Information and Communication Technology Literacy among Student-Teachers in Universities in Nigeria

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ABSTRACT

The use of Information and Communications Technology (ICT) in the school system is becoming increasingly prominent. This study was conducted to find out the ICT literacy levels among student-teachers in the universities in North-Central Nigeria. The study involved a total of 638 student-teachers consisting of 360 males and 248 females. The instrument used for the study was a researcher-designed questionnaire with a reliability index of .74. The results indicated that student-teachers in North-central Nigeria have an average ICT literacy level. No significant difference was established in the level of ICT literacy between male and female student-teachers {t(636)=1.672 >.05} and there was no significant difference in the level of ICT literacy by student-teachers in the Arts, Sciences, and Social Sciences {F(2,635) = 0.935 > 0.05}. It was recommended that universities make available more ICT equipment and facilitate the student-teachers in adopting the culture of integrating ICT into pedagogy and educational administration since they have an average ICT literacy level.

Keywords: *ICT, Literacy and Student-teacher, socio-political and teacher educator.*

INTRODUCTION

The rapid development in technology has led to tremendous changes in the way we live, and the social and educational demands of the society. In line with the impact of new technologies at workplaces and everyday life, teacher educational institutions try to improve their education programs and classroom facilities in order to minimize the teaching and learning technology gap between the present and the future.

Education is regarded as a veritable tool for socio-political and economic development not only in Nigeria but across the globe, thus, the introduction of Information and Communications Technology (ICT) as a facilitator of teaching and learning at all levels of the educational system. This is further affirmed in the Nigerian national policy on education (Federal Republic of Nigeria, FRN, 2004). It is, therefore, necessary for student-teachers to have a firm knowledge of information and communication technology and its impact on the society at large.

Several definitions have been provided for ICT. The University of Queensland, Australia (2008) referred to ICT as a term that covers all forms of computer and communication equipment and software used to create, store, transmit, interpret and manipulate information in its various formats. ICT use in the classroom is becoming increasingly prominent, because of children need to develop skills that will empower them for modern society and because of the potential value of such technologies as tools for learning.

However, one of the challenges facing teacher educators is how to ensure that graduate teachers have the necessary skills and pedagogical knowledge that will enable them to both effectively use today's

technologies in the classroom as well as continue to develop and adapt to new emerging technologies. Hence, the need to incorporate the acquisition of ICT literacy into the curriculum of teacher training in the higher institutions.

The term ICT literacy has at its roots in the need to involve the acquiring and advantageous use of information through the use of technology. The use of a range of communication tools such as Internet, e-mail and the World Wide Web (WWW) for information retrieval and dissemination is now considered to be components of ICT literacy and yet not necessarily that of computer literacy (Oliver & Towers, 2000). In addition, many of the skills previously associated with computer literacy are now commonly seen to be components of the more encompassing term ICT literacy. Many authors describe computer literacy as a component of a more encompassing list of ICT skills (Bruce, 1998; Elsenburg& Johnson, 1996; Shapiro & Hughes 1996).

The notion of computer literacy is tending to be considered a component of a larger set of key skills that have been identified as important outcomes of schooling outside the domain of traditional curriculum areas. These generic skills include such elements as reading and writing, communication skills, numeracy, critical thinking and people skills (Harvard, Hughes, & Clark, 1998). An emerging trend is the perception that ICT literacy forms part of a generic skill set, with implications for teaching and learning in the schools, as well as for life-long learning and just-in-time learning (Dede, 1996).

O'Conor et al. (2002) described the foundational set of skills and knowledge that underlie ICT literacy as cognitive proficiency and technical proficiency.

Cognitive proficiency has to do with the desired foundational skills of everyday life at school and workplaces. This proficiency is demonstrated in literacy, numeracy, problem-solving, and visual literacy. On the other hand technical proficiency includes a foundational knowledge of hardware, software applications, networks, as well as elements of digital technology. The integration and application of cognitive and technical skills is referred to as ICT proficiency. Proficiency in ICT use builds the capacity of an individual. It facilitates innovation, transformation and societal change. ICT literacy encompasses both cognitive proficiency and technical proficiency. For example, in order to carry out an ICT task which involves searching the internet for the various methods of teaching mathematics, individuals will apply reading and problem-solving skills (cognitive); they must also have the prerequisite knowledge of computer operation that will lead him to the information he wants through the search engine (technical).

