Assessment of Information and Communication Technology (ICT) Resources and their Influence on Basic Science Learning in the Federal Capital Territory (FCT), Abuja

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Abstract
This study sought to assess availability, functionality and adequacy of Information and Communication Technology (ICT) resources, and their influence on basic science learning. A descriptive survey research design was adopted for the study. A total sample size of 174 basic science teachers from the two Area councils (AMAC and Kuje) participated in the study. "ICT Facilities and its Influence on Basic Science Learning Questionnaire" (IFIBSLQ) was used to collect data from public and private lower and upper schools in AMAC and Kuje Area councils of FCT. Data obtained were analysed, using frequency, percentage, one-sample and Independent samples t-tests at 0.05 level of significance. Findings showed that the level of availability of ICT facilities is high; functionality is poor, while adequacy is low. There is however no significant difference in the influence of ICT on basic science learning between rural and urban areas. All hands are to be on deck in ensuring effective usage of ICT resources for basic science learning in secondary schools.

***Keywords**: Assessment, ICT facilities, Basic science learning*.

Introduction
There have been numerous contributions of science and technology to human development. Consequently, just as other nations of the world, Nigeria is striving to have its citizens educated in Science, Technology, Engineering and Mathematics (STEM) disciplines (Umar & Salihu, 2015; Enemarie, 2016; Nwachukwu, 2017). Basic science on the other hand, is a component of science and technology, a subject taught at upper and lower basic schools level. As a result, it is the bedrock of science and technology subjects in the secondary school and by extension science, technology and engineering disciplines in tertiary institutions. The position of basic science as the bedrock for all science subjects in the secondary school and by extension science and technology related disciplines in tertiary institutions, has led to its inclusion in the Nigerian basic school curriculum.

According to FRN (2013), basic science learning is aimed at enabling the student who is exposed to it to acquire the specific science process skills such as observation, organizing information acquired, generalizing on the basis of acquired information, predicting as a result of generalization and designing experiment to check prediction.

According to Aina (2013), science is dynamic and new discoveries are coming up every day in science and in teaching methodology and thus we can benefit from these developments when we are connected to the world through ICT. Mbugua, Gori and Tanui (2015) also observed that the objective of global investment in ICT has been to improve teaching and learning in schools since ICT integration in teaching makes the lessons more interesting which again results to improved students' performance in examinations.

Information and communication technology facilities refer to valuable tools used to enhance teaching and learning (Duke, 2018). Achor and Ityobee (2020) identified various ICT facilities used in the teaching and learning process to include desktops, digital camera, the internet and the World Wide Web (WWW), CD Rom and DVDs, electronic mails, digital libraries, computer mediated conferencing, video conferencing, computer, power point, television, overhead projector, radio cassette, video tape, audio cassette, audio CD, electronic notice board and telephone. According to Achor and Ityobee (2020) it appears some of these facilities seem not to be sufficiently available for teaching and learning process and might have accounted for why teachers and students are not making good use of them in their teaching and learning.

Achor and Ityobee (2020) also found that the available ICT facilities were more in urban than rural Upper Basic schools in Benue State. This was also corroborated by Pei-Yu (2013) who found that there was a significant difference in technology availability between rural and urban schools, including the number of interactive whiteboards, desktops in laboratories, notebooks, netbooks, and tablet computers in favour of urban schools. Mabayoje, Isah, Bajeh and Oyekunle (2015) found that there was low level of ICT skills among secondary school students in the rural areas and that there was lack of ICT facilities for hands-on training which is the main reason for low ICT skills for teaching and learning. In the same vein, Onwuagboke (2014) found that the extent of availability of ICT resources in rural secondary schools was very low.

On functionality, Eze and Aja (2014) found that ICT devices are not available and most of the ICT devices are not in good working condition in schools. Abdul-Salam (2012) also found that ICT facilities were not available in most of the schools and wherever available they were inadequate as compared to the number of students. Similarly, Onwuagboke (2014) found that the extent of availability of ICT resources in secondary schools is very low, in other words they were grossly inadequate in the schools where they were found.

