**INFLUENCE OF INFORMATION COMMUNICATION TECHNOLOGY (ICT) AS INSTRUCTIONAL TOOL IN TEACHING AND LEARNING SECONDARY SCHOOL BIOLOGY IN ENUGU SOUTH L.G.A ENUGU STATE, NIGERIA**

**DR. VERONICA C. UDE**

**DEPARTMENT OF SCIENCE AND VOCATIONAL EDUCATION,**

**GODFREY OKOYE UNIVERSITY, ENUGU.**

**&**

**DR. EUNICE N. ONAH**

**DEPARTMENT OF COMPUTER & ROBOTICS EDUCATION**

**UNIVERSITY OF NIGERIA, NSUKKA**

***Abstract***

*This study investigated the influence of ICT as instructional tool in teaching and learning secondary school biology in Enugu South LGA, Enugu State, Nigeria. It employed descriptive survey research design. Three research questions formulated and three null hypotheses, which were tested at 0.05 level of significance guided the study. This study was carried out in Enugu South LGA of Enugu State, Nigeria. One hundred and fifty students were drawn from eleven government owned secondary schools which constituted of co-educational and single sex schools, with population of 1436 SS2 students, using purposive and simple random sampling technique. Instrument for data collection is Instructional Tools in Teaching and Learning Biology Questionnaire (ITLB). The internal consistency of the instrument was determined to be .814 using the Cronbach Alpha Model. Data collected were analyzed using mean and standard deviation for the research questions and t-test for testing the null hypothesis at 0.05 level of significance. The result revealed positive and significant influence on teaching and learning Biology using ICT tools on the students performance. The researchers therefore recommended that Government should provide computer laboratories with internet provider in all schools and that serving teachers of Biology should be given in-service training through seminars and workshops to expose them to the use of ICT as part and parcel of instructional technology.*

***Keywords****: ICT, Instructional technology, Teaching and learning, Biology and Secondary schools.*

**INTRODUCTION**

The National Grid for learning, United Kingdom government initiative indicated that teachers must move swiftly to more internets and web based work in schools. According to Busari (2006), the whole world is experiencing the advancement of science and technology. The use of ICT is fast gaining prominence and becoming one of the most important elements defining the basic competencies of the students. According to World Bank, ICT consists of the hardware, software, networks and media for the collection storage, processing, transmission and presentation of information. The use of ICT falls into four (4) major categories: constructing knowledge and problem solving (through the internet-mail, CD – ROMS, databases, videoconferencing); using process skills; aiding explanation of concepts; and communicating ideas -power point, desktop publishing (WAEC, 2012). The use of ICT in teaching and learning is a relevant, innovative and functional way of providing education to learners that will assist in imbibing in them the required capacity for reverting the economic recession that has bedeviled the country Nigeria. ICTs have the potential to accelerate, enrich, and deepen skills, to motivate and engage students, to help relate school experience to work practices (Abomi,2010). The advent of ICT in this 21st century has undoubtedly affected the education industry positively especially in science education. Biology as a very important aspect of science has suffered serious setback due to its dynamic nature. The traditional content is being replaced by modern discoveries in cell biology, genetic engineering, biotechnology, etc. (Tella, 2011). Biology teaching and learning can only lead to greater achievement when the students and teachers are exposed to ICT and its application in science education. Mean while the achievement of biology students in the subject has remained poor for decades (WAEC chief Examiners Report, 2005).

According to Osuafor (2013), one of the factors that has been identified as influencing outcomes in biology is poor strategy of instruction. It is therefore pertinent that ICT as teaching tools should be applied in teaching and learning biology. Biology teaching can be result oriented when students are ready and teachers disposed to the use of appropriate resources. Despite the importance placed on biology by the society and innovations to improve teaching and learning, the student’s achievement in WASSCE and NECO SSCE biology remains a mirage. The researchers are therefore looking at a possibility of ICT application to teaching and learning biology for this alarming situation to improve so as to make teaching and learning biology more effective and attractive. For the biology teachers to use ICT tools as instructional materials, they must be ICT compliance; be competent in handling the gadgets; be able to prepare the environment where the tools will be used and make sure that the tools will attract the attention of the students, arouse, motivate and provide the rationale for the utilization. Most experts in the field of education agreed that when properly used, information and communication technology ICT hold great promise to improve teaching in addition to shaping work force opportunities. Poole (2006) indicated that computer illiteracy is now regarded as the new illiteracy. This has actually gingered a new and strong desire to equip institutions with computer facilities and qualified personnel necessary to produce technological proficient and efficient students in Nigeria. Asinde (2010) opined that ICT positively affects students academic achievement and retention. Hence there is no doubt that ICT tools can aid the instructional process and facilitate students learning. This is buttressed by the studies by Burnett,( 2014) and Fitzgerald and Warner (2006) which found positive effect associated with technology aided instruction. The Federal Government of Nigeria realized the role of ICT in National development consequently, it has but in place a policy document - titled the National Policy for Information Technology, 2001. The policy clearly spelt out the ICT vision, mission and policies for Nigeria. The FRN (2004) acknowledged the importance of using ICT in improving knowledge and thus states in the National Policy that government shall provide necessary infrastructure and training for the integration of ICT in advancing knowledge and skill in the modern world (FRN, 2013). It is therefore assumed that if government policy has been implemented; teachers in our schools system must have acquired ICT skills which will help them for effective instructional delivery as well as facilitating teaching and learning. No wonder Iwiyi (2007) pointed out that computer acquisition and use is an important aspect of the teaching and learning process. If a teacher is to function effectively, and meet the challenges of the 21st century and global competitiveness, the teacher education process must make adequate provision of individualized computer training for the would be biology teachers, for a better output.