The issue of gender and ICT application has been of interest to researchers (Bebetos & Antoniou, 2008; Kadel, 2005; Schaumburg, 2001; Townsend, 1997). Gender refers to the social attributes and opportunity associated with being male and female and the mutual relationship. These attributes and relationships are socially constructed and are learned through the socialization processes while technology is modifying nature to meet their needs. Gender and technology development serve as forum for exploring the linkage between changing gender relations and technological development (Ewhrudjakpor, 2006). In other words, the activities of women and men are linked to institution or governments, on the basis of technology, social relations and management.

Women tend to have less access than men to existing ICT facilities. Frequently, rural information centers or cybercafés are located in places that women may not be comfortable frequenting, since most communications facilities in rural areas feature shared public access. Women also have time constraints because of their domestic engagements. Some accommodation needed to ensure gender equality in access and use of ICTs are adapted schedules to suit women's hours and availability of women support staff and trainers (Tinio, 2003).

There is a distinction between possession of knowledge and the ability (competence) to use such knowledge and skill for appropriate purposes; hence there is need to examine the area of competence of student-teachers. Competences in the aforementioned areas could also be related to areas of specialization. Area of specialization can be determined by the various courses offered in the university. This can basically be divided into three: humanities, which houses the arts, the social sciences and the natural sciences. In all these areas, the use of ICT by lecturers and students are important. In the opinion of Morrison, Lowther, and De Mulle (2002) and Olumorin (2008) all teachers required the knowledge of the use of ICT for personal and

administrative purposes.

Since ICT has found its way into the classroom as a tool for enhancing teaching and learning, it is expected that teachers who are to use this technology should be competent in its use for better productivity. Student-teachers will ultimately become qualified teachers and they will be expected to use this technology for classroom instruction and administrative purposes. Their ability to use this technology will depend on the extent to which they are literate in its use. Hence, this study sought to determine the information and communication technology literacy among student-teachers in universities in North- Central Nigeria.

Research Questions

1. What is the level of ICT literacy among university student-teachers in the North Central Zone of Nigeria?
2. Does the student-teachers' level of ICT literacy vary based on gender?
3. Does the student-teachers' area of specialization influence their ICT literacy level?

Research Hypotheses

1. There is no significant difference in the level of ICT literacy between male and female student-teachers.
2. There is no significant difference among the level of ICT literacy of student-teachers in the Sciences, Arts, and Social Sciences.

RESEARCH METHODOLOGY

This research is a descriptive research of the survey type. The survey involved the use of a researcher-designed questionnaire to collect necessary information on student-teachers' ICT literacy level. The population for this study consisted of all student-teachers in universities in the North Central zone of Nigeria. The target population comprised the 300 and 400 level students in the conventional universities and 500 level students in the special universities (i.e. University of Agriculture, Makurdi, and Federal University of Technology, Minna). Students were selected from universities offering education courses.

The student-teachers were stratified based on gender (male/female), and area of specialization (Arts, Social Science and Science Education). Thereafter, random sampling technique was used to select the final sample to reflect the initial stratification. In addition, proportional sample based on student-teachers in the universities was employed. Altogether, a total of six hundred and thirty eight (638) student-teachers were involved in the study. Out of this figure, three hundred and sixty (360) were males while two hundred and forty eight (248) were females. The demography of respondents who adequately filled and returned the questionnaire for the study is as presented in Table 1.

As indicated by Table 1, the total number of respondents who returned adequately filled questionnaire from the eight universities sampled was 638 out of the 700 instruments administered. In Nasarawa State University, Keffi, there were 93 respondents out of which 40 (43%) were females while 53 (57%) were males. In the University of Jos, there were 76 respondents, 40 males (53%), and 36 (47%) females. In Benue State University, Makurdi, a total of 66 respondents returned their questionnaire. This comprises of 37 (56%) males and 29 (44%) females.

