



IJSRM

INTERNATIONAL JOURNAL OF SCIENCE AND RESEARCH METHODOLOGY

An Official Publication of Human Journals



Human Journals

Research Article

December 2019 Vol.:14, Issue:2

© All rights are reserved by Igori Wallace et al.

Effects of ICT on Students' Academic Performance in Science Education



**Igori Wallace^{1*}, Eru John Ode², Inalegwu Oada
Ogom¹**

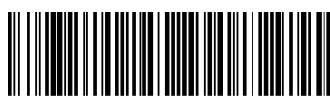
*¹Department of Chemistry, College of Education, Oju,
Benue State, Nigeria*

*²Department of Computer Science, College of Education,
Oju, Benue State, Nigeria*

Submission: 24 November 2019

Accepted: 30 November 2019

Published: 30 December 2019



HUMAN JOURNALS

www.ijsrm.humanjournals.com

Keywords: Academic performance, Chemistry, Gender, Information and Communications Technology, Science Education

ABSTRACT

The study examined the effect of Information and Communications Technology on students' academic performance in science education in College of Education, Oju, Benue State, Nigeria. A quasi experimental pre-test, post-test control group design was adopted for the study using intact class. Two research questions were raised and two hypotheses tested at 0.05 level of significance. The population of the study comprised 3,450 NCE II students from faculty of science, College of Education, Oju. The sample comprised 53 NCE II students selected from the faculty using intact class. The instrument used for data collection was Chemistry Achievement Test (CAT) and the data were analyzed using mean and standard deviation for the research questions, and t-test for the hypotheses. The results showed that students who were taught with ICT had better academic performance on Chemistry and that the gender has no significant effect in the academic performance of students who were taught Chemistry with ICT instructional package. Based on the findings, it was recommended among other things that Chemistry teachers should use ICT for teaching Chemistry in colleges of education.

INTRODUCTION

The application of Information and Communications Technology (ICTs) in education has revolutionized teaching and learning. Students with diverse learning styles are able to maximize their learning potential when instructors use ICT to support their teachings. ICT enables the learners to be more independent, reflective and self-regulated in their learning process. In addition, ICT makes it possible to deliver virtual instruction to students outside the classroom. ICTs help student's master materials and skills though it depends on the teacher's instructional goal, students' levels, instructional needs and available resources. Jones (2010) has it that technology travels with people. Information and Communication Technology (ICT) can be defined as a diverse set of electronic technologies and technological tools and resources used to communicate, create, store, disseminate and manage information. Liu (2005) sees it as the combination of technologies for collecting, storing, processing, communicating and delivering information. Information Communication Technology is regarded as an engine for growth and tool for empowerment with profound implications for education, change and socio-economic development. Information Communication Technology such as videos, televisions, multimedia and computer software which combines text, sound and colourful moving images can be used to provide challenging and authentic content that will engage the students in the learning process (Akude & Ajuzie, 2011).

Educational institutions may utilize ICT to enrich the students with skills and knowledge for the 21st century (Badeleh & Sheela, 2011), such that it can add to worldwide accessibility to education, educational equality, broadcasting of quality teaching learning programs, educators' professional growth and to help in obtaining a more effective educational management. Hence, accessibility, inclusion and standard being the key issues of education, can be comfortably addressed through ICT. ICT improves the standard of education by encouraging learning through ongoing discussion, delayed time discussion, directed instruction, self-learning, critical thinking, data seeking and analysis (Carrillo, Onofa & Ponce, 2010). Utilization of ICT can enhance outcomes, instruction, administration and create important abilities in the underprivileged groups and at the same time influence educational instruction and research process (Andoh, 2012).

In classroom teaching and learning process, the use of ICT is imperative as it gives chance to the instructors and learners to operate, store, control and retrieve data other than to promote

self-regulated and active learning (Ali, Haolader & Muhammad, 2013). ICT-based learning includes an expanded propensity towards collaborative learning among learners and instructors, not just in a specific classroom. This kind of collaboration is in contrast to the conventional learning environment, for example, distance learning inspires educators and learners to engage in learning even after school time (Ali, Haolader & Muhammad, 2013). The system helps instructors to plan and prepare lessons and design materials such as course content (Ali, Haolader & Muhammad, 2013). The rapid development of this system has prompted a revolution in learning as new technological advancement in education has involved the re-examination of new techniques and instruments in instructional process.

