INFLUENCE OF ICT ACCESS AND UTILISATION ON ACADEMIC PERFORMANCE OF SCIENCE STUDENTS IN SELECTED PRIVATE SECONDARY SCHOOLS IN IBADAN

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ABSTRACT

This study investigated the influence of ICTs access and utilisation on academic performance of science students in selected private secondary schools in Ibadan. Alongside four specific objectives, two research questions and two hypotheses were formulated. The research design employed is the descriptive survey design. Data were collected from 156 science students from six private secondary schools in Ibadan with the use of questionnaire. The data analysis was done with the use of Descriptive statistics such as frequency and percentage distribution and Pearson's correlation. Findings revealed the ICT facilities that were made available to include that: the science students had access to television at school, home and cyber café. Hence, the average performance of the students in science subjects was 60-64%, and that ICTs access (r=.148**, N=156, P<0.05) and ICTs utilisation (r=.254**, N=156 and P<0.05) has significant positive relationship with academic performance of the students. There is significant joint influence of ICT access and utilisation on academic performance of the science students (R=.282 and a multiple R2 of .079) and F-ratio of 6.595 (p<0.05). The main challenge was that students could not have access to most of the ICT facilities at schools. Therefore, the study recommended that both teachers and students should update their ICT skills, ICT newest editions should be provided by government, non-governmental organisations and proprietors, recruitment of technology personnel as ICT facilitators, among others.

Keywords: *Information and Communication Technology, Access, Utilisation, Sciences, Academic performance*

Introduction

Education systems in developing countries are often centrally managed in a top-down structure. This is visible in environments where schools have different needs and where localised information plays an important role. The core importance of education in secondary schools lies in the process of individual human capital acquisition and fulfillment, the externalities that stem from secondary school education and the significance of this fabric of knowledge for the process of economic growth that is now well accepted. Apart from many theoretical explorations, a large empirical literature has emerged. The empirical explorations focus on a number of important issues. Studies of the determinants of school attendance link the secondary school education decisions of students to their cognitive and non-cognitive ability, their other characteristics, and the characteristics of their family (Day, 2009; Frenette, 2009).

According to Federal Government of Nigeria on National Policy on Education (2004), the objectives of secondary school education in the country is to: provide all primary school leavers with the opportunity for education of higher level irrespective of sex, social status, religion or ethnic background; offer diversified curriculum to cater for the differences in talents, opportunities and future roles; provide trained manpower in the applied science, technology and commerce at sub-professional grades; develop and promote Nigerian languages, art and culture in the context of world and culture heritage. The objectives also include: fostering national unity with an emphasis on the common ties that unite us in our diversity; raise a generation of people who can think for themselves, respect the views and feelings of others, respect the dignity of labor, appreciate those values specified

under our broad national goals and live as good citizens; provide technical knowledge and vocational skills necessary for agricultural, industrial, commercial and economic development (Awwalu, Najeemah & Mohammad, 2012).

However, secondary school students are growing up in a fast changing technology environment. The trend in emerging technologies comprises three major components namely content creation, content sharing and interactivity. Improved secondary education is essential to the creation of effective human capital in any country (Evoh, 2007). The need for ICT in Nigerian secondary schools cannot be overemphasized. In this technology-driven age, everyone requires ICT competence to survive. Organizations are finding it very necessary to train and retrain their employees to establish or increase their knowledge of computers and other ICT facilities (Adomi & Anie, 2006; Tyler, 1998).

ICT is a composite term, which embodies three important concepts. To understand ICT, one must understand all three concepts. "Information" means many things to many people, depending on the context. Scientifically, information is processed data and can be loosely defined as that which aids decision making. Information, though abstract, could also be visualized as a commodity, which could be bought or sold. Other writers have defined information as: Any potentially useful fact, quantity or value that can be expressed uniquely with exactness. Information is whatever is capable of causing a human mind to change its opinion about the current state of the real world (deWatteville & Gilbert 2000). Communication on the other hand refers to the transfer or exchange of information from person to person or place to place. When action produces a reaction, whether positive or negative, communication has taken place. Other writers in the field of communication studies have defined communication as: a process: a transfer of information, ideas, thoughts and messages. It involves a sender, a receiver, a code and, a language that is understood by both the sender and the receiver (Womboh, 2008).