ICT has been found by various scholars to enhance learning in sciences. Oyebola (2018) observed that the use of multimedia improves learning and positively influenced students' academic performance and therefore there is need for integration of ICT in teaching Biology. Basri, Alandejani and Almadani (2018) also found that there exists a relationship between ICT integration and academic performance.

Mbugua, Kiboss and Tanui (2015) concluded that integration of ICT in teaching is a vital component in the improvement of students' academic performance.

It is in recognition of the importance of ICT in education that government and non-governmental organizations in the developing countries are now investigating on educational technologies with a view to bridging the digital gap and enhance teaching and learning in the new contemporary society. Assessment of the availability of these ICT resources at basic education level becomes very necessary in basic school in the study area. Assessment study on the availability and influence of ICT resources has being overlooked in the educational research in the basic education subsection. This present study focused to assess ICT resources and its influence on basic science learning at the basic education subsystem.

Purpose of the study

The main purpose of this study is to ascertain the degree of availability of ICT resources and their influence on basic science learning, in two Area Councils (AMAC and Kuje) of FCT Abuja, Nigeria. The specific objectives are:

- To ascertain the level of availability of ICT resources used for Basic science learning.
- To determine the level of functionality of ICT resources used for Basic science learning.
- To investigate the adequacy of ICT resources used for Basic science learning.
- To determine the influence of ICT on Basic science learning in rural and urban areas.

Research questions

The following research question was raised in this study:

- To what extent is ICT for learning Basic Science Available in the sampled schools?
- To what extent are ICT for basic science learning functional in the sampled schools?
- To what extent are ICT resources for basic science learning adequate in the sampled schools?

Hypothesis

1. There is no significant difference in the influence of ICT resources on Basic science learning in rural and urban areas.

Research Methodology

This study was designed to investigate the assessment of ICT resources on Basic science learning. The study used descriptive survey method. The population of the study comprised of basic science teachers in private and public owned primary and secondary schools in Abuja Municipal Area Council (AMAC) and Kuje area councils. The population was stratified into the two councils and then participants were purposively selected based on availability and willingness to participate in the study. A total of 174 basic science teachers in the selected two area councils (AMAC and Kuje) participated in the study. One instrument titled "ICT Resources and its Influence on Basic Science Learning Questionnaire" (IRIBSLQ) was used to collect data from public and private lower and upper schools in AMAC and Kuje Area councils of FCT. Three experts were involved in the validation of the questionnaire instrument. Corrections were thereafter effected before administering to the targeted audience. Reliability of the instrument used was computed with the aid of the Statistical package for Social Sciences version 23 using Cronbach alpha statistics. The reliabilities of the functionality and adequacy of ICT for teaching basic science were found to be 0.834 and 0.866 respectively. Availability was a checklist. Data obtained from the administration of the instrument was analysed, using frequency, percentage and t-test at 0.05 level of significance.

Result

Analysis of respondents across gender divide showed that 52.3% were males while 47.7% were females. Based on location of respondents, 53.4% were from the urban area while 46.6% were from the rural area.

Research Question One: To what extent are Information and Communication Technology (ICT) resources for basic science learning available in the sampled schools?

Table 1: Table Showing Availability of Information and Communication Technology (ICT) resources for Learning Basic Science (N = 174).

S/N	ITEMS	AVAILABILITY				TOTAL	%
		Yes		NO			
		No	%	No	%		
1.	Desktop computer	140	80.5	34	19.5	174	100
2	Digital cameras	86	49.4	88	50.6	174	100
3.	Projectors	105	60.3	69	39.7	174	100
4.	Scanners	106	60.9	68	39.1	174	100
5.	Photocopier	112	64.4	62	35.6	174	100
6.	Printers	128	73.6	46	26.4	174	100
7.	Smart phones	123	70.7	51	29.3	174	100
8.	Instructional animations	103	59.2	71	40.8	174	100
9.	Tablets or IPad	92	52.9	82	47.1	174	100

Table 1 above shows the extent to which Information and Communication Technology (ICT) resources for teaching basic sciences are available in the sampled schools. Eight out of the nine Information and Communication Technology (ICT) resources highlighted were available. This is shown by the percentage of schools that claimed that each of the eight Information and Communication Technology (ICT) resources highlighted were available. Therefore, the following instructional resources were available in majority of the schools sampled; Desktop computer, Projectors, Scanners, Photocopier, Printers, Smart phones, Instructional animations and Tablets or IPad. However in about half of the schools (50.6 %), Digital cameras were not available.