To enhance the academic performance of students, there is a need to turn from conventional teaching methods to modern teaching methods. Computer Assisted Instruction (CAI) is space and time independent making it convenient for students to go through the program either at home or on a school computer. This encourages interactivity, which individualizes content for each learner based on their needs and it provides formative feedback to multiple choice questions. CAI enhances learning rate where the learners are able to learn more materials given the same amount of time as compared to conventionally taught learners. Moreover, students receiving instructions through ICT retain learning better (Cener, Cener, E., Acun, I., & Demirhan, G. 2015). The issue of low achievement among the learners has been tormenting the instructive framework right from the elementary classes to university level. This issue wastes human potential and facilities for education.

Statement of the Problem

Students' learning remains central in any academic achievement debate. ICTs provide a window of opportunity for educational institutions and other organizations to harness and use technology to complement and support the teaching and learning process. However, despite the enormous advocacy of ICT aided teaching and learning, investment and donation of ICT equipment to College of Education, Oju, the College still faces the challenge of how to transform students learning process to provide students with the skills to function effectively in this dynamic, information-rich, and continuously changing environment.

The cause of concern is that unless this problem is addressed, investment in the development of ICT in the College is going to be put to waste and improvement in the quality of teaching and learning is going to be sluggish. This may make the College fail to achieve its mission

and to produce graduates who are ready for the world of work which is increasingly reliant on ICT aided generation and dissemination of knowledge. In view of this discrepancy, there is need to examine the particular effects of availability, accessibility and user-ability of ICT resources on students learning in College of Education, Oju.

Purpose of the study

The main purpose of the study was to find out the effects of ICT on students' academic performance in science education. The specific objectives were:

1. Investigate the effect of ICT on students' academic performance in science education.
2. Investigate the effect of ICT on the academic performance of male and female students in science education.

Scope of the Study

The study on the Effect of ICT on students learning was carried out in College of Education, Oju, Benue State, Nigeria. The study specifically sought to determine the effects of ICT on students' academic performance in science education.

Significance of the Study

- i. The study should be of great importance to the policymakers and College administrators of College of Education, Oju helping them to appreciate the usefulness of ICT in learning so as to come up with policies that promote ICT in learning.
- ii. The findings and recommendations of the study should be of importance to College of Education, Oju lecturers and other lecturers of higher institution of learning on the use of ICT to aid learning.
- iii. The researcher hopes that result of the study may be useful to future researchers with interest in examining further the effects of ICT on students learning. This should lead to the generation of new ideas for the better implementation of ICT into learning process.

Research Questions

The study specifically sought answers to the following questions:

1. Is there any difference in the academic performance of science and health education students who were taught using ICT and those taught with conventional method?
2. Is there any difference in the academic performance of male and female students taught chemistry with ICT?

Hypotheses

Based on the research questions, the following hypotheses were formulated and tested at 0.05 level of significance.

1. There is no significant difference in the academic performance of students who were taught chemistry with ICT and those taught with conventional method.
2. There is no significant difference in the academic performance of male and female students who were taught chemistry with ICT.

MATERIALS AND METHODS

The study adopted quasi-experimental pre-test, post-test, control group design in determining the effect of ICT on students' academic performance in science and health education. The study adopted the use of intact class. The population of the study comprised of 3,450 NCE II students from faculty of science, College of Education, Oju. The sample for the study was 53 NCE II students selected from the faculty with the aid of simple random sampling technique from which the two intact classes were selected. The two intact classes comprised one experimental group of 33 students and one control group of 20 students, making 53 students which is the sample for the study.

The two intact classes were first pre-tested to determine their academic equivalence before they were taught and post-tested. The instrument used for data collection was the Chemistry Achievement Test (CAT), which was made up of 20 multiple choice questions. The instrument Chemistry Achievement Test (CAT) and the treatment, ICT instructional package were validated by one Chemistry expert, one Educational Technology expert and one Measurement and Evaluation expert. The reliability of the instrument was determined using

test-retest method, and the reliability coefficient of 0.82 was obtained using Pearson Product Moment Reliability Coefficient formula. The study covered a period of two weeks using normal school time table period allotted to Chemistry. The first week was used for pre-testing the two groups to ascertain the students' entry behaviour. The two groups were taught two periods of one hour lesson by the two trained research assistants using lesson plan prepared by the researcher, and this lasted for one week. The experimental group was taught with ICT instructional package, while the control group was taught using conventional method of teaching. The data obtained from the pre-test and post-test of the two groups were analyzed using means and standard deviation to answer the research questions, and t-test to test the hypotheses at 0.05 level of significance.