Table 1 Demographics of Respondents by Institution

Institution	Respondents					
	No	Males	Females	Arts	Social Sc.	Science
Nasarawa State University, Keffi.	93	53(57%)	40(43%)	32(34.4%)	40(43.0%)	21(22.6%)
University of Jos.	76	40(53%)	36(47%)	19(25.0%)	42(55.3%)	15(19.7%)
Benue State University, Makurdi.	66	37(56%)	29(44%)	10(15.2%)	6(9.1%)	50(75.8%)
University of Abuja.	101	59(59%)	42(41%)	25(24.8%)	48(47.5%)	28(27.7%)
Ibrahim Babangida University, Lapai	38	18(47%)	20(53%)	11(28.9%)	22(57.9%)	5(13.2%)
University of Ilorin	100	47(47%)	53(53%)	45(45.0%)	14(14%)	41(41%)
Kwara State University, Malete	74	40(54%)	34(46%)	0(0%)	60(81.1%)	14(18.9%)
Federal University of Agriculture, Makurdi	90	66(73%)	24(27%)	0(0%)	0(0.0%)	90(100%)
Total	638	360	278	142	232(36.4%)	264 (41.3)

The total number of respondents in the University of Abuja was 101 out of which 59 (59%) were males while 42 (41%) were females. In Ibrahim Babangida University Lapai, the total number of respondents was 38.18 (47%) of them are males, while 20 (53%). In the University of Ilorin, 100 respondents returned their questionnaire. Out of this number, 47 (47%) were males while the remaining 53 (53%) were females. In Kwara State University, the total number of respondents was 90 out of which 66 (73%) were males while 24 (27%) were females. Altogether, 22.2% of the respondents were studying Arts Education, 36.4% were in the social sciences while 41.3% were in the sciences.

The instrument used for this study is a researcher-designed questionnaire named ICT Literacy Level Questionnaire (ICTLLQ) drawn from the existing instrument of Olumorin (2008), Yusuf (2004), and UNESCO's survey instrument for ICT literacy (2010). The instrument contains five sections A, B, C and D.

Section A deals with respondents' biodata information on the institution and respondents' area of specialization, and Section B requested for information on respondents' access to some computer applications, programmes and supporting devices. Respondents were expected to choose a response mode that best described where they saw themselves in terms of access to the listed computer applications, programmes and supporting devices. It contained 28 items. The response modes for this section were: My Personal Computer (MPC), Family PC (FPC), Friends' PC (FRPC), School's Computer Room (SCR), Business Centre (BC). Section C requested for information on respondents' level of literacy on basic ICT operations. It contained 12 items. The response modes for this section were: Advanced (A), Moderately Skilled (MS), Know the Basics (KB), and No Competence (NC). In section D, respondents were expected to provide information on their competence in integrating ICT for instruction. It contained 18 items. The response modes for this section are: Highly proficient (HP), Proficient (P), Somewhat (S), and Not at all proficient (NAP).

Validation of the research instrument was carried out by giving the questionnaire to educational technologists and computer experts for content validity. The reliability of the instrument was carried out using test re-test method. Using Pearson Product Moment Correlation Coefficient formula, a reliability index of 0.742 was obtained for the instrument.

Data were collected by direct administration. Firstly, permission was sought from the administrators of the Faculties of Education in the universities concerned. The sampled universities were personally visited by the researchers. The instrument was administered to respondents and retrieved immediately after the respondents have filled them. The study was conducted over a period of thirteen weeks.

In assessing the ICT literacy level of the student-teachers, this study adapted the ICT literacy grading system presented by Australia's Ministerial Council for Education, Early Childhood Development and Youth

Affairs (MCEECDYA, 2008). In adapting this, the response of each of the student-teachers to each item in the questionnaire is graded, summed up and taken to percentage. However, the grading system was adapted to five since the questionnaire was formulated on five response modes. The overall percentage grade obtained by any respondent was matched with any of the five ICT grade levels (1-5) adapted from MCEECDYA (2008). Each respondent was placed in accordance with the scheme on Table 2:

Table 2 ICT Literacy Level Grading Scheme

Overall % grade	ICT literacy level
80-100	5
61-80	4
41-60	3
21-40	2
0-20	1

The statistical methods used for analysis were: frequency count; mean, percentages; t-test, and analysis of variance (ANOVA).

Data Analysis and Results

The analyses of the data obtained in respect of the research questions and the hypotheses are presented as follows:

Research Questions 1: What is the level of ICT literacy among student-teachers in universities in the North Central Zone of Nigeria?