Education policy documents in many countries have placed emphasis on promoting the use of ICT in teaching and learning after in conjunction with curriculum reform initiative that aim to enhance the development of 21st century skills such as collaborative inquiry and collaboration (Law, Lee, Chan and Vuen, 2010). It is on this premise that the researchers want to ascertain how effective is the application of ICT as instructional tool in teaching and learning as well as students achievement in Biology in Enugu South LGA, Enugu State.

**Purpose of the study**

The study seeks to determine the influence of ICT as instructional tool in teaching and learning secondary school biology in Enugu South LGA of Enugu State, Nigeria. Specifically the study is to:

1. Find out the level of availability of ICT infrastructure in the secondary schools in Enugu South LGA
2. Find out the extent to which the students have acquired ICT skill
3. Find out the extent to which teachers use ICT as instructional tools while teaching biology
4. Find out the influence of use of ICT tools in teaching and learning biology on the student’s academic achievement.

**Scope of the study**

The research is carried out in Enugu South Local Government Area of Enugu State, Nigeria. The study is delimited to the effect of ICT in teaching and learning of SS Biology.

**Research Questions**

The following research questions guided the study:-

1. What is the level of availability of ICT infrastructure in secondary schools in Enugu South LGA of Enugu State?
2. To what extent have the students acquired ICT skills?
3. To what extent have the teachers use ICT tools while teaching biology
4. What effect does use of ICT tools in teaching and learning secondary school biology have on the academic achievement of the students?

**Hypothesis**

The null hypothesis tested at 0.05 level of significance guided the study:

1. There is no significance difference on the achievement of the students with ICT skills and those without.

**Research Method**

The study employed survey research design. The study was conducted in Enugu South LGA of Enugu State. This area was chosen because it houses both rural and urban schools as well as co-educational and single sex schools. Simple random and purposive sampling was used to select students from SS2 students. The choice of SS 2 students being that they are supposed to have experienced biology teaching and learning with and without ICT as instructional tools. A total of 150 SS2 students out of a population of 1436 were used for the study. The instrument for data collection is questionnaire (ITLB). This instrument was subjected to face and content validation by experts in Science Education and measurement and Evaluation.

The reliability of the instrument ITLB was determined using Cronbach Alpha Model. A reliability coefficient of 0.84 was obtained. The data obtained were analyzed using means and standard deviation for the research questions and t-test for testing the null hypothesis.

**Results:**

1. **Research question 1:** What is the level of availability of ICT infrastructure in the secondary schools in Enugu South LGA?

Table 1 shows the mean and standard deviation of responses on the level of availability of ICT.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/N** | **ICT Resources in School** |  | **SD** | **Decision** |
| 1. | Computer sets are available in my school | 2.30 | 0.74 | Rarely available |
| 2. | Internet system is available | 1.80 | 0.71 | Not available |
| 3. | CD ROMS, flash drives, diskette, digital camera, printer, scanner, project DVD player are provided in my school | 2.21 | 1.08 | Rarely available |
| 4. | Televisions and radios are available in my school | 2.80 | 0.98 | Available |

|  |
| --- |
|  |

From the above table the items 1, 2, and 3 have mean rating scores between 1.80 – 2.30 which is below 2.5, the criterion weighted score for available ICT resources. This indicates that modern ICT infrastructure are of very low availability in the schools except item4 which has a mean score > 2.50.