RESULTS

Pre-test performance of experimental and control groups

Table No. 1: Mean and standard deviation scores of the academic performance of NCE II students in chemistry for experimental and control groups

Group	N	\bar{x}	SD
Experimental	33	13.10	2.20
Control	20	12.50	2.30

Table No. 1 shows the mean scores of 13.10 and 12.50 for the experimental and control groups and their standard deviation scores were 2.20 and 2.30 respectively for the pre-test. The pretest was conducted to ascertain the academic equivalence of the experimental and control groups in Chemistry before the teaching commenced. This result showed that the students in the two groups were equivalent in terms of their previous knowledge of the subject.

Research Question 1

Is there any difference in the academic performance of science and health education students who were taught using ICT and those taught with conventional method?

Table No. 2: Mean and standard deviation scores of the academic performance of NCE II students in chemistry for experimental and control groups (post-test)

Group	N	\bar{x}	SD
Experimental	33	15.20	1.90
Control	20	13.40	2.30

Table No. 2 shows the mean scores of 15.20 and 13.40 for experimental and control groups for post-test. The results indicated a higher mean score for experimental group than control group. The standard deviation score of 1.9 for experimental group was less than 2.40 for the control group; this shows a better rate of dispersion of the experimental group than the control group.

Research Question 2

Is there any difference in the academic performance of male and female students taught Chemistry with ICT?

Table No. 3: Academic performance of NCE II male and female students in Chemistry for experimental group.

Gender	N	Pre- test \bar{x}	Post-test \bar{x}	Gain in scores
Male	15	13.00	16.50	2.52
Female	20	12.20	15.20	3.44

Table No. 3 shows the mean scores of 13.00 and 12.20 for the male and female students in the experimental group for pre-test, and 16.50 and 15.20 for male and female students in the post-test. The mean gain in score shows 2.52 and 3.44 for the male and female students respectively, showing that both male and female students performed relatively better in Chemistry when taught with ICT instructional package. Hence, gender has no effect on the performance of male and female students who were taught Chemistry with ICT.

Hypothesis (H₀₁)

There is no significant difference in the academic performance of students who were taught chemistry with ICT and those taught with conventional method.

Table No. 4: t-test comparison of the academic performance of NCE II students who were taught Chemistry with ICT and those taught with conventional method.

Source of variation	N	\bar{x}	SD	df	t-cal	t-crit	p>0.05
Experimental group	33	15.20	1.90				
Control group	20	13.40	2.30	71	3.14	1.93	Rejected

Table No. 4 shows that the calculated t-value of 3.14 is greater than the critical t-value of 1.93 at 0.05 significant level, so, hypothesis 1 was rejected. Thus, there is a significant difference in the academic performance of NCE II students who were taught Chemistry with ICT instructional package with mean scores of 15.20 and those taught with conventional method with mean scores of 13.40. Those who were taught Chemistry with ICT performed better than those taught with conventional method.

Hypothesis (Ho2)

There is no significant difference in the academic performance of male and female students who were taught chemistry with ICT instructional package.

Table No. 5: t-test comparison of the academic performance of NCE II male and female students who were taught Chemistry with ICT.

Source of variation	N	\bar{x}	SD	df	t-cal	t-crit	p>0.05
Male	15	16.50	3.46				
Female	20	15.20	1.33	32	0.58	2.32	Not Rejected

Table No.5 shows that the calculated t-value of 0.58 for male and female students of experimental group was less than the critical t-value of 2.32 at 0.05 significant level. So, hypothesis 2 is not rejected. Thus, there is no significant difference in the academic performance of NCE II male students with mean scores of 16.50 and female students with mean scores of 15.20 who were taught Chemistry with ICT. This means that gender has no effect on the experimental group who were taught Chemistry with ICT instructional package.