Research Question Two: To what extent are Information and Communication (ICT) Resources **for basic science learning functional in the sampled schools?**

Table 2: Table Showing Functionality of Information and Communication (ICT) Resources for Learning Basic Science (N = 174).

S/N	ITEMS	FUNCTIONALITY						Total	%
		Poor		Fair		Very Okay			
		No	%	No	%	No	%		
1.	Desktop computer	25	14.4	90	51.7	59	33.9	174	100
2.	Digital cameras	63	36.2	71	40.8	40	23.0	174	100
3.	Projectors	54	31.0	71	40.8	49	28.2	174	100
4.	Scanners	37	21.3	78	44.8	59	33.9	174	100
5.	Photocopier	40	23.0	73	42.0	61	35.1	174	100
6.	Printers	34	19.5	71	40.8	69	39.7	174	100
7.	Smart phones	45	25.9	61	35.1	68	39.1	174	100
8.	Instructional animations	48	27.6	72	41.4	54	31.0	174	100
9.	Tablets or ipad	59	33.9	65	37.4	50	28.7	174	100

Table 2 above also showed the level of functionality of the Information and Communication (ICT) resources for teaching basic sciences in the sampled schools. The functionality of the

resources was generally below average. Seven of the Information and Communication (ICT) resources (Desktop computer, Digital cameras, Projectors, Scanners, Photocopier, Printers, Instructional animations Tablets or ipad) were just fair in more than 40% of the schools sampled. Therefore, the analysis result showed that generally, the ICT resources were generally not functioning well.

Research Question Three: To what extent are ICT resources for basic science Learning adequate in the sampled schools?

Table 3: Table Showing Adequacy of ICT resources for Learning Basic Science (N = 174).

S/N	ITEMS	ADEQUACY						Total	%
		Not Adequate		Somewhat Adequate		Very Adequate			
		No	%	No	%	No	%		
1.	Desktop computer	55	31.6	67	38.5	52	29.9	174	100
2.	Digital cameras	88	50.6	47	27.0	39	22.4	174	100
3.	Projectors	80	46.0	58	33.3	36	20.7	174	100
4.	Scanners	69	39.7	56	32.2	49	28.2	174	100
5.	Photocopier	78	44.8	53	30.5	43	24.7	174	100
6.	Printers	70	40.2	46	26.4	58	33.3	174	100
7.	Smart phones	97	55.7	38	21.8	39	22.4	174	100
8.	Instructional animations	82	47.1	43	24.7	49	28.2	174	100
9.	Tablets or ipad	93	53.4	51	29.3	30	17.2	174	100

Table 3 above showed the level of adequacy of the ICT resources for teaching basic sciences in the sampled schools. The adequacy of the ICT resources was generally not adequate. For instance, none of the ICT resources was very adequate and non was somewhat adequate in more than 40% of the schools sampled. Therefore, the analysis of the result showed that generally, the ICT resources for basic science teaching were grossly inadequate.

Hypotheses Testing

Hypothesis One: There is no significant difference in the influence of ICT resources on Basic science learning in rural and urban areas.

Table 4: T-Test Analysis of Influence of ICT resources on Basic science learning in rural and urban areas.

