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INTEGRATION OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) IN COMPUTER STUDIES: IT'S IMPACT ON STUDENTS' PERFORMANCE AT THE BASIC SECONDARY SCHOOL LEVEL

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Abstract
The work examined the impact of ICT on Computer studies and its impact on students' performances at the Basic Secondary school level. The study is aimed at integrating ICT in the teaching and learning of Computer studies to improving the academic performance of sampled students. The research hypotheses were that: "there was no significant difference in the mean scores of the basic secondary school level students taught with ICT resources and in the alternative, there was significant difference in the mean scores of the basic secondary school level students taught with ICT resources". The quasi-experimental research design was employed in the study and the research's findings supported the second hypothesis; that there is a significant difference in the mean scores of the students taught with ICT resources. From the research findings, the study concluded that there is a significant impact of ICT integration in improving the academic performances of students in Computer studies. The study recommended that efforts should be made by educational stakeholders to provide ICT infrastructures for teachers and learners alike to acquire the essential skills and knowledge of how to integrating ICT tools in the teaching and learning of Computer studies at the Basic secondary school level so as to improving on students' academic performances in the subject matter.

Keywords: ICT, Computer Studies, Integration, Impact and Students' performance.

Introduction
In the opinion of Ogunsola (2015), Information and Communication Technology (ICT) is an electronic based system of information transmission, reception, processing and retrieval, which has radically altered our ways of thinking, livelihood and the environment in which we exist. Igbunu (2019), opined that Computer technology with sundry names such as; digital age revolution, Internet revolution, Binary revolution, Multimedia revolution, in combination with other ICT resources as created profound changes in our global society. According to Obinna (2013), ICT has become an integral part of the education system globally. And Nigeria as a component of the world is not in isolation, as ICT has steadily finds its way into our educational system despite the chronic limitations created by our economic shortfalls.

In the view of Olokoba, Abdullahi and Omosidi (2014), most teachers exit the teachers' institutions with little or no knowledge of ICT needed in this digital age for the effective professional productivity. Olakulehin (2017), said that the way ICT is applied in the education system can be divided into two main classes, which are;

i. For education; referring to the development of ICT for teaching and learning.
ii. In education; involving the adoption of the general components of the technology in the teaching process for the main aim of training teachers in the application of ICT for

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teaching. Equally, UNESCO (2004), classified ICT in education into pedagogy and training.

Bello (2010), argued that if teachers are to be convinced of the value of applying ICT in their training, their educational training should focus on the pedagogical issues. It is vital to note that ICT can aid Computer studies teachers to teach productively and the students to learn effectively. An in-depth x-ray of the present state of technology application in our school system, shows that teachers do not sufficiently make use of ICT resources even when provided opinioned. Sanusi (2018), remarked that it will take sometimes for teachers in the Basic secondary schools' system in developing nations such as ours to be able to gain advantages provided by ICT.

Therefore, the need to integrate ICT in the teaching and learning process at the Basic secondary schools, cannot be overemphasized. It is pertinent to note that technological advancements have shown visibility to the dark trenches of learning globally. As part of the curriculum, learners and teachers must be encouraged to accept ICT resources in their engagements in teaching and learning of Computer studies.

Mudasiru (2015), asserted that ICT is an indispensable component of the modern-day world. The opinion of Castells, (2016), captured the fact that, the pervasiveness of ICT has brought with it rapid technological, social, political, and economic transformations which has created a networked society. The education space has been deeply influenced and positively impacted upon by ICT. The numerous researches carried out by Belts (2013) and Francisca (2017), were aimed at verifying the views of students and their motivation by the new technologies, and to prove that ICT possesses the potential to enhance the quality of teaching and learning at the various strata of education.

Lemke and Coughlin (2018); Davis and Tearle (2019) collectively agreed that; ICT has the potential to accelerate, enrich, and deepen skills, motivate and engage students in learning, help to relate school experiences to work practices, helps creates economic viability for future work force, contributes to positive changes in the school system, strengthens teaching and provides opportunities for connecting the school system to the world.

The application of ICT can cause the school system to be efficient and productive, engendering a variety of tools for enhancing and facilitating teachers' professional activities posited Kirschner and Woperies (2003). From a review of 28 major reports on technology integration in American schools', Culp, Honey and Mandinach (2003); advanced three basic reasons for ICT application in education system. These they said were; a tool for addressing challenges in teaching and learning, a change agent, and a central force in economic competitiveness.

