INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) SKILLS AND COMPETENCIES REQUIRED OF SCIENCE EDUCATION GRADUATES BY SECONDARY SCHOOL PRINCIPALS IN ENUGU STATE

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Abstract

Survey research design was adopted in the study that sought to determine the computer operation and networking skills and competencies required of science education graduates by private and government secondary school principals in Enugu state. Two research questions guided the study and two null hypotheses were tested at 0.05 level of significance and at the appropriate degrees of freedom. Purposively and randomly, 72 principals – 30 from private and 42 from government schools were sampled to constitute the sample of the respondents. A two-part, 47-item structured questionnaire developed by the researcher, validated by one university lecturer and two principals, with a reliability co efficient (r) of .81 was used to collect data for the study. The instrument was of the four- point response options type. Mean and standard deviation were employed in answering the research questions while the t-statistics was employed in testing the hypotheses. 2.50 was the adopted criterion mean for the study. Result was that the two groups of principals do not differ significantly in the computer operation and networking skills and competencies they require of the science education graduates. Among the recommendation was that they and other employers of labor be involved in developing, revision and up- dating of the curricula for science teacher education programmes in higher institutions of learning.

Information and Communication Technology (ICT), according to the Dictionary of Computing (1986), is any form of technology (equipment or techniques) used by people to handle information. It refers to the technology which supports activities involving the creation, storage, manipulation and communication of information together with their related methods, management and application (Oliver and Chapman (1990) ICTs include both old technologies such as radio, telegraphs, telephones, town criers and modern ones such as computers, internet, e-mail, handset etc. It is therefore erroneous to see ICT as being entirely computer-based. However, ICT has become an indispensable part of the contemporary world having permeated virtually every aspect of human endeavor including education.

Many nations in the world have transformed their education system and training with the introduction of new information and Communication Technologies (ICTs). (Brill and Galloway, 2007). Different teaching/learning strategies that involve the application of the new ICTs for enhanced learning (particularly of science subjects) have been advocated. In fact, virtually every aspect of the education enterprise namely staff and students' admission, enrolment, registration, induction, various support services, testing, examination, result computation, storage and dissemination to mention just a few have been permeated by different ICT tools and processes for better and more reliable results. The field of education particularly is being very fast renovated by the penetrating influence of ITCs. They have made serious positive impact on the quantity and quality of education generally especially science education.

Adequate training for the present and future workforce particularly in the education industry must include provisions for the acquisition of ICT skills and competencies.

The implication of this is that the teachers in the nations school system, during their pre-service training, need to be equipped with adequate skills, knowledge and competencies relevant to the job of teaching. In view of the place and role of ICT and the services associated with them in the scheme of things in this information age, teachers in the nations school system should as a matter of necessity possess adequate and relevant ICT knowledge, skills and competencies for them to function effectively. Tertiary institutions, particularly the universities which is charged with the responsibility of producing high level trained manpower for the nation (Federal Republic or Nigeria (FRN) (2004) should ensure that training in the appropriate use of ICTs is given a place of pride in all their training programmes particularly those meant for the training of teachers.

Two types of school are operated in the country. These are private and government owned schools and each of these recruit their teachers based on what they consider to be the required qualities such teachers should possess. ICT is yet an innovation particularly in the education industry were its application is yet to be fully integrated into teaching and learning in this part of the world. The skill and competency requirements of teachers for enhanced full integration of ICT into the teaching and learning of science in schools as perceived principals of schools is yet to be empirically determined. This study did that and also compared the opinion of the principals of the two types of schools.

The government of the country in recognition of the role of ICT in advancing knowledge and skill in the modern world, emphasized in the National Policy Education (NPE) (2004) on the need to integrate ICT into education in Nigeria. It stated that the government shall provide the required infrastructure and training. University education for would- be science teachers is a major part of such promised training and at the end of it, they (science education graduates) are expected to have acquired relevant skills, knowledge and competencies that would enable them perform the jobs that would be assigned to them especially those that require the application of ICT skills and competencies effectively. It is expected that as employees of science education graduates seek for people with specific ICT skills and competencies necessary for effective science teaching, they should find them among the graduates of universities in the locality. In other words, science education graduates should possess the ICT skills and competencies required of them by their would- be employers.

No study known to the researcher was concerned with finding out what the would – be employers of science education graduate require of them as ICT skills and competencies hence this study is quite apt in terms of both focus and time.

Statement of Problem

Many graduates including science education graduates roam the streets in search of jobs. The demand for science teaching jobs is higher than its supply so there is the need to increase ones chances of being employed for the relatively available ones. Shortage of qualified science teachers in schools is replete in literature so also are recommendation based on empirical studies that ICT gadgets and processes be incorporated into teaching and learning in schools. This can be achieved only by qualified science teachers who also possess the ICT skills and competencies required of them and which would enable them do the job of science teaching in this 21st century effectively. What are the ICT skills and competencies required of science education graduates by their employers? This is the question the study set out to address.