**Research Question 2:** To what extent have the students acquired ICT skills? Deviation of responses on the extent of ICT skill acquisition.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/N** | **Skills acquisition** |  | **SD** | **Decision** |
| 5. | I can use the internet system of ICT | 1.60 | 0.77 | Very low |
| 6. | I can use flash drive, CD ROM and diskette of ICT | 1.80 | 0.71 | Very low |
| 7. | I can use computer testing, data processing analysis, data storage and run programmes on the computer | 1.57 | 0.77 | Very low |
| 8. | I can use television and radios | 2.97 | 0.92 | Available |

|  |
| --- |
|  |

Table 2 items 5, 6, and 7 have mean and S.D rating scores between 1.57 – 1.80 ….. Which is below 2.5, the criterion weighted mean score for ICT skill acquisition by students. This indicates that students find it difficult to utilize the few available ICT infrastructures in the school for learning evidenced by their mean scores < 2.50 in all items except television and radio with means score > 2.50.

**Research questions 3:** To what extent have the teachers use ICT tools while teaching biology?

Table 3 shows the mean and standard deviation of responses on the extent of use of ICT tools by biology teachers

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/N** | **ICT Usage** |  | **SD** | **Decision** |
|  |  |  |  |  |
| 9. | Biology teacher make use of internet and computer in teaching some topics | 1.70 | 0.88 | Very low |
| 10. | Biology teachers come to class with laptops | 1.85 | 0.72 | Very low |
| 11. | Biology teachers use projectors and power point while teaching | 1.25 | 0.32 | Very low |
| 12. | Biology teacher gives use projects and assignments through the e-mail | 1.20 | 0.30 | Very low |

Table 3 items 9 – 12 have mean and standard deviation between 1.25 – 1.85 which is below the criterion mean of 2.50. This indicates that biology teachers rarely make us of ICT tools in teaching biology.

**Research questions 4:** What effect/influence does use of ICT tools in teaching and learning secondary school Biology have on the academic achievement of the students?

Table 4: shows the mean and standard deviation scores of responses on effect of teaching biology with ICT tools on students achievements

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/N** | **Effect of ICT Usage** | **Mean** | **SD** | **Decision** |
| 13. | ICT appeals to different senses of the body thereby taking care of individual differences in learning | 3.12 | 0.81 | Very high |
| 14. | It exposes the biology student to varied and multi-sources of information | 3.10 | 0.83 | Very high |
| 15. | It helps every student to learn at his own place | 3.03 | 0.93 | Very high |
| 16. | It breaks the high dependence on teachers as the major source of knowledge  3.1175 | 3.22  0.8425 | 0.80 | Very high |

|  |
| --- |
|  |

Table 4 items 13 – 16 all have man and standard deviation of 3.03 – 3.22 > than 2.50 criterion mean. This indicates that teacher’s use of ICT tools in teaching biology has a very high positive effect on the academic achievements of the students.

Null Hypothesis

Ho1: There is no significant difference on the achievement of the students with ICT skills and those without.

Table 5 shows table of t-test

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Variable |  | n | df | S | P value | t- cal | tc | Decision |
| Values | 3 | 160 | 159 | 0.84 | 0.05 | 9.277 | 1.960 | Reject Ho1 |

**Decision Rule:** Reject Ho if and only if t cal > tcv at α – level of 0.05. Otherwise accept.

Since tcal = 9.27 > tcv -= 1.960 we reject the null hypothesis. This indicates that there is significant difference between the mean achievement score of students with ICT skills and those without the ICT skills.

**Discussion:**

The major focus of this study is to find out the effect of Information Communication Technology ICT as instruction tool in teaching and learning secondary school biology in Enugu South LGA of Enugu state, Nigeria. The findings of the study revealed that the level of availability of ICT facilities in secondary schools in Enugu South LGA is very low. This is in line with the finding of Adomi (2010) who discovered that unavailability of ICT components in schools hampers teachers use of the facilities in teaching students. Also Every, Emmanuel, Joseph, Dennis and Asinde (2010) in Arinze, Okonkwo, Iwuno (2012) noted that there is lack or inadequate ICT infrastructure in many secondary schools and then called for improvement.

The level of acquisition of ICT skills by the students showed low level, evidenced by the low mean score except radio and television. This is in line with the finding by Adomi (2012) who attributed the inadequate ICT manpower in schools as a factor which causes low level of ICT skill acquisition by secondary school student. He pointed out that the students can acquire competent ICT skills when the teachers are well grounded to teach them how to use it. Most of the students can actually use television and radio because they are largely available in the homes.

Result from table 3 revealed that biology teachers do not use any educational compact discs during biology lessons. This may be attributed to the fact that schools are poorly equipped with ICT and biology teacher because of ignorance and fear of using ICT, find it difficult to use ICT tools during biology lesson. One cannot give what he does not have. This is in line with the finding of Kola, 2013 who said that majority of Science Teachers are not computer literate and have remained in that condition for long time without seminar, conferences, workshop and refresher course in computer. The result from table 5 revealed that there is positive significant difference between the mean achievement score of students with ICT skills and those without ICT skills. The finding also revealed that the use of ICT tools in teaching and learning secondary school biology improves their academic performance of the student as all the items have a mean score above 2.50. This is very obvious as ICT makes teaching and learning very interesting, enjoyable and appeal to different science (Arinze et al, 2012). The finding also supported the view of sensory stimulation theory which has it that when multi-senses are stimulated, that greater learning takes pace which at the same time improve the academic performance of the student. It also lent credence to Tella, 2011 who said that ICT has provided opportunity for the learner to use maximum senses to get the information.

