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Assessment and Prospective Application of Information and Communication Technology Usage among Secondary School Teachers in Enugu Urban, Nigeria

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Authors' contributions

Authors may use the following wordings for this section: This work was carried out in collaboration between all authors. Authors UMN and UMB designed the study, author UMN performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Author MBU supervised the research. All authors read and approved the final manuscript.

Original Research Article

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ABSTRACT

Aims: To assess the secondary school teachers' usage of ICT in Enugu Urban, Nigeria.
Study Design: Descriptive survey design (Questionnaire).
Place and Duration of Study: Department of Education, Institute of Ecumenical Education Thinkers Corner, Enugu, Nigeria, between April 2011 and December 2011.
Methodology: 253 teachers were randomly selected from 40 public secondary schools in Enugu Urban, Nigeria. Assessments were made on ICT facilities available to teachers, adequacy level of exposure to these ICT facilities, perceived benefits and challenges facing ICT usage and adoption among teachers.
Results: It showed that most of the ICTs were not available in schools and the teachers were not too well exposed to ICT facilities. The study also x-rayed the teachers' perceived benefits to ICT usage and challenges facing ICT usage in secondary schools.
Conclusion: It was recommended among others that there should be: inclusion of ICT programmes at various teachers educational institutions, provision of functional and

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adequate ICT facilities in schools by school administrators, proper funding of education by the government, provision and improvement of infrastructures especially electricity and finally establishment of ICT crash programmes for teachers and subsequent update.

Keywords: Information and communication technologies; teachers; secondary schools; education; Nigeria.

1. INTRODUCTION

1.1 Introduction / Statement of the Problem

In recent years there has been a groundswell of interest in how computers and the Internet can best be harnessed to improve the efficiency and effectiveness of education at all levels and in both formal and non-formal settings.

One of the many challenges facing developing countries today is preparing their societies and governments for globalization and the information and communication revolution. Policy-makers, business executives, NGO activists, academics, and ordinary citizens are increasingly concerned with the need to make their societies competitive in the emergent information economy [1].

ICT stands for information and communication technologies. According to Bandele [2], ICT is a revolution that involves the use of computers, internet and other telecommunication technology in every aspect of human endeavour. Jimoh [3] also defined ICT as the handling and processing of information (texts, image, graphs, instruction e.t.c) for use, by means of electronic and communication devices such as computers, cameras, telephone.

ICT according to Blurton [4] is defined as a diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information. The author posited that these technologies include computers, the Internet, broadcasting technologies (radio and television), and telephony. But ICTs are more than just these technologies; older technologies such as the telephone, radio and television, although now given less attention, have a longer and richer history as instructional tools [5]. For instance, radio and television have for over forty years been used for open and distance learning, although print remains the cheapest, most accessible and therefore most dominant delivery mechanism in both developed and developing countries [6]. The use of computers and the Internet is still in its infancy in developing countries, if these are used at all, due to limited infrastructure and the attendant high costs of access. Moreover, different technologies are typically used in combination rather than as the sole delivery mechanism. For instance, the Kothmale Community Radio Internet uses both radio broadcasts and computer and Internet technologies to facilitate the sharing of information and provide educational opportunities in a rural community in Sri Lanka [7].

Many different types of technology can be used to support and enhance learning. Everything from video content and digital moviemaking to laptop computing and handheld technologies has been used in classrooms. Similarly, new uses of technology such as pod casting are constantly emerging [8]. To Marshal, various technologies deliver different kinds of content and serve different purposes in the classroom. Word processing and e-mail promote communication skills; database and spreadsheet programmes promote organizational skills;

and modelling software promotes the understanding of Science and Mathematics concepts. It is important to consider how these electronic technologies differ and what characteristics make them important as vehicles for education [9].

Technologies available in classrooms today ranges from simple tool-based applications (such as word processors), to online repositories of scientific data. Others are primary historical documents, handheld computers, closed-circuit television channels, and two-way distance learning classrooms. Pensky [10] asserts that even the cell phones that many now carry with them can be used to learn. According to Lei and Zhao [11] each technology is likely to play a different role in students learning. Rather than trying to describe the impact of all technologies as if they were the same, researchers need to think about what kind of technologies are being used in the classroom and for what purposes. Two general distinctions could then be observed from the literature. Students can learn from computers where technology are used essentially as tutors and serve to increase student's basic skills and knowledge. Moreover, they can learn with computers where technology is used as tool that can be applied to a variety of goals in the learning process and can serve as a resource to help develop higher order thinking, creativity and research skills [12,13].