Analysis of the results obtained in respect of this research question is presented on table 3. From the analysis on table 3, the mean grade obtained is the average score of all the respondents to all items under each area of literacy as presented in each section of the questionnaire. The score is awarded out of a maximum score of 4, which is the highest grade of four response modes used in the questionnaire. The scores of the response modes range from 0 to 4.

Table 3 Overall ICT literacy level of the student-teachers

SN	Area of Literacy	Mean grade obtained	Maximum grade obtainable
1	Basic ICT operation	2.82	5
2	ICT use	2.35	4
3	Access to ICT	2.94	4
4	ICT integration for instruction	2.68	4
	Average	2.7	4.25

Grading system adapted from MCEECDYA (2008).

From Table 3, 2.7 out of 4.25 transforms into 63.53% as the overall percentage score for the four sections used to determine the ICT literacy level of the respondents. This is rounded up to 64. This falls into ICT literacy level 3 (average) on the grading scale for measuring ICT literacy as adapted by this study. Next, 51-70% falls on ICT literacy level 4, level 5 being the highest (Table 4). Based on the adopted scale, student-teachers in the North-Central zone of Nigeria are therefore placed on ICT literacy level of 3. Respondents on level 3 are described as having an average ICT literacy level. They have the ability to use ICT to enhance communication. They use conventionally recognised software commands to edit and reformat information products. They recognise common examples in which ICT misuse may occur and suggest ways of avoiding them.

Research question 2: Does the student-teachers' level of ICT literacy vary based on gender?

The corresponding hypothesis for this research question is hypothesis 1.

Hypothesis 1: There is no significant difference in the level of ICT literacy between male and female student-teachers. The results obtained in respect of this hypothesis is presented on table 4.

Table 4 t-Test of the level of ICT literacy of student-teachers based on gender

Gender	N	Mean	Df	T	Sig.	Decision
Male	364	71	636	1.672	0.095	Ho not rejected
Female	274	69				

$p > 0.05$

Referring to Table 4, the *t*-test value of $t(636)$, = 1.672 greater than 0.05 is not significant because the probability value of 0.095 is higher than the alpha value of 0.05. This indicates that no significant difference exists in the level of ICT literacy between male and female student-teachers. Therefore the hypothesis which states that there is no significant difference in the level of ICT literacy between male and female student-teachers is rejected. This means that the student-teachers' level of ICT literacy does not vary based on gender.

Research question 3: Does the student-teachers' area of specialisation influence their ICT literacy level?

The corresponding hypothesis for this research question is hypothesis 2.

Hypothesis 2: There is no significant difference among the level of ICT literacy of student-teachers in the Sciences, Arts, and Social Sciences.

The result obtained in respect of this hypothesis is presented in Table 5.

Table 5 ANOVA of difference among Arts, Sciences and Social Sciences student-teachers on their ICT literacy.

	Sum of squares	Df	Mean square	*F*	Sig.	Decision
Between groups	616.820	2	308.410	0.935	0.393	Do not reject H_o
Within groups	209404.705	635	329.771			
Total	210021.524	637				

From the data shown in Table 5, the *F*-value $F(2,635) = 0.935$ and its *p*- value is greater than 0.05 is not significant because the probability value of 0.393 is higher than the working alpha value of 0.05 which indicates that there is no significant difference among the level of ICT literacy of student-teachers in the Sciences, Arts, and Social Sciences. Therefore, the hypothesis which states that there is no significant difference among the level of ICT literacy of student-teachers in the Sciences, Arts, and Social Sciences is accepted. This means that student-teachers' area of specialization does not influence their ICT literacy level.

Summary of Findings

The findings of this study are therefore summarized as follows:

1. Based on the adapted scale, student-teachers in the North-Central zone of Nigeria had an ICT literacy level of 3 which is graded as average. Respondents on level 3 are described as being able to generate simple general search questions and select the best information source to meet a specific purpose. They retrieve information from given electronic sources to answer specific, concrete questions. They assemble information in a provided simple linear order to create information products. They use conventionally recognized software commands to edit and reformat information products. They recognize common examples in which ICT misuse may occur and suggest ways of avoiding them.
2. There was no significant difference in the level of ICT literacy between male and female student-teachers {$t(636) = 1.672 > 0.05$}. This means that gender had no influence on their level of ICT literacy. Therefore the hypothesis which states that there is no significant difference in the level of ICT literacy between male and female student-teachers is accepted.
3. There was no significant difference in the level of ICT literacy of student-teachers in the Sciences, Arts, and Social Sciences {$F(2,635) = 0.935 > 0.05$}. This means that area of specialization had no influence on the level of ICT literacy. Therefore, the hypothesis which states that there is no significant difference among the level of ICT literacy of student-teachers in the Sciences, Arts, and Social Sciences is accepted.