**Conclusion**

The giant stride in the advancement in Information and Communication Technology (ICT) in the 21st century is a welcome development. Its application in almost all facets of life especially in education cannot be overemphasized as it has opened up a wide range of limitless knowledge for both the young and the old. It has broken barriers to access to information both locally and globally. For this reason, it bothers on the education sector especially the government owned schools to put in place the necessary ICT infrastructure in schools. It also poses a great challenge to both biology teachers and students to acquire the necessary ICT competence and skills. It is believed that this will bring about much improvement in the academic achievement of biology students, bring a reflexive change in their salve study and learner centred system of education.

**Recommendations**

Based on the findings of the study the researchers recommended that the government should procure the necessary ICT infrastructure for the schools according to National Policy on Education standard. This will enable the students and teachers benefit maximally in the ongoing technological development and ICT contribution to educational advancement.

Biology teachers should be motivated to develop and use multimedia computers and software relevant to teaching and learning. This can be achieved through provision of soft loan for acquiring personal computer or supply by the government at subsidized rate. The government in conjunction with departments of computer education in universities should embark on mass computer literacy programme especially for biology and other science teachers at all levels. This should be accomplished through in-service training, workshops conferences and seminars so as to harness the benefits of ICT in Science education. Finally government schools should be provided with digital libraries to enhance learning through ICT.

**REFERENCES**

Adomi E.E. (2010); Application of ICT in Nigeria Secondary Schools: Library, Philosophy and Practice 2010 http/www.google-analytics

com/ga.jstype=text/javascript’ percent3 Epercent 3c/script percent 3E

Asinde, F. (2010). Effect of Information and Communication Technology on Students Academic Achievement and Retention in Chemistry at Secondary level.European/American Journals.

Arinze, F.O., Okonkwo, E.N., Iwunor, A.N. (2012). Information and Communication Technology (ICT) Application in Secondary Schools and Students’ Academic Performance in Social Studies, African Research Review, an International multi-disciplinary Journal, Ethiopia vol. 6(4) serial No 27, Pp 266-278. Available at http.//dx.doi.org/10.4314/afrrev.v6i418.

Burnette, C. (2006). New concepts in the education of Science teachers. Journal of Research in Science Teaching. 1(1).

Busari, A O.(2012). Identifying Difference in Perception of Academic Stress and Reaction to Stressors Based on Gender among First year University Students. International Journal of Humanities and Social Science 2(14)

Evey, C.K.; Emmanuel, O.O., Joseph A.; Dennis, U. and Asinde F.A. (2010). The Need for ICT in Secondary Schools Curriculum in Nigeria In; Arinze, F.O. et al. Information and Communication Technology (ICT) Application in Secondary Schools and Students’ Academic Performance in Social Studies. African Research Review, an International multi-disciplinary Journal, Ethiopia 6(4) serial No 27, 266-278, Available at http.//dx.doi.org/10.4314/afrrev.v6i418

Federal Republic of Nigeria (2013) National Policy on Education Lagos: NERDC Press.

Inyang – Abia, M.E. (2004). Essential of Educational Technology. Calabar: Wusen Publishers Limited Nigeria.

Iwiyi, G.U. (2007). The importance of Information and Communication Technology (ICT) in Schools. www.globalacademicgroup.com/journal.

Law, N., Man W.L., Clan A and Iden A., (2003) Teachers and Teaching Innovations in a Connected World in Factors Influencing The Impact of ICT on Students Learning.

Nwana S. (2010) Challenges in the Application of E-Learning by Secondary School Teacher in Anambra State Nigeria: African Journal of Teacher Education 2(1)

Osuafor, A. (2013). Influence of Family Background on Academic Achievement of Secondary School Biology Students in Anambra State . Afican journal online https;/www.ajol/index.php/ajote/article/download/……3232.

Poole, A.H. (2016). The conceptual Landscape of Digital curation – Journal of Documentation, 72 (5).

Tella, A. (2011). Availability and Uses of ICT in South West Nigerian Colleges of Education. African Research Review, International Multi-Disciplinary Journal, Ethiopia 5 (5) Serial no 22 Oct. 2011 available at http//dx.doi.org/10.431 affrev. V5i5.25.

Yusuf M.O. (2005b) Information and Communication technologies and Education, Analyzing the Nigeria National Policy for Information Technology. International Education Journal 6, (3) 316-321.