According to Ogunsola (2011) as cited by (Obinna, 2013); saw ICT as an electronic based system of information transmission, reception, processing and retrieval, which has changed our perceptions about life. ICT can be used to access global knowledge and to communicate with people globally (Ogunsola, 2011).It has been proven that students taught with ICTs, gain deeper understanding of complex topics and concepts and are more likely to recall information and apply same to solve problems outside the school asserted Apple Computers (2012).

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In most nations of the world, ICT has been integrated into their curricula to support teaching and learning process in the educational systems. But others who are in their early phase of integrating ICTs resources in their education systems, has shown no profound improvements in learning and teaching argued Aristovnik (2012). The researcher is focused on ascertaining the level of the impact of ICT's implementation on the students' academic performances at the Basic secondary school level. Ikpeama, (2013) stated that technology teaching strategies are often based on cognitive view of teaching and learning. Some examples of ICT tools for teaching and learning in the school system are; multimedia devices, web-based instructions, intelligent tutoring systems, virtual reality devices, audio-visual aids, Computer-aided instructions and other newly developed network tools.

Statement of the problem

Computer studies as a school subject has been impacted on by ICTs, which have positively affected the teaching and learning of the subject. A great deal of researches have proven the benefits of ICT to the quality of teaching and learning, acclaimed Al-Ansari (2006). ICTs have the potential to innovate, accelerate, enrich, and deepen skills to motivate and engage learners to help relate school experiences to work practices, create economic viability for the future work force, as well as strengthening teaching and helping schools change (Davis and Teartle, 2019). The rapid increase of ICTs integration in various sectors of the nation's economic stay has resulted in improving these sectors' outputs. Hence, the challenges faced by the Basic secondary education are numerous without the integration of ICT said (Ibezim and Otuu, 2013). The integration of ICTs in the education system, makes the teaching and learning of Computer studies easier and enhances students' receptivity with great impact on academic performances. ICTs integration in Computer studies and its impact on students' performances at the Basic secondary school level, is focused on some selected Basic secondary schools in Warri metropolitan area of Delta state, Nigeria.

Research questions

Q1. Is there a difference in the mean scores of students of Computer studies in the Basic Secondary schools taught with ICT and those taught without it?

Q2. Is there a difference in the mean scores of male and female Computer Studies students in the Basic Secondary schools taught with ICT and those taught without it?

Hypotheses

H0: There is no significant difference in the mean scores of students of Computer studies in the Basic Secondary schools taught with ICT and those taught without it.

H1: There is a significant difference in the mean scores of male and female Computer Studies students in the Basic Secondary schools taught with ICT and those taught without it.

Concept of Information and Communication Technology (ICT)

According to the United Nations Educational, Scientific and Cultural Organization; UNESCO (2002); teaching has gravitated to the degree of being one of the most challenging professions in our world today where knowledge and skills are expanding so rapidly that modern technologies require the application of ICT to function seamlessly. Most nations of the world now regard the mastering of ICT and its basic concepts as part of core education (UNESCO, 2002).

Lockard and Abrams (1994), opined that computer could now be viewed more as a partner as opposed to a competitor and could be treated in a more natural manner. In the opinion of

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United Nations Economic and Social Commission for Asia and the Pacific, UNESCAP (2001), as cited by Geoffrey (2010), stated that; ICTs refers to technologies people use to solve tasks, share, distribute, gather information and with it communicate, etc. Daniels, (2012) as cited by Amin (2013) understands ICTs as the building blocks of modern society. He further stated that many nations now regard the integration of ICT and mastering of its basic skills and concept as part of core education vis-à-vis reading, writing and numeracy.

Pelgrum and Law (2003), stated that towards the end of the 1980s, the term 'Computer' was replaced by information technology (IT), signifying a shift of focus from computing technology to the capacity to store and retrieve information. He further stated that the paradigm shift was followed with the introduction of the term 'ICT' about 1992, when e-mails were made available to the general public (Pelgrum and Law, 2003).From their opinion, ICTs encompasses; Internet services provision, telecommunications' equipment and services, media and broadcasting, libraries and documentation services, commercial information providers, network-based information services, and other related activities.

Availability and Accessibility of ICT resources and students' academic performances

The availability and application of ICTs in teaching and learning, can help both the teachers and students to exploit their potentials for acquiring information for schooling purposes and to increase in leaning through communication, posited Riel (2008) as cited by (Geoffrey, 2010). While Bonnet (1997), argued that the availability of visual digital technology, such as; animation, simulation, and virtual images, involve students and reinforces their conceptual understanding. Ajayi (2016), claimed that "figurative speaking instructional materials enable the teacher to be in more than one place at a time and to address several issues at a time.

