were randomly assigned to the experimental groups and the control groups.

The experimental groups contained 162 students of which 74 male and 88 female students and control groups were 172 students of which 78 male and 94 female students.

Educational Technology Achievement Test (EDTAT) and Educational Technology Interest Inventory (EDTII) were used for data collection. The reliability coefficient of the Educational Technology Achievement Test (EDTAT) and Educational Technology Interest Inventory (EDTII) were established after administering them to students in College of Education, Lafiagi which was not among the sampled area. The (EDTAT) was administered on 20 Educational Technology. The scores obtained were computed using Kuder-Richardson 20 (K-R 20) in order to establish the internal consistency of the EDTAT. The reliability coefficient obtained for the EDTAT after computation was 0.83. Kuder-Richardson 20 (K-R 20) was used because EDTAT is a dichotomous scored. (i.e it is either right or wrong). Cronbach’s alpha technique was used to establish the internal consistency of the Education Technology Interest inventory (EDTII), the reliability coefficient obtained was 0.90.

Educational Technology Achievement Test (EDTAT) and Educational Technology Interest Inventory (EDTII) pre-test to the both groups in their respective schools in examination conditions. The students’ were told to fill in the correct answers for the Educational Technology Achievement Test (EDTAT) and Educational Technology Interest Inventory (EDTII) questions given to them to prevent pre-test sensation. The scores obtained by the experimental group and the control group were compared. Their regular class teachers administered the test. The data collected from the EDTAT and EDTII were analyzed using mean and standard deviation to answer the research questions. While, the null hypotheses were tested using Analysis of Covariance (ANCOVA) at 0.05 level of significance.

IV. RESULTS

Research Question 1

What is the effect of computer simulation on the mean academic achievement score of students on Educational Technology as against those taught with conventional teaching method?

Table 1 Mean and Standard deviation of pretest and posttest academic achievement scores of students’ taught Educational Technology (EDT) using Computer Simulation and those taught with conventional teaching method.

Variable	N	Pretest		Posttest		Mean Gain
		\bar{X}	SD	\bar{X}	SD	
Computer simulation	162	10.38	2.85	22.57	3.23	12.19
Conventional Teaching Method	172	11.48	3.08	20.87	3.4	9.39

Results in Table 1 show that the experimental group taught Educational Technology using computer simulation had a pretest academic achievement mean score of 10.38 with a

standard deviation of 2.85 and a posttest academic achievement mean score of 22.57 with a standard deviation of 3.23. The difference between the pretest and posttest academic achievement mean for the experimental group was 12.19. The control group taught energy conversion using Conventional Teaching Method had a pretest academic achievement mean score of 11.48 with a standard deviation of 3.08 and posttest academic achievements mean score of 20.87 with standard deviation of 3.40. The difference between the pretest and posttest academic achievement mean for control group was 9.39. However, for each of the groups, the posttest academic achievement means were greater than the pretest academic achievement means score with the experimental group having the higher mean gain (12.19 > 9.39). This is an indication that students have achieved mastery when taught using instructional mode (i.e. Computer simulation or Conventional teaching method). This suggest that students taught using Computer simulation performed better in Educational Technology than the students taught using conventional teaching method.

Research Questions 2

What are the comparative mean academic achievement test score of male and female students in Educational Technology using Computer simulation? The answer to this research question is presented in Table 2.

Table 2 Mean and Standard deviation of pretest and posttest academic achievement score of male and female students’ taught Educational Technology using Computer simulation

Variable	Instructional Mode	Gender	N	Pretest		Posttest		Mean Gain
				\bar{X}	SD	\bar{X}	SD	
Computer simulation		Male	74	10.19	3.14	22.59	2.97	12.4
		Female	88	10.55	2.6	22.56	3.45	12.01

Results in Table 2 show that the male group taught EDT using Computer simulation had a pretest academic achievement mean score of 10.19 with a standard deviation of 3.14 and a posttest academic achievement mean score of 22.59 with a standard deviation of 2.97. The difference between the pretest and posttest academic achievement mean score for the male group was 12.40. The female group had a pretest academic achievement mean score of 10.55 with a standard deviation of 2.60 and a posttest academic achievement mean test score of 22.56 with a standard deviation of 3.45. The difference between the pretest and posttest academic achievement test score means with the male group having higher mean gain (12.40 > 12.01). This is an indication that male students have achieved mastery when taught EDT computer simulation more than there female counterpart.