Communication is a process involving the passing of messages through the use of symbols, which all parties in the communication encounter understand. It involves the exchange of ideas, facts, opinions, attitudes and beliefs between people. It is not a one-way affair. There must be a sender to transmit the message, and receiver to make appropriate decisions on how the rest of the exchange should continue. As opined by James (2004) Technology refers to the use of scientific knowledge to invent tools that assist human beings in their efforts to overcome environmental hazards and impediments to comfort. In this regard, technology refers to the things like the computer, telephone, cell phone, GSM handsets, television and radio. Put together, therefore, ICT has been defined as: The acquisition, analysis, manipulation, storage and distribution of information; and the design and provision of equipment and software for these purposes. (deWatteville & Gilbert, 2000). ICT has become the most popular and easy means of dissemination of science information and communication and this calls for possession of adequate ICT skills by science students. The ability to use computers effectively has become an essential part of everyone's education. The demand for Computer/ICT literacy is increasing in Nigeria, because employees realise that computers and other ICT facilities can enhance efficiency. On the other hand, employees have also realized that computers can be a threat to their jobs, and the only way to enhance job security is to become computer literate. With the high demand for computer literacy, the teaching and learning these skills is a concern among professionals. This is also true of other ICT components.

The philosophy of the Nigeria policy in Education (NCE) on science education is inspired by the desire to help students become intellectually informed in science and technology. Science education combined both theory and practical learning of science related subjects such as Physics, Chemistry, Biology, Further Mathematics, general Mathematics and Agricultural Science together in secondary schools; learning one and leave the other is not acceptable. Science education comprises numerical techniques, analytical geometry, trigonometry and calculus, mechanics and properties of matter, others are electromagnetism, basic and digital electronics, science methodology, heat, optics, modern and quantum science and chemical matters. Practical science and workshop are unique features of science education that cannot be compromised.

Other features of science education include the essentialness of field trip and students" project. Every student is expected to complete their syllabus in all science subjects before enrolling for senior school certificate examination (SSCE); science education permits student to carry out projects purely

in science fields. It is mandatory for students to go on excursion at least once before they complete their secondary school education to enable them learn importance of community resources in learning of science subjects. A lot of factors to a greater extent have an impact on student's academic performance in science among which include access to and use of ICT facilities. This paper therefore seeks to investigate the influence of access points and ICT utilization on academic performance of science students in selected private secondary schools in Ibadan city.

Statement of the Problem

Several factors seem to have impact on student's academic performance in science subjects. Among these include teachers' expectations on students" academic performance, which also depends on quality of ICT facilities adopted for teaching and learning, where the students have access to the ICT facilities and the types of ICT facilities used in the teaching and learning process. There has been significant interest and concern about the risks of ICTs because of access to information even at a click of buttons and the anonymity that the system allows. Many parents are worried that their wards are spending too much time on ICT, driven tools like Facebook and other social media and not enough time studying.

In addition, there appears like there is a silent assumption that a student at the secondary school level is an emotionally, physically, intellectually and socially mature learner; one who has already chosen a career path and is keen to attain the theoretical rudimentary through interaction with science subjects' content unlike their counterparts at the lower levels, who are still at the quagmire of self-identity and career path search. Poor academic performance in science however is an indicator that the commitment to attaining the career goal might either be lacking or has been dimmed by either internal or external influences. Several studies have been conducted by different researchers and have come up with submissions like: many secondary school students use ICT facilities to communicate with family, teachers, and friends. ICTs have created new and non-personal ways for people to interact with others and students have taken advantage of this technological trend mainly for social and entertainment purpose at the detriment of their studies. In spite of all these submissions by different researchers, writers and scholars, there still seems to be a gap in issues relating to ICT access and utilization as determinants of academic performance in sciences among secondary school students. It is against this background that this study seeks to conduct an investigation on this with particular reference to selected private secondary school students in Ibadan.