For example, a virtual concept of a subject can be ongoing while the teacher moves around the classroom to explaining to learners the subject's content in response to requests based on individual differences concerns. The act reduces verbalism or irrelevant repetitions of self by the teacher, and also adds variety in reinforcing verbal messages by providing a multi-media approach.

Hence, the objective of this research work is to establish research findings on the impact of ICT on students' performances by empirically testing the different opinions using an achievement test in which a group of students are taught with ICT, while the other group of students are taught without ICT. The findings of the two groups called; Experimental/Testing and Control groups, were compared with the view to finding the group that had the impact of ICT integration in the teaching and learning process.

The availability of ICT resources can enhance learning by making education less dependent on the teacher, and making education available at home throughout the day, argued Mbwesa (2009) as cited by (Geoffrey, 2010). (Bonnet, 2017), is the opinion that; the use of ICT in teaching and learning, can positively transmit knowledge and skills to students. Accessibility and the application of ICT allows students to enquire deeper into the real world, readily access information sources and to analyze and interpret such information. Without the integration of ICT in the teaching and learning of Computer studies at the Basic secondary school level, the classroom will remain very much traditional.

The integration of ICT in schools, required an institution to be networked, so as to ensure seamless access to the Internet and multimedia resources for students and teachers alike in or outside the school system. For its success, a wide range of peripherals and remote working

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devices, plus video conferencing must be provided and integrated into the school system. The barriers to ICTs integration in the school system, centres on accessibility of Internet services, infrastructure and qualified personnel to manage the system. The continuous access to computer-aided devices armed with qualified teachers, creates the security for ICT integration in Computer studies during teaching and learning and boost students' courage in lesson deliveries.

Impact of ICT resources on students' leaning abilities

According to Achuzie (2009) as cited by (Obinna, 2013), showed that from the findings of a research carried out, the secondary schools which used ICT tools in teaching and learning, fostered learning, produced Computer literates and potential researchers. He also found out that ICT helped to prepare such secondary school students for the technological and computing tasks they will be faced with in the future. Gladly, Computer science/studies has been made compulsory at the secondary school level, according to the National Policy on Education by the Federal Republic of Nigeria (FRN, 2013). This is aimed at assisting students to get use to ICT devices as they grow educationally. Ikwumelu (2012) as cited by Terende and Clement (2014), outlined the general impact and importance of ICT-driven instructional aids in teaching and learning thus:

i. Stimulation of students' interest,
ii. Concretizes abstract issues or topics in teaching and learning process,
iii. Creates effective communication,
iv. Used for mass instruction and large audience,
v. Provides useful sources of information for teachers and learners,
vi. Helps in creating continuity of reasoning and coherence of thought,
vii. Saves time and reduces verbalism,
viii. Used for enhancing teaching methods, and
ix. Promotes closer relationship between school and host community.

Design and population of the study

This research work employed the Quasi-experiment research design, where it allowed for the study of sampled population at a specific time and the difference between the individual groups within the surveyed population to be compared. This research type allows for the independent variables to be manipulated to observe the impact on the dependent variables, which serves to determine possible outcomes given certain conditions.

Of the two groups, the experimental/treatment group is acted on while the control group was not acted on. The research work is a Quasi-experimental, pre-test and post-test control designed, tailored towards investigating the impact of integrating ICTs on students' academic performances in Computer studies at the Basic secondary school level, in Warri Metropolitan area of Delta State, Nigeria.

The selected population of 814 students was gotten from the Basic secondary schools in the Warri Metropolitan area, comprising Warri and Effurun in Warri South and Uvwie local government councils.

Sampled population and Sampling techniques

The study sample size is 104 students divided into two groups of 52 students each, sampled from the four (4) selected schools. The first group of 52 students is made of up 26 males and 26 females for the experimental group, while the second group of 52 students consists of 26 males and 26 females for the control group. The Stratified Random sampling was used to

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ensure the simplification and correctness of the data on the availability of ICT resources required to carry out the research work.

Significance level; is set at 0.05 alpha (α) level of significance, two-tailed test.
The selected schools for the study are; Hussey College, Warri; Urhobo College, Effurun; Don Domingos College, Edjeba-Warri and Sedco Secondary School, Sedco-Effurun. The selected population of the students' distribution from the schools is shown below:

Table 1: Population of students selected from Hussey College, Warri.