Research Questions 3

Does the use of computer simulation enhance the students’ interest in Educational Technology as against those taught with conventional teaching method?

The answer to this research question is presented in

Table 3. Mean and Standard deviation of pretest and posttest interest scores of students’ taught Educational Technology using computer simulation and those taught with conventional teaching method

Variable	N	Pretest Interest		Posttest Interest		Mean Gain
		\bar{X}	SD	\bar{X}	SD	
Computer Simulation	162	50.06	5.6	55.58	6.18	5.52
Conventional Teaching Method	172	49.82	4.4	52.28	4.22	2.46

Results in Table 3 show that the experimental group taught EDT using computer simulation had a pretest mean interest score of 50.06 with a standard deviation of 5.60 and a posttest mean interest score of 55.58 with a standard deviation of 6.18. The difference between the pretest and posttest mean interest score for the experimental group was 5.52. The control group taught EDT using Conventional Teaching Method had a pretest mean interest score of 49.82 with a standard deviation of 4.40 and a posttest mean interest score of 52.28 with a standard deviation of 4.22. The difference between the pretest and posttest mean interest score for control group was 2.46. However, for each of the groups, the posttest means interest score were greater than the pretest means interest score with the experimental group having the higher mean gain (5.52 > 2.46). This is an indication that computer simulation had greater improvement on students’ interest in Educational Technology.

Hypothesis 1

There is no significant difference between the mean achievement scores of students taught

EDT with computer simulation and those taught with conventional teaching method.

Table 4 Analysis of Covariance (ANCOVA) of students’ Achievement in Educational Technology (EDT) taught computer simulation and those taught with conventional teaching method

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	267.343 ^a	2	124.096	11.258	.000
Intercept	14310.055	1	11210.885	1017.032	.000
Pretest	4.078	1	4.878	.443	.506
Method	193.102	1	223.002	20.230	.000
Error	3318.158	331	11.023		
Total	179196.000	334			
Corrected Total	1596.850	333			

$\alpha = 0.05$

The result in Table 4 shows that with respect to the achievement mean scores of students taught EDT using computer simulation and those taught with conventional method, an F-ratio of 20.23 was obtained with associated exact probability value of 0.00. Since the associated probability value (0.00) is less than 0.05 set as level of significance for testing the hypothesis, this means that the null hypothesis (H_{01}) which stated that there will be no significant difference between the mean achievement scores of students taught EDT using computer simulation and those taught with conventional method is rejected. Inference drawn is that there is a significant difference between the mean academic achievement scores of students taught EDT using computer simulation and those taught with conventional method. This result showed that students' academic achievement improved in EDT taught using computer simulation than students taught using conventional teaching method.

Hypothesis 2

There is no significant difference between the effect of gender (male and female) on students' achievement in EDT taught using computer simulation as against conventional teaching method.

Table 5 Analysis of Covariance (ANCOVA) of students' Achievement in Educational Technology (EDT) with regard to gender when taught using computer simulation as against conventional teaching method.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	258.549 ^a	4	64.637	5.845	.000
Intercept	11207.976	1	11207.976	1013.502	.000
Pretest	5.385	1	5.385	.487	.486
Method	214.432	1	214.432	19.390	.000
Gender	5.491	1	5.491	.497	.482
method * gender	4.561	1	4.561	.412	.521
Error	3638.301	329	11.059		
Total	161096.000	334			
Corrected Total	3896.850	333			

$\alpha = 0.05$

The result in Table 5 shows the effect of gender (male and female) on students' achievement in EDT taught using computer simulation as against conventional teaching method with an F-ratio of 0.50 which was obtained with associated probability value of 0.48. Since the associated probability value 0.48 is greater than 0.05 set as level of significance for testing the hypothesis, this means that the null hypothesis (H_{02}) which stated that there will be no significant difference between the effect of gender (male and female) on students' achievement in EDT taught using computer simulation as against conventional teaching method is accepted. Inference drawn is that gender has no significant effect on students' achievement in EDT. Therefore, any difference in the achievement mean score of male and female students in EDT

on the basis of computer simulation and conventional approach may be due to chance.

Hypothesis 3

There is no significant difference between the mean interest scores of students taught EDT using computer simulation and those taught using conventional teaching method. Data Analysis in respect of this Hypothesis is presented in table 6.