Objectives of the Study

This study sought to investigate the extent to which ICTs access and utilisation determine the academic performance of science students in private secondary schools in Ibadan. Thus, the specific objectives of the study were to:

i. find out the access points to ICT facilities use for learning sciences among private secondary school students in Ibadan;

ii. establish the influence of ICTs access points on academic performance of the science students;

iii. determine the influence of ICTs utilisation on academic performance of the science students; and

iv. ascertain the joint effect of access points and ICTs utilisation on academic performance of the sciences students.

Research Questions

The following are the questions that this study seeks to answer:

1. What are the access points to ICT facilities used for learning sciences among private secondary school students in Ibadan?

2. What is the average performance of the science students as at last terminal examination?

Research Hypotheses

This study seeks to test the following hypotheses at 0.05 level of significance:

Ho[1]: There is no significant relationship between ICTs access points and academic performance of science students in selected private secondary schools in Ibadan.

Ho[2]: There is no significant relationship between ICTs utilisation and academic performance of science students in selected private secondary schools in Ibadan.

Ho[3]: There is no significant joint influence of ICTs access points and ICTs utilisation on academic performance of science students in selected private secondary schools in Ibadan.

Review of Related Literature

Looking at the role of education in nation building and the population explosion in the secondary schools these days, access to ICT in the teaching-learning process becomes imperative. This is true because its adoption by the students will enhance effective learning. Such issues like good course organisation, effective class instruction learning, content creation, self-assessment, self-study collaborative learning, task-oriented activities and effective communication between the students and even teachers and academic activities will be enhanced by access to ICT and in particular, the use of ICT based technology. However, teaching and learning have gone beyond the teacher standing in front of a group of students and disseminating information to them without the students" adequate participation (Ajayi, 2008). The author posited that with access to ICT, students can be taken beyond the traditional limits, ensure their adequate participation in teaching and learning process and create vital environments to experiment and explore.

Adequate access could be enhanced to the following various ICT facilities used in the teaching learning process in schools according to Babajide and Bolaji (2003), Bryers (2004), Bandele (2006) and Ofodu (2007): radio, television, computers, overhead projectors, optical fibers, fax machines, CD-ROM, Internet, electronic notice board, slides, digital multimedia and video/VCD machine. It appears some of the facilities are not sufficiently provided for the teaching - learning process in the secondary schools. This might account for why teachers are not making use of them in their teaching. According to Ajayi (2008), access to these facilities and its use involves various methods, which include systematized feedback system computer-based operation/network, video conferencing and audio-conferencing, Internet/worldwide websites and computer assisted instruction. It must however be stressed that the effective use of the various method of the ICT in teaching-leaning depends on the availability of these facilities and teachers' competence in using them. Observation has shown that there are no functional Internet facilities in most of the secondary schools. Thus, teachers as well as students appear not to be knowledgeable in the use of ICT because there appears not to be any official training for both the teachers and the students in the schools.

ICT for academic performance mean as dealing with disadvantaged populations anywhere in the world, but it is more seen with applications in developing countries. It concerns with directly applying information technology approaches to solve academic related problems. ICTs can be applied directly, or indirectly, where it can assist students to improve educational conditions in term of assignment preparation, school and home lesson, time table collation, group discussion and private study, lesson note copying, among others. ICT for academic performance needs to be properly monitored and implemented, as the system design and user interference should be suitable to the target uses. ICT for academic performance project installed without proper coordination with its beneficiary commonly have a tendency to fall short of the main objectives. For example, in the wage of ICT for students' academic performance project in those education sectors, where a majority of the population is considered to be technological illiterate, project lies idle and sometime gets damage and allowed to become obsolete (Massaquoi, 2006).