According to Murphy, R., Penuel, W., Means, B., Korbak, C., and Whaley, A. [14], the primary form of student learning from computers is described as Discrete Educational Software (DES), Integrated learning system (ILS), Computer-assisted Instruction (CAI), and Computer-based instruction (CBI). These software applications are also the most widely available applications of educational technology in schools today, along with word-processing software, and have assisted in classroom for more than 20 years [15]. Murphy, et al. [14], explains that teachers use DES not only to supplement instruction, as in the past, but to introduce topics, provide means for self-study, and offer opportunities to learn concepts otherwise inaccessible to students. The software also manifests two key assumptions about how computers can assist learning. First, the users' ability to interact with the software is narrowly defined in ways designed specifically to promote learning with the tools. Second, computers are viewed as a medium for learning, rather than as tools that could support further learning. As DES is recognised as the commonly used approach to computer use in student learning, in more recent years, use of computers in schools has grown more diversified as educators recognize the potential of learning with technology as a means for enhancing students reasoning and problem solving abilities. Zhang [16] notes that "this shift which has been driven by the plethora of new information and communication devices now increasingly available to students in school and at home, each of which offers new affordances to teachers and students alike for improving student achievement and for meeting the demand for 21st century skills."

In Nigerian educational institutions, especially secondary schools, the mode of delivery of knowledge and curriculum are not yet ICT enhanced, though with the development of a National Policy on ICT in Education, Nigeria is predictably a step in the right direction toward improvement for the sector. The newly introduced curriculum in Nigeria has computer studies / information and communication technology (ICT) as one of the core subjects [17].

A cursory look at the secondary schools in Nigeria has shown that many teachers in the system still rely much on the traditional "chalk and talk" method of teaching rather than embracing the use of ICT. According to Okebukola [18], computer is not part of classroom technology in over 90% of public schools in Nigeria, thus the chalkboard and textbooks continue to dominate classroom activities. This is an indication that the students are still lagging behind in the trend of changes in the world. This presupposes that there is the

tendency for the teachers and students to be denied the opportunities which ICT offers in the teaching-learning activities.

In order to replace the traditional pedagogical practices that still underpin the educational system in the country, there is need for the application of functional and efficient ICT in Nigerian Secondary Schools. Although, there have been studies on information and communication technology in Nigerian schools / institutions [19,20,21,22,23,24], much has not been written or studied on the effect and usage of ICT among teachers in public schools especially in Enugu Urban, South East Nigeria. The researcher therefore deemed it necessary to study ICT competence and usage among teachers in the aforementioned metropolis.

1.2 Purpose of the Study

The purpose of this study was to assess the secondary school teachers' usage of ICT in Enugu Urban. The study specifically seeks to:

a) Find out the availability of ICT facilities to teachers in the various schools in Enugu Urban Nigeria.
b) Ascertain the teachers adequacy of exposure to ICT facilities
c) Determine the challenges facing ICT usage among teachers.
d) Recommend solutions to the challenges facing ICT usage and adoption among the teachers.

1.3 Research Questions

To achieve the stated objectives of the study, the following research questions were developed to guide the study;

i. To what extent are the ICT facilities available to teachers?
ii. What is the adequacy level of teachers' exposure to ICT?
iii. What are the teachers perceived benefits of ICT usage?
iv. What are the constraints / challenges facing ICT usage and adoption among teachers?

2. METHODOLOGY

Descriptive survey design method was used for this study. The population for the study consisted of 40 public secondary school teachers in Enugu urban, Nigeria. Sample population comprises of 1965 teachers from 40 public secondary school in Enugu Urban as shown in table 9. Sample size determination was done using Taro Yamane formular:

$S = \frac{N}{1+N(e)^2}$ Where N= population of the sample population of 1965, e is error term(0.05).

Sample size (S) of 332 Teachers was obtained. 350 questionnaires were distributed to the teachers in the study area and a total of 253 respondents filled their questionaires properly, that is 72% return rate.