DISCUSSION

The results obtained from this study indicate that student-teachers in the North-Central zone of Nigeria have an average ICT literacy level. By implication, the majority of the student-teachers could only make use of ICT for some purposes and they cannot be described as being very proficient in ICT use. The findings indicate that there is a limit to which the student-teachers will be able to deploy ICT in their professional practice when they eventually become professional teachers. This is because teachers' ability and willingness to integrate ICTs into their teaching will largely depend on the professional training and development they receive (Abolade & Yusuf, 2005; Selinger & Autin, 2003; Williams, 2003).

Since these student-teachers have indicated a limited ability to use ICT effectively at their level, it means they need more training on integrating ICT use into their teaching. The present finding is similar to that of Olumorin (2008) who conducted a study to find out lecturer's attitude to, competence and use of computers in tertiary institutions in Kwara State Nigeria. His findings indicated that lecturers were averagely competent in the use of computers in their areas of specializations, computer being a major ICT element.

The introduction of ICT related courses into the curriculum of universities could also be a factor responsible for the average level of ICT literacy indicated by the student-teachers. For instance, at the university level, the NUC benchmark for minimum academic standard prescribes that all education students should take EDU 304 (ie., ICT in Education) as a 2 credit course. (NUC, 2004). For GSE 107, 108 and EDU 304, the content areas include the meaning and types of computer, historical development of computer, classification of computer, basic computer operation, introduction to word processing and so forth. The group of respondents in this study has been taken through these courses. This could be responsible for their average level of ICT literacy.

Besides that, the present study indicates no significant difference in the level of ICT literacy between male and female student-teachers. This means that gender is not a factor with regard to ICT literacy. The result is similar to that of Olumorin (2008) who found that both male and female lecturers used computers frequently, that the attitude of male and female lecturers to computers did not differ and that the competency level of male and female lecturers does not differ. It should be emphasized that gender is not a criteria for admission into universities. Some studies carried out have found gender disparity in ICT achievement in favor of males (Ajunwa 2000; Awodeji, 1997). The present finding does not go along with

these studies. However, the finding is similar to those of Anaekwe (1997), Ibe (2004), Madu (2004) and Nwosu (1991). Hence, findings on the extent of gender difference in ICT literacy are inconclusive.

The subject area of specialization of the student-teachers had no influence on their ICT literacy level, since no significant difference was found between the level of ICT literacy of student-teachers in the Sciences, Arts, and Social Sciences. In a related study conducted by Olumorin (2008), he also found no significant difference in computer use by lecturers in tertiary institutions based on their areas of specialization. This corroborates the fact that all areas of specialization require extensive use of ICT.

CONCLUSION

The conclusion that could be drawn from the results of this study is that the ICT literacy level of student teachers in the North-central part of Nigeria was just average. To have been able to attain a literacy level of 3 out of a maximum level of 5 is an indication that the ICT literacy level of the respondents is not too poor and not so good. The competencies attached to this level of literacy include the ability to generate simple general search questions and select the best information source to meet a specific purpose. It also includes the ability to use conventionally recognized software commands to edit and reformat information products.

RECOMMENDATIONS

Based on the findings of this study, the following recommendations are put forward:

1. Since the level of ICT literacy level of the student-teachers were found to be average, effort should be made by the universities to provide facilities that enhance access. This will improve transform this into making the student-teachers to imbibe the culture of integrating ICT into pedagogy and educational administration.
2. The high level of ICT literacy of the student-teachers poses lesser hindrance to the deployment of ICT for instruction by lecturers; hence, lecturers should utilize available ICTs in their respective universities to the fullest to improve academic performance of the student-teachers.
3. There is need to improve the access of the student-teachers to ICT for a better level of use, especially since they have an average ICT literacy level. Hence the various universities should make available more ICT equipment to their students.
4. Student teachers should be encouraged to expand their ICT literacy to the level of being able to produce instructional software for their own lessons.

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