ICTs are very rarely seen as central to the overall learning process. Moreso, in the most advanced countries, ICTs are generally not considered central to the teaching and learning. Nevertheless, many ICT in education initiatives in LDCs seek (at least in their rhetoric) to place ICTs as central to teaching and learning (Abe & Adu, 2007). The positive impact of ICT use in education has not been proven. "In general, and despite thousands of impact studies, the impact of ICT use on student academic performance remains difficult to measure and open to much reasonable argument". Positive impact could be more likely when linked to pedagogy. It is believed that specific uses of ICT can have positive effects on students' academic performance, when ICTs are used appropriately to

complement a teacher's existing pedagogical philosophies (Faloye & Oparah, 2007). Computer Aided Instruction has been seen to slightly "improve students' performance on multiple choice, standardized testing in some areas Computer Aided (Assisted) Instruction (CAI)", which refers generally to student self-study or tutorials on PCs, has been shown to slightly improve student test scores on some reading and math skills, although whether such improvement correlates to real improvement in students' learning is debatable (Adedapo, 2007).

Aduwa-Ogiegbaen and Iyamu (2005) however listed some factors that constitute obstacle to the use of ICT in Nigerian secondary school to include: cost, weak infrastructure, lack of skills, lack of relevant software and limited access to the Internet, lack of regular electricity supply, lack of students training on ICT and its clear direction in the NNPIT, limited ICT facilities, lack of skilled personnel, among others. Olagunju (2012) contend that training is of utmost importance if students and teachers are to use the technology of their choice and that gaining the required skills further empowers teachers to use ICT in order to improve the condition of teaching-learning and as well contribute to community development.

Methodology

Descriptive survey design was adopted for this study. Data for the study was collected from science students in six selected private secondary schools in Ibadan. The choice of these 6 schools was based on their nation-wide acceptability as conventional private secondary schools with large population of science students. Also, these schools have educational resources this study was interested to use. These include: Kings International College, Moniya; Posit College, Arulogun Road; Yinbol College, Orogun; Milestone College, Arulogu Road; Adejare College, Abiola Area, Moniya, and Besley College, Moniya. Structured questionnaire that was personally administered by the researcher was used to collect data from the respondents. A total number of 156 copies of the questionnaire were retrieved from the respondents sequel to completion. The data collected was analysed with the use SPSS. Descriptive statistics such as frequency and percentage distribution in tables was used to answer the research questions, while the Pearson's correlation was used to test the hypotheses 1 and 2, and regression analysis was used to test the hypothesis 3.

Results and Discussion

A total of 156 copies of questionnaire were administered on the science students out of which 156 were returned with useful responses. This gives a response rate of 100% which is considered adequate for this study. The analysis and presentation of results were therefore based on the 156 useful responses received.

RQ 1: What are the access points to ICT facilities use for learning sciences among private secondary school students in Ibadan?

Table 1: Access Points to ICT Facilities Use for Learning Physics

S/N	ICT Tools	School		Home		Cyber Café	
		Freq.	%	Freq.	%	Freq.	%
1	CD ROM	35	22.4	43	27.6	110	70.5
2	Overhead Projector	59	37.8	47	30.1	17	10.9
3	Digital Camera	40	25.6	54	34.6	47	30.1
4	Computer	50	32.1	103	66.0	101	64.7
5	Interactive White Board	110	70.5	98	62.8	21	13.5
6	Internet	59	37.8	100	64.1	107	68.6
7	Telephone	52	33.3	48	30.8	37	23.7
8	Fax Machine	40	25.6	56	35.9	59	37.8
9	Scanning Machine	51	32.7	45	28.8	114	73.1
10	Radio	53	34.0	97	62.2	58	37.2
11	Mobile Phone	55	35.3	96	61.5	49	31.4
12	Television	110	70.5	114	73.1	108	69.2
13	Filmstrip	57	36.5	48	30.8	40	25.6
	N = 156						

Table 3 presents response distribution on access points to ICT facilities use for learning science subjects among private secondary school students in Ibadan. Hence, most of the respondents have access to: television 110(70.5%) at school, 114(73.1%) at home and 108(69.2%) at cyber café; interactive white board 110(70.5%) at school and 98(62.8%) at home; Internet 100(64.1%) at home and 107(68.6%) at cyber café; Computer 103(66.0%) at home and 101(64.7%) at cyber café; 96(61.5%) at home. However, respondents only had access to radio 97(62.2%) at home, mobile phone 96(61.5%) at home, scanning machine 114(73.1%) at cyber café and CD-ROMS 110(70.5%) at cyber café. Based on the results in Table 3, respondents had access to television at school, home and cyber café. Interactive white board was accessed at school and home while, Internet and Computers were accessed at home and cyber café.