The respondents comprises of 253 secondary schools teachers (172 females and 81 males) randomly selected from 40 public secondary schools in the population. The respondents mean age range is 41-50 years. A self-designed questionnaire tagged "Teachers ICT use survey in secondary schools" was used to collect data for the study. The instrument consists of five sections. Section A request the respondents demographic information like age range, sex, location of school, class taught, subject taught and educational qualification. The items in section B required the respondent to tick as appropriate. Sections C and D were generated based on the research questions in chapter one of this work and the items in Sections C and D items are likert type response format in which the respondents were to choose from strongly agree, agree, undecided , disagree, strongly disagree and which has the following scores respectively:5,4,3,2,1. Section E dealt on the challenges and constraints faced with ICT adoption among the teachers. All the items were used to asses the secondary school teachers' usage of ICT in Enugu urban of Enugu state. The researcher derived that the validity of the instrument used was correct and vetted by educational research experts, thus the content validity was established. A measurement to assess reliability of this research instrument was seen as suitable in this investigation Thus, it was tested with Cronbach alpha coefficient, and a reliability coefficient of 0.89 was obtained, which showed a strong reliability of the research instrument. The data collected for this study were analysed using percentage scores and frequency counts:

$$\frac{F}{N} \times \frac{100}{1}$$

Where

F= frequency.
N= Total number of respondents

Table 1. Number of Teachers in the population sample

School	Number of Teachers
1	59
2	63
3	54
4	66
5	53
6	45
7	54
8	54
9	37
10	47
11	67
12	95
13	44
14	63
15	48
16	60
17	48
18	51
19	41
20	50
21	40

22	68
23	29
24	44
25	42
26	30
27	33
28	79
29	63
30	31
31	35
32	39
33	37
34	34
35	44
36	49
37	83
38	39
39	8
40	39
Total	1965

3. RESULTS AND DISCUSSION

The results of the analysis are presented and discussed below:

3.1. Demographic Information of the Respondents

From the demographic information presented in Tables 2 to 5, gender distribution of the respondents showed that females are higher in number than the males. The age range 31-40 had highest number of respondents while respondents above 60 years of age had the least number. Respondents with educational qualifications of bachelor's degree and HND holders had the highest number while there was no respondent with O'level qualification. Also greater percentage of the respondents teaches the junior secondary section.

Table 2. Distribution of respondents by gender

Sex	No	%
Female	172	67.98
Male	81	32.02
Total	253	100

Table 3. Age distribution of respondents

Age bracket	No	%
Below 20 years	7	2.77
20-30	43	17.00
31-40	74	36.36
41-50	92	29.25
51-60	31	12.25
Above 60	6	2.37
Total	253	100

Table 4. Distribution of respondents by educational qualification

Qualification	No	%
O'level and below	0	0.00
N.C.E	40	15.81
OND	6	2.37
HND/Bachelors degree	96	37.94
PGD	78	30.83
Msc	28	11.07
Ph.D	5	1.98
Total	*253*	*100.00*

Table 5. Distribution of respondents based on class taught

Class	No	%
Junior Class	151	59.6
Senior Class	102	40.4
Total	253	100

3.2 Research Question 1: To What Extent are the ICT Facilities Available to Teachers?

On the issue of availability of different ICTS in schools. It showed that most of the ICTS were not available in the schools as presented in Table 6. Although greater percentage of the teachers claimed that computers, Television sets and video equipment were available in their schools, other ICTS like internet, Radio (tape recorder), Projectors, Scanner, Digital camera, slide Disc player, film strips and electronic notice boards were not available. The inadequacy of this ICTS is in agreement with the reports of Ajayi and Ekundayo [19,20] and can be attributed to Governments inadequate funding. This hinders ICT usage and affects the resourcefulness of the teachers. The data obtained on availability of different ICTS is disappointingly low when viewed in terms of improvement of educational quality and training.