DISCUSSION

The results of the study showed that students who were taught with ICT achieved better academic performance than those taught without it. The t-test analysis in table 4 showed

better academic performance by the experimental group because of the use of ICT instructional package in teaching Chemistry. From the above result, it is clear that the use of ICT instructional package has enhanced the teaching and learning of Chemistry among NCE students resulting in higher achievement gains by the learners. The findings of this study is in agreement with the assertion made by Miciano (2005), that the use of instructional materials in teaching Mathematics improved the academic performance of students in the subject.

The result of the study further showed that the male and female students who were taught with ICT achieved better academic performance in Chemistry. The calculated t-value in table 4 showed better academic performance in Chemistry for male and female students of the experimental group. This implied that there is no significant difference in the academic performance of male and female students who were taught Chemistry with ICT. This means that gender has no effect on the performance of students in Chemistry when they are taught with ICT instructional package. This result is in agreement with the findings of Inyang and Ekpei (2007), which said that on the basis of gender, there was higher level of performance of the mixed grouping than male and female groups. Thus, they emphasized more on mixed grouping. This result however disagreed with the work of Niem (2000) who found out that the learning ability of boys in goal performance were more than the girls.

CONCLUSION

Based on the findings of the study, it was concluded that students who were taught using information and communication technology (ICT) instructional package performed better in Chemistry than the students taught without it. Also, male and female students who were taught using ICT performed better in Chemistry. Hence, the use of Information and Communication Technology instructional package helped to enhance the academic performance of students in Chemistry.

Recommendations

Based on the findings of the study, the following recommendations were made:

- i. Government should be interested in providing funds to college of education to enable chemistry teachers provide Information and Communication Technology (ICT) tools for teaching chemistry.

- ii. Chemistry teachers should try to use ICT materials in the teaching and learning of Chemistry in secondary schools, in order to encourage male and female students to always participate fully in the learning of chemistry.
- iii. School administrators should encourage chemistry teachers to use relevant ICT materials in teaching of chemistry lessons.
- iv. Chemistry teachers should encourage both male and female students to always participate fully in the learning of chemistry.

REFERENCES

1. Cener, E., Acun, I., & Demirhan, G. (2015). The impact of ICT on pupils' achievement and attitudes in social studies. *Journal of Social Studies Education Research*, 6(1), 190-207.
2. Inyang, E. & Ekpei, B.A. (2007). Gender grouping and students' performance. *Journal of Science*
3. Akude, I. & Ajuzie, N. (2011). Undergraduate economics students' accessibility to, and utilization of internet facilities in Alvan Ikoku Federal College of Education, Owerri. *Journal of Education Media & Technology*, 15(1), 47-56.
4. Andoh, C. B. (2012). Factors influencing teachers' adoption and integration of information and communication technology into teaching: A review of the literature. *International Journal of Education and Development using Information and Communication Technology*, 8(1), 136-155.
5. Ali, G. Haolader, F. A., & Muhammad, K. (2013). The role of ICT to make teaching-learning effective in higher institutions of learning in Uganda. *International Journal of Innovative Research in Science, Engineering and Technology*, 2(8), 61-73
6. Badeleh, A. & Sheela, G. (2011). Effects of information and communication technology based approach and laboratory training model of teaching on achievement and retention in chemistry. *Contemporary Educational Technology*, 2(3), 213-237.
7. Carrillo, P., Onofa, M., & Ponce, J. (2010). *Information technology and students achievement: Evidence from a randomized experiment in Ecuador*. Inter-American Development Bank: Department of Research and Chief Economist. IDB Working Paper Series No. IDB-WP-223
8. *Teachers Association*, 5(1), 12-18.
9. Jones, F. (2010). A new generation of learners? The next generation and digital natives. *Learning, Media and Technology*, 35(4), 365-385.
10. Liu Z (2005). Reading Behaviour in the digital environment: changes in Reading behaviour over the past 10 years. *J. Doc.*, 61 (6): 700-12
11. Miciano, T.A. (2005). *Fundamental principles on teaching Mathematics*. New York: McGraw-Hill Book.
12. Niem, G. (2000). *Gender influence on learning*. United States of America: Prentice-Hall Inc.