RQ 2: What is the average performance of the science students as at last terminal examination?

Table 2: Average performance of the science students

Marks Obtained	Frequency	Percentage (%)
70 and Above	10	6.4
65-69	11	7.1
60-64	78	50.0
55-59	6	3.8
50-54	8	5.1
45-49	15	9.6
40-44	15	9.6
0-39	13	8.3
N = 156		

Most of the science students were good as 78(50.0%) affirmed that they scored between 60-64 marks in their last terminal examination. Only 13(8.3%) of the respondents failed as they scored between 0-39 marks (see Table 2). Therefore, it is affirmed that the average performance of the students in science subjects was 60-64%.

Testing the Research Hypotheses

The hypotheses for this study were tested at 0.05 level of significance.

Ho_1: there is no significant relationship between ICTs access points and academic performance of science students in selected private secondary schools in Ibadan.

Table 3: Relationship between ICTs' access points and academic performance of the students

Variable	Mean	Std. Dev.	N	r	Sig. (P)	Remark
ICTs access points	20.94	2.186	156	.148**	.001	Sig.
Academic Performance of students	4.97	2.005				

** Significant P<.05

Table 3 presents information on relationship between ICTs' access points and academic performance of the science students in Ibadan. Findings show that ICTs' access has significant positive relationship with academic performance of the students (r = .148**, N = 156 and P < 0.05). This means that access to ICT facilities increase, there will be increase in academic performance of the students in science subjects. Therefore, Ho_1 is rejected.

Ho_2: There is no significant relationship between ICTs utilisation and academic performance of science students in selected private secondary schools in Ibadan.

Table 4: Relationship between ICTs utilisation and academic performance of the students

Variable	Mean	Std. Dev.	N	R	Sig. (P)	Remark
ICTs utilisation	26.04	2.012	156	.254**	.000	Sig.
Academic performance of students	4.97	2.005				

** Significant P<.05

Table 4 presents information on relationship between ICTs utilisation and academic performance of science students in private secondary schools in Ibadan. Findings show that ICTs utilisation has significant positive relationship with academic performance of students (r = .254**, N = 156 and P < 0.05). This means that for every level of increase in ICTs utilisation, there will also be increase in academic performance of the students in science subjects. Therefore, Ho 2 is rejected.

Ho_3: There is no significant joint influence of ICTs access points and ICTs utilisation on academic performance of science students in selected private secondary schools in Ibadan.

Table 5: ANOVA Table showing the joint influence of ICTs access points and ICTs utilisation on academic performance of science students

R	R Square	Adjusted R Square	Std. Error of the Estimate
.282	.079	.067	1.936

A N O V A						
Model	Sum of Squares	DF	Mean Square	F	Sig.	Remark
Regression	49.433	2	24.717	6.595	.002	Sig.
Residual	573.406	153	3.784			
Total	622.840	155				

Table 5 shows a coefficient of multiple correlation (R = .282 and a multiple R2 of .079). This

means that 7.9% of the variance was accounted for by the two predictor variables when taken together. The significance of the joint influence was tested at $P < .05$. The table shows that the analysis of variance yielded F-ratio of 6.595 ($p < 0.05$). This implies that the level of influence of the independent variables to the dependent variable was significant and that other variables not included in this model may have accounted for the remaining variance. Therefore, Ho3 is rejected.