Table 6. Availability of different ICTS in schools

S/N	ICTS	Availability			
		Available		Not available	
		(N)	%	(N)	%
1	Computer	151	59.68	102	40.32
2	Internet	31	12.25	222	87.75
3	Radio(Tape recorder)	98	38.74	155	61.26
4	Projectors	26	10.28	227	89.72
5	Television sets	135	53.36	118	46.64
6	Video Equipment	127	50.20	126	49.80
7	Scanner	18	7.11	235	92.89
8	Digital camera	14	5.53	239	94.47
9	Slide	23	9.09	230	90.91
10	Film strips	0	0.00	0	0.00
11	Electronic notice boards	0	0.00	0	0.00
12	Disc player	98	38.74	155	61.26
	MEAN		*23.75*		*59.58*

3.3 Research Question 2: What is the Adequacy Level of Teachers' Exposure to ICT?

The study also shows that the teachers are not well exposed to ICT facilities in the respondent schools as shown in Table 7 .Elsewhere similar findings had been reported [19,20,24,25]. This is an evidence of low level of ICT application in teaching and learning process in Nigerian secondary schools. This implies that the teachers are not in tune with pedagogic application of ICTs rather they are still fond of the old of chalk and talk [19,20,26] and this practise doesn't encourage them to be in tune or update with the worlds ICT trends.

3.4 Research Question 3: What are the Teachers Perceived Benefits of ICT Usage?

The perception of ICT has been beneficial to use by teachers in this study corroborates findings by Kwache [27]; Ajayi and Ekundayo [20]; Tella et al. [19]. The benefits as seen in table 8 include making teaching-learning more interesting, fun, diverse, easy decision making, improvement of financial records, enhances teachers efficiency, helps distance learning programmes, makes teachers to be up-to-date in their disciplines/ subjects. This finding shows that the teachers know the important role ICT plays in teaching – learning process. Kwache [27] posited that the application of ICT makes institutions more efficient and productive, enhance and facilitate pedagogical activities. Similar report by Tella et al. [19] indicated that ICT is accurate, fast and reliable and has the capacity to store and disseminate large information within the shortest periods, makes it a veritable and indispensable instrument for distance education programme. The study showed that the respondents that strongly agree and agrees are more than those who disagreed or strongly disagreed on perceived benefits of ICT usage.

Table 7: Adequacy level of the teachers' exposure to ICT facilities in Enugu urban

S/NO	Items	SA		A		U		D		SD		Total	
		N	%	N	%	N	%	N	%	N	%	N	%
1	The school provides functional internet facilities and access for browsing	7	2.77	13	5.14	8	3.16	75	29.64	150	59.29	253	100
2	Teachers are exposed to the use of ICT in teaching	21	8.30	20	7.91	0	0.00	108	42.69	104	41.11	253	100
3	Enough ICT materials are provided for teaching	3	1.19	5	1.98	4	1.58	125	49.41	116	45.85	253	100
4	Teachers are knowledgeable in the use of ICT	8	3.16	75	29.64	6	2.37	89	35.18	75	29.64	253	100
5	ICT technical support / training are provided or organized for teachers periodically	3	1.19	6	2.37	11	4.35	154	60.87	79	31.23	253	100

3.5 Research question 4: What are the Constraints / Challenges Facing ICT Usage and Adoption among Teachers?

It has been shown in the study (see table 9) that frequent electricity interruption hinders ICT usage among teachers. Electricity problem is a major challenge in all sectors of the Nigerian economy and has militated against ICT application and use in Nigeria [28,29,24]. This accounts for irregular usage of ICT among the few schools with ICT facilities.

Inadequate ICT facilities as seen in the study hinders ICT usage. This can be attributed to poor funding. Similar results had been reported elsewhere [20,30].

This study also showed that majority of the teachers in the respondent schools lack ICT skills or are not computer literate. This can be attributed to non-inclusion of ICT in the teachers curriculum at educational institutions. This is supported by previous studies [20,30] and at variance with Adomi and Kpangban [25].

High cost of purchasing ICT facilities/ components as one of the challenges observed in the study is linked to exorbitant amount of computers and ICT accessories. This hinders ICT adoption as observed by some authors [25,31].

Nonchalant attitude of teachers and administrators in adopting ICT in teaching and learning as observed in the study is so because teachers are not well exposed to ICT and its still unfamiliar, distant and mysterious to them.

The study revealed that non-inclusion of ICT programmes in teachers training curriculum hinders ICT adoption. If ICT programmes are incorporated in their curriculum, it will equip them with ICT rudiments which aids the teaching and learning process.

Limited school budget accounts for challenges to ICT adoption among the respondents. This so because procurement of ICT facilities will be cumbersome.