Table 6 Analysis of Covariance (ANCOVA) of students' interest in Educational Technology (EDT) taught using computer simulation and conventional teaching method

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1044.373 ^a	2	522.186	19.115	.000
Intercept	7488.532	1	7488.532	274.130	.000
PRETEST interest	138.424	1	138.424	5.067	.025
Method	888.848	1	888.848	32.538	.000
Error	9042.074	331	27.317		
Total	979823.000	334			
Corrected Total	10086.446	333			

$\alpha = 0.05$

The result in Table 6 shows that with respect to the interest mean scores of students taught EDT using computer simulation and those taught with conventional method, an F-ratio of 32.54 was obtained with associated exact probability value of 0.00. Since the associated probability value (0.00) is less than 0.05 set as level of significance for testing the hypothesis, this means that the null hypothesis (H_{03}) which stated that there will be no significant difference between the mean interest scores of students taught EDT using computer simulation and those taught using conventional teaching method is rejected. Inference drawn is that there is a significant difference between the mean interest scores of students taught EDT using computer simulation and those taught using conventional method. This result showed that computer simulation resulted in an improvement of students' interest in EDT more than students taught using conventional method.

V. DISCUSSION OF FINDINGS

The result in table 4 shows that an F-ratio of 20.23 was obtained with associated exact probability value of 0.00. There is a significant difference between the academic achievement mean scores of students taught EDT using computer simulation and those taught with conventional method. This result showed that students' academic achievement improved in EDT taught using computer simulation than students taught using conventional teaching method.

This finding is in agreement with the finding of Johnstone and Otis (2016) which showed that there was a significant

difference in students' preference on determining effectiveness of constructivist instructional strategies as against traditional methods for vocational electronics students.

The result in table 5 shows that an F-ratio of 0.50 which was obtained with associated probability value of 0.48. There is no significant difference between the effect of gender (male and female) on students achievement in EDT taught using computer simulation as against conventional teaching method is accepted. Therefore, any difference in the achievement mean score of male and female students in EDT on the basis of computer simulation and conventional approach may be due to chance.

Okoye and Okeke (2016) whose research on the effect of computer simulation instructional approach on teaching practical skills to mechanical related trade students in western Nigeria technical colleges, found a significant difference between the students taught with constructivist teaching approach and those in the control group. But no significant difference exists between male female students exposed to the constructivist approach.

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The findings of this study is similar to Orora *et al.* (2014) The finding revealed that the mean scores of reflective inquiry on students' interest in RTVE are higher than the mean scores of students who use the conventional method.

VI. CONCLUSION

The need to find the best method to assist Colleges of Education students in learning Educational Technology (EDT) and stimulate their interest is paramount since interest is essential for achievement in EDT and vocational subjects as a whole. The study adopted quasi-experimental research design. Specifically, the study makes use of pre-test post-test non-equivalent control group design. This study has found out that Computer simulation (scaffolding fading, thinking skill and collaborative learning) is more effective in improving students' achievement and interest in EDT than Conventional method. Also the study revealed that, there was an effect attributable to gender on students' achievement and interest in EDT. However, the study found out interaction effects of computer simulation and gender on achievement and interest of Colleges of Education two (NCE 2) on Educational Technology students. Computer simulation on students' interest and achievement in EDT does not depend on the levels of gender. Hence, irrespective of nature of sex, learners will record improved performance in their interest and achievement in EDT when Computer simulation is employed

for teaching EDT. This result therefore showed that computer simulation is a viable teaching method for EDT. This simply means that computer simulation is more effective in improving students' achievement and interest in EDT regardless of Gender. It is hoped therefore, that if computer simulation is taken into consideration in the teaching of EDT in Colleges of Education, this will bring improvement into their academic performance and make them have interest in EDT and other vocational subjects. Students of EDT will be able to develop strong problem solving, creative thinking, collaborative work, and independent decision making skills which will make them adaptable to the present and envisaged changes in the technological advancement.

VII. RECOMMENDATIONS

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

1. Educational Technology lecturers should adopt the use of the computer simulation, and information technological tools to the teaching of EDT.
2. Government at all level should consider review of curriculum for EDT with a view to incorporate computer simulation into the teaching of EDT
3. Students should always be allowed to participate actively and interact freely with the teacher and their colleagues in the classroom to improve interpersonal intelligence and development in EDT.
4. Workshops, seminars and conferences should be organized by Ministry of Education and administrators of Colleges of Education to enlighten technical lecturers and improve their knowledge and skills on the use of computer simulation for improving students' achievement and interest in EDT.

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