S/N	Classes	Male Students	Female Students	Total
1	Basic 7 (J.S.S 1)	32	53	85
2	Basic 8 (J.S.S 2)	34	49	83
3	Basic 9 (J.S.S 3)	13	40	53

Total = 221

Table 2: Population of students selected from Urhobo College, Effurun.

S/N	Classes	Male Students	Female Students	Total
1	Basic 7 (J.S.S 1)	20	37	57
2	Basic 8 (J.S.S 2)	34	52	86
3	Basic 9 (J.S.S 3)	26	47	73

Total = 216

Table 3: Population of students selected from Don Domingos College, Edjeba-Warri.

S/N	Classes	Male Students	Female Students	Total
1	Basic 7 (J.S.S 1)	23	40	63
2	Basic 8 (J.S.S 2)	20	50	70
3	Basic 9 (J.S.S 3)	17	32	49

Total = 182

Table 4: Population of students selected from Sedco Secondary School, Sedco-Effurun.

	Classes	Male Students	Female Students	Total
1	Basic 7 (J.S.S 1)	19	30	49
2	Basic 8 (J.S.S 2)	33	50	83
3	Basic 9 (J.S.S 3)	22	41	63

Total = 195

(Geoffrey, 2010) posited that, Computer studies topics taught in abstract form at the Basic secondary schools leaves learners with a weak background on the subject's concepts.

Instrument for Data collection

The instrument is a Computer Students Performance Test (CSPT) cum a Marking scheme validated by two (2) experts in the Department of Computer Science Education, College of Education, Warri. The validation of the instrument was based on its face and content validity, accuracy by an expert.

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Reliability of the Instrument

The reliability of the instrument was established using the Test-Retest method. The result of the test was analyzed using Pearson Correlation Coefficient (PCC), the reliability coefficient of the instrument was found to be 0.89.

Method of Data collection

For the essence of the data collection, the pre-test was conducted for the groups and data collected for analysis. For the Experimental/Treatment group, ICT was applied during the Computer studies lessons for a week. While for the Control group, their Computer studies lessons were carried out without the use of ICT.The ICT instructional resources provided for the Experimental group during the classes were functional desktop and Laptop Computers to achieve the objective of the study.

Analysis and Presentation of Results

Method of data analysis

The mean, standard deviation and mean difference, will be used to analyze the research questions, while the t-test will be used to analyze the null hypothesis with the aid of Statistical Package for Social Science (SPSS) version 16.0.

The previous discussions before now have provided the bases from which the explanations on the impact of ICT integration in Computer studies at the basic secondary schools in Warri metropolitan area can be built. Now the data gathered from the study shall be analyzed and presented. The mean and mean difference were applied in the analysis of the research questions, and the t-test was used to test the null hypothesis.

The formula used for the calculations is:

$$\overline{X} = \frac{\Sigma fx}{N}$$

Where $\overline{X}$ = is the mean

Σ = sigma for summation.

f = frequency

x = score value

N = number of responses

Analysis of Research Questions

On Research Question one

Q1. Is there a difference in the mean scores of students of Computer studies in the Basic Secondary schools taught with ICT and those taught without it?

Table 5: The difference in the mean scores of Computer Studies students in the Basic Secondary school taught with ICT and those taught without it.

Variables	No. of Students	Mean Scores	Mean difference
Experimental group	52	11.32	1.88
Control group	52	9.44	

From the table 5 above, the mean score of the experimental group is 11.32, while the mean score of the control group is 9.44 and the mean scores difference is 1.88.

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This shows that the students in the experimental group taught with ICT, performed better than the students in the control group that were taught without ICT.

Based on the above outcome, there exist a difference in the mean scores of the Basic Secondary schools' students taught with ICT and the ones taught without ICT.

On Research Question two

Q2 (a). Is there a difference in the mean scores of male and female Computer Studies students in the Basic Secondary schools taught with ICT and those taught without it?**(Experimental group)**

Table 6: The difference in the mean scores of Computer Studies male and female students in the Basic Secondary school taught with ICT.

The Experimental group

Variables	No. of students	Mean Scores	Mean difference
Males	26	11.92	1.19
Females	26	10.73	

From the table 6 above, the mean score of the male students is 11.92, while that of the female students is 10.73 and the mean difference is 1.19.