Other factors that hinder ICT usage and adoption among the teachers in the respondents' schools were Lack of maintenance culture and poor management on the parts of the school administrators and government. This finding is at variance with Adomi and Kpangban [25], who reported that 3% and 2% of the respondents respectively agreed on the issue.

Table 8: Perceived benefits of ICT usage

S/NO	Items	SA		A		U		D		SD		Total	
		N	%	N	%	N	%	N	%	N	%	N	%
1	ICT helps in making teaching-learning more interesting	131	51.78	92	36.36	3	1.19	9	3.56	18	7.11	253	100
2	Using ICT makes lesson more fun	120	47.43	101	39.92	0	0.00	21	8.30	11	4.35	253	100
3	Using ICT makes lesson more diverse	111	43.87	109	43.08	2	0.79	10	3.95	21	8.30	253	100
4	Using ICT improves / enhances efficiency of teachers	150	59.29	79	31.23	7	2.77	11	4.35	6	2.37	253	100
5	ICT helps in distance learning programmes	156	61.66	60	23.72	8	3.16	15	5.93	14	5.53	253	100
6	Using ICT improves presentation of materials	100	39.53	91	35.97	12	4.74	30	11.86	20	7.91	253	100
7	ICT makes teachers to be up-to-date in their disciplines / subjects	129	50.99	99	39.13	5	1.98	7	2.77	13	5.14	253	100
8	ICT enhances financial records management in schools.	96	37.94	118	46.64	11	4.35	16	6.32	12	4.74	253	100
9	ICT usage makes decision making easy and faster in educational sector	95	37.55	97	38.34	15	5.93	22	8.70	24	9.49	253	100

Table 9: Challenges facing ICT usage and adoption among teachers

S/NO	Items	SA		A		U		D		SD		Total	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Frequent electricity interruption hinders the use of ICTS among teachers	133	52.57	94	####	4	1.58	10	3.95	12	4.74	253	100
2	Inadequate ICT facilities in schools	142	56.13	88	####	6	2.37	12	4.74	5	1.98	253	100
3	Limited school budget hinders ICT adoptions	148	58.50	83	####	5	1.98	11	4.35	6	2.37	253	100
4	Lack of ICT skills among teachers	109	43.08	##	####	6	2.37	17	6.72	8	3.16	253	100
5	High cost of purchasing ICT facilities / components	125	49.41	81	####	8	3.16	22	8.70	17	6.72	253	100
6	Non-challant attitude of teachers and administrators in adopting ICT in teaching and learning	98	38.74	93	####	10	3.95	30	11.86	22	8.70	253	100
7	Poor management on the parts of school administrators and government	87	34.39	##	####	4	1.58	40	15.81	17	6.72	253	100
8	Lack of maintenance culture	91	35.97	##	####	0	0.00	13	5.14	38	15.02	253	100
9	Non inclusion of ICT programmes in teachers training curriculum affects its adoption in schools	152	60.08	40	####	0	0.00	51	20.16	10	3.95	253	100

4. CONCLUSION AND RECOMMENDATIONS

4.1 Implications of the Findings

The result findings showed that ICT usage is still low or not encouraging among the teachers and so many challenges hinders ICT adoption and usage among teachers. The implications are: ICT facilities were not fully available in most schools. This hinders in ICT adoption and usage among teachers and also in teaching and learning process. More so, Teachers were not well exposed to ICT facilities in secondary schools. This implies that there is still a long way to achieve pedagogic application of ICT in Nigerian schools. In addition, Teachers knew the benefits of ICT usage and adoption. This implies that if these ICT facilities were provided for them with adequate encouragement in terms of manpower development, funding and so on, it will be utilised by them to some extent. Nevertheless, there were so many challenges facing ICT usage and adoption among teachers. This implies that for ICT to be fully utilised by the teachers, there should be solution/panacea to these problems.

4.2 Recommendations

The researcher recommended the following in order to enhance ICT adoption and usage among secondary school teachers: Inclusion of ICT programmes at various teachers educational institutions, provision of functional and adequate ICT facilities in schools by school administrators, proper funding of education by the government, provision and improvement of infrastructures especially electricity, establishment of ICT crash programmes for teachers and subsequent update.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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