Discussion of the Findings

Findings of this study revealed that respondents had access to television at school, home and cyber café. Interactive white board was accessed at school and home while, Internet and computers were accessed at home and cyber café. This is similar to the submission of Grossman and Helpman (2005), who maintained that laptops are now becoming the preferred method of computing, ICT continues to insinuate and alter itself in the ever-changing globe, where students have access to them in their schools, home or business environments. World Bank (2006) submits that Cyber Cafes and 'Call boxes' are generating a lot of income for owners of such businesses and are employing a good number of youths and equally engaging secondary school students in Internet browsing. Adomi, Okiy and Ruteyan (2003) maintained that most cybercafé clients in Nigeria are students. The absence of ICT equipment in most Nigerian secondary schools leads students to resort to cybercafés for Internet access.

In addition, findings revealed that the average performance of the students in science subjects was 60-64%. This perhaps explains the academic ability of the students as a result of their ICT utilisation. Therefore, the finding is in line with Adeyemi (2011) who maintained that a students' performance is mainly explained by a student's characteristics, educational environment and teachers' characteristics, thus access to, and use of ICT may have significant impact on these determinants and consequently the outcome of students' education.

Findings revealed that ICTs' access has significant positive relationship with academic performance of the students ($r = .232^{**}$, N = 204 and $P < 0.05$). This is in support of Yusuf (2005), who stressed that access to ICT facilities has significant effect on academic performance of students. Thus, ICTs have the potential to accelerate, enrich, and deepen skills, to motivate and engage students, to help relate school experience to work practices, create economic viability for tomorrow's workers, as well as strengthening teaching and helping schools change.

Findings revealed that ICTs utilisation has significant positive relationship with academic performance of stud ents ($r = .254^{**}$, N = 156 and $P < 0.05$). This explains Adedapo (2007) who was of the opinion that computer Aided Instruction has been seen to slightly "improve students' performance on multiple choice, standardized testing in some areas. Computer Aided (Assisted) Instruction (CAI)", which refers generally to student self-study or tutorials on PCs, has been shown to slightly improve student test scores on some reading and Math skills, although whether such improvement correlates to real improvement in student learning is debatable.

Findings equally revealed that the coefficient of multiple correlation yielded (R = .282 and a multiple R2 of .079). This means that 7.9% of the variance was accounted for by the two predictor variables when taken together. The significance of the joint influence was tested at $P < .05$. The table shows that the analysis of variance yielded F-ratio of 6.595 ($p < 0.05$). This implies that the level of influence of the independent variables to the dependent variable was significant and that other variables not included in this model may have accounted for the remaining variance. This therefore supports the view of Adomi and Kpangban (2010), who maintained that adoption and use of ICTs in schools have a positive impact on teaching, learning, and research.

Conclusion

Despite the significance of ICTs in development of Nigeria secondary schools education, these private secondary schools are yet to fully adopt ICT for teaching and learning in spite of the fact that they have majority of the educational resources this study was interested to use. Yet, access to, and use of ICT has significant influence on science students, academic performance. However, the main problem confronting the proper use of ICT facilities by the students was fear of using ICT tools due to lack of confidence in ICT tools. Hence, there could be improvement on the students' academic

performance if teachers are willing to learn and strengthen the students' understanding and their ICT literacy skills in line with the 21st century ICT competency demands.

Recommendations

The following recommendations were made based on the findings of this study:

1. As ICT continues to take on new form, with nanotechnology set to usher in a new wave of ICT electronics and gadgets, both teachers and science students should try and update their ICT literacy skills in order to take full advantage of ICT facilities for teaching and learning purposes.
2. Government, non-governmental organisations and school proprietors should make adequate provision for ICT newest editions such as smart watches, (the Apple Watch), smart wristbands (the Nike+ FuelBand), and smart TVs (Google TV) available for science and technology learning purpose.
3. Science teachers should ensure that ICT facilities are used by science students positively and not to attract negative connotations.
4. There are large economic incentives (huge cost savings due to elimination of the telephone network) to merge the telephone network with the computer network system using a single unified system of cabling, signal distribution and management. Therefore, government/school authorities should endeavour to recruit qualified personnel or organise regular training and workshop for teachers to man the science and technology teaching and learning practical sessions effectively.

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