The outcome shows that the male students performed better than the female students that were both taught with ICT. The result above proved that there is a difference in the mean scores of the male and female students taught with ICT.

Q2 (b). Is there a difference in the mean scores of male and female Computer Studies students in the Basic Secondary schools taught without ICT?

Table 7: The difference in the mean score of Computer Studies male and female students in the Basic Secondary school taught without ICT **(Control group).**

The Control group

Variables	No. of Students	Mean Scores	Mean difference
Males	26	10.00	1.11
Females	26	8.88	

The mean score of the male students from the above table is 10.00, on the other hand the mean score of the female students in the above table is 8.88, giving a mean difference of 1.11. The result revealed that the male students taught Computer studies without the aid of ICT, performed better than the female students equally taught without ICT. In view of the research question, the outcome above proved that there is a difference in the mean scores of the male and female students taught without ICT.

Testing the Hypotheses

H0: There is no significant difference in the mean scores of students of Computer studies in the Basic Secondary schools taught with ICT and those taught without it.

H1: There is a significant difference in the mean scores of male and female Computer Studies students in the Basic Secondary schools taught with ICT and those taught without it.

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Table 8: The application of T-test on the difference in the mean scores of the students taught with ICT and the students taught without ICT.

Items	No. of Students	Mean	S.D	S.E	t-value	df	P-value	Remark
Experimental Group	52	11.32	3.104	0.43	3.368	103	0.001	Significant
Control Group	52	9.44	2.578	0.36				

Significance level is set at 0.05 alpha (α) level of significance two-tailed test.

From the above table, it can be deduced that at 0.05 level of significance, the degree of freedom (df) is 103, the mean score of the experimental group = 11.32. While the mean score of the mean score of the control group is 9.44. The P-value was observed to be 0.001.

Because, the p-value is less than 0.05, the outcome implies that there is a significant difference in the mean scores of the Basic Secondary schools' students taught with ICT and the students taught without ICT. Therefore, the null hypothesis of the research is rejected, and the alternative hypothesis is accepted as there is a significant difference between the experimental and control groups.

Discussion of findings

The result from table 5 above showed a difference in the mean scores of the Basic Secondary schools' students taught with ICT-aided devices such as the smart phone, projector, the Internet, etc. The performances of the students in the experimental group was better than those in the control group, signifying that the experimental group taught with ICT devices performed better than those in the control group taught same concepts without ICT devices.

Therefore, it is proven that ICT plays significant role in improving the performances of Computer studies students at the Basic Secondary school level. Affirming the fact in the opinion of Esu (2016), that instructional materials are valuable assets in learning situations as they make lessons practical and realistic. The proofs from tables 6 and 7, showed differences in the mean scores of the male and female students taught with ICT as in (6) and those taught without ICT as in (7). It showed that the male and female students in the experimental group taught with ICT performed better than those in the control group taught without ICT.

From the analyses above, the study has shown that the impact of ICT integration in Computer studies on students' performances at the Basic Secondary school level is significant.

Conclusion

The study investigated ICT's integration in Computer studies and its impact on students' performances at the Basic Secondary school level in Warri metropolitan area. Two (2) research questions were formulated to guide the research. One hundred and four (104) students, comprising 52 males and 52 females were randomly sampled from four (4) selected schools for the study. The study population was split into experimental and control groups, with multiple choice test questions designed and administered on the 104 students to obtain data.

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The study tested two hypotheses based on the research questions. The mean, mean difference, standard deviation and t-test were applied in the analysis of the data. And from the findings of the study it was observed that;

1. The integration of ICT in the teaching-learning process enhanced students leaning abilities and improved their academic performances in Computer studies.
2. The male students taught with ICT performed better than the ones taught without ICT.
3. There is a significant difference in the mean scores of the students taught with ICT and the ones taught without ICT.
4. There is a significant difference in the mean scores of the male students taught with ICT and the female students in the same group.
5. The hypotheses analyses results showed that there is a significant difference in the mean scores of the students taught with ICT and those taught without ICT.

Recommendations

Based on the outcomes of the study, the recommendations below were proffered:

1. ICT professionals should be employed in the Basic Secondary schools in Delta State, so as to improving on Computer studies.
2. The schools at this level in Delta State should be equipped with ICT resources to aid teachers to seamlessly convey learning content to learners.
3. The application of ICT in teaching and learning process should be made compulsory at the Basic Secondary school level by relevant organs of education in the State.
4. Teachers and students alike should be encouraged towards embracing ICT in teaching-learning process.

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