Location	N	Mean	Standard Deviation	T	df	Sig.(2tailed)	Remark
Urban	93	43.8387	8.69569	.898	172	.370	NS
Rural	81	42.6543	8.65038				

Table 4 presents the t-test comparison of influence of ICT resources on basic science learning in rural and urban areas. The t-test comparison showed that the difference in rural and urban influence of ICT resources on basic science learning was not statistically significant. This is evident from the sig-2 tailed value that is greater than the 0.05 benchmark. Since any t-test comparison of means of two groups which is greater than the 0.05 benchmark signifies insignificant difference in influence of the two groups (urban and rural areas), it therefore

follows that the difference is not statistically significant. Therefore, the null hypothesis which states that there is no significant difference in the influence of ICT resources on Basic science learning in rural and urban areas is accepted. The values of the mean influence of urban and rural areas however showed that the influence of urban area is higher than that of their rural areas. Since the difference is not statistically significant, it cannot be generalised; it must have occurred due to sampling error.

Discussions of Findings

The findings in table 1 showed that the level of availability of most of ICT resources in basic science learning is high. This could be due to the fact that many have now embrace ICT. Moreover, majority of the schools are private schools. Private schools often seek to outshine their contemporaries, and one way to achieve this is to step up acquisition of facilities like ICT to the pleasure of parents. The finding of this study contradicts findings of Achor and Ityobee (2020) who on investigating availability of information and communication technology facilities across urban and rural Upper Basic schools in Benue State, Nigeria found that ICT facilities were not available in Upper Basic schools in Benue State.

The findings from table 2 showed that the level of functionality of ICT resources for basic science learning were not generally below average. One of the reasons for this could be because of the economic downturn in the country. Scarcity of funds might have affected negatively the level of quality and maintenance of the facilities procured. The finding from this study on functionality of ICT resources for teaching basic science agrees with Eze and Aja (2014) who found that most of the ICT devices available are not in good working condition in schools.

The findings in table 3 showed that the ICT resources for teaching basic sciences in the sampled schools were grossly inadequate. This is expected in a country like Nigeria with all the economic challenges. This result is in agreement with Onwuagboke (2014) who found that the extent of availability of ICT resources in secondary schools is very low, in other words they were grossly inadequate in the schools where they were found.

The findings in table 4 showed that there is no significant difference in the influence of ICT on basic science learning in rural and urban areas. These findings may be as a result of the curriculum content which can be in the form of texts and visuals like pictures, posters, audio-visual multicolour images and videos, maps, and graphics which can be simultaneously presented to the students while in class irrespective of their location. The implication is that students in both rural and urban areas have identical opportunity to excel in sciences with the use of ICT resources in teaching basic science. Although the difference in ICT resources influence on basic science teaching and learning is not statistically significant and cannot be generalised, there is however a difference based on the sample for this study. The sampled urban respondents had shown a higher impact of ICT resources on basic science learning. This could be because of the level of accessibility and literacy obtainable in the urban areas.

Achor and Ityobee (2020) also found that the available ICT facilities were more in urban than rural Upper Basic schools in Benue State. This was also corroborated by Pei-Yu (2013) who found that there was a significant difference in technology availability between rural and urban schools, including the number of interactive whiteboards, desktops in laboratories, notebooks, netbooks, and tablet computers in favour of urban schools. Mabayoje, Isah, Bajeh and Oyekunle

(2015) found that there was low level of ICT skills among secondary school students in the rural areas and that there was lack of ICT facilities for hands-on training which is the main reason for low ICT skills for teaching and learning. In the same vein, Onwuagboke (2014) found that the extent of availability of ICT resources in rural secondary schools was very low.

Conclusion

The findings of the study revealed that ICT resources for basic science learning were quite available while their functionalities and adequacies were poor in the teaching of basic science learning. The difference in the effects of ICT resources on basic science learning between urban and rural areas is considerably the same, since the difference is not statistically significant.

Recommendations

In line with the findings of this study, the following recommendations are made:

i. Science teachers should be given incentives, remuneration to encourage and motivate them towards proper utilization of ICT resources for best educational practices.
ii. School administrators should ensure the adequate provision and functionality of ICT resources for basic science learning.
iii. Curriculum planners, developers and designers should endeavour to include in the curriculum, activities that will enhance the use of ICT resources, so that even the students can participate and/or learn independently when given the opportunity.
iv. Educational bodies at the state and local government level should ensure that adequate supervision and close monitoring of class room teachers are frequently done so as to ensure the usage of the available ICT resources for basic science learning.

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