Significance of the Study

It is the researchers hope that the findings of the study may guide the developers and implementers of university education curricula in revising and/or up – dating the curricula of courses from which the trainee science teachers acquire ICT skills, knowledge and competencies. From the findings, the graduates will know their areas of deficiency and probably make efforts on their own to "fill the gaps"

Scope of the Study

The study was limited to only computer operation and networking competencies

Purpose of the Study

The purpose of the study was to find out:

1. computer operation and
2. computer networking skills and competencies required of science education graduates by secondary school principals.

Research Questions

The following researcher questions were answered by the study:

1. What computer operation skills and competencies are required of science education graduates by secondary school principals?
2. What networking skills and competencies are required of science education graduates by secondary school principals?

Hypothesis

The following two hypotheses were tested in the study at O.O5 level of significance:-

HO1. There is no significant difference between the mean response to computer operation skills and competencies required of science education graduate by principals of private and government secondary schools

HO2. There is no significant difference between the mean response of principals of private and government secondary schools to the computer networking skills and competencies required of science education graduates.

Research Method

Survey design was adopted and the study was carried out in Enugu State of Nigeria covering both government and private secondary schools. Purposively, only principals of schools that have computer facilities (with or without internet connection) were involved in the study. Specifically a total 72 principals (30 from private schools and 42 from government schools) constituted the respondents.

A 47 – item structured questionnaire validated by one computer education lectures from ESUT and two secondary school principals from Enugu state was used to collect data for the study. The preliminary section of the questionnaire was used to find out type of school (private or government) and those that have functional computer facilities in the school.

Method of Data Collection

For principals of government schools, on–the–spot administration and collection of the instrument was done during one of the secondary school principals meeting at the state capital – Enugu. Three principals previously known to the researcher were the research assistants who secured the co –operation of their colleagues. All principals responded to the questionnaire items but only

questionnaire copies from principals who indicated that they have functional computer facilities in their schools were made use of during collation, others were dropped. For the private secondary schools, with the assistance of four Postgraduate students of ESUT, a total of 33 private schools were visited to administer the questionnaire. 30 out of the 33 private schools met the required condition and so questionnaire from their principals were made use of during collation of data. Mean and standard deviation were employed in answering the research questions while t – test statistics was employed in testing the hypotheses. 2.50 was adopted as the criterion mean for the study. That hypothesis be rejected if t-calculated was higher than t-critical was also adopted.

Presentation and Analysis of Data

Data that yielded answers to the research questions are presented in tables below first before the testing of the hypotheses.

Research Question 1

What computer operation skills and competencies are required of science education graduates by secondary school principals?

Table 1:
Computer Operation Skills and Competencies Required of Science Education Graduates by Principals.

N = 72

	Science Education Graduates Should be Able to:	**X**	**SD**	**Decision**
3	Boot – up and shutdown a computer system	4.82	0.71	Required
4	Identify and use icons, windows, menu etc	4.73	0.32	Required
5	Type and save documents	4.72	0.49	Required
6	Retrieve and update files	4.22	o.66	Required
7	Print documents	4.66	0.62	Required
8	Use spread sheet	4.26	0.83	Required
9	Use word processing packages	4.47	0.68	Required
10	Utlize the power point for presentations	3.66	0.64	Required
11	Open and work with more than application at a time	3.42	0.73	Required
12	Copy documents from hard disk to CD, flash drive etc	4.62	0.76	Required
13	Copy from CD, flash drive etc to hard disc.	4.49	0.63	Required
14	Copy, cut, paste, delete etc texts	4.11	0.67	Required
15	Generate reports from data base	3.78	0.78	Required
16	Insert and eject CDs and flash drives	3.64	0.87	Required
17	Use different printing options	3.88	0.94	Required
18	Use scanner or digital camera to burn CDs	2.61	0.86	Required
19	Create, name and save document in files and sub files	4.01	0.58	Required
20	Browse the web	3.02	0.77	Required
21	Perform simple web – search	2.98	0.81	Required
22	Use effectively different page set – up options	3.32	0.24	Required
23	Maintain question bank in computer	4.02	0.60	Required

All the 21 items in table 1 above have mean response values ranging from 2.61 to 4.82 which is above the criterion mean of 2.50. It means therefore that the principals/respondents require the science education graduates to possess all the 21 ICT operation skills and competencies listed in the table.

Research Question 2

What computer networking skills and competencies are required of science education graduates by secondary school principals?

Table 2:
Computer Networking Skills and Competencies Required of Science Education Graduate by Principals.

N=72

S/No	Science Education Graduates Should be Able to:	$\overline{X}$	SD	Decision
24	Browse the net effectively.	4.81	0.39	Required
25	Upload and download documents/files to and from the net	3.24	0.89	Required
26	Access right security passwords and zones	2.74	1.13	Required
27	Be knowledgeable about area network eg. WAN, MAN, LAN	3.03	1.01	Required
28	Use anti-virus softwares to remove unwanted programs	3.98	0.88	Required
29	Delete virus-infected files from the network	3.71	1.18	Required
30	Use modem and computer to access the internet	4.06	0.63	Required
31	Understand and apply basic telecom terms eg. World wide web, direct access, baud rate internet.	2.81	1.31	Required
32	Hold online conferences with science students and others	4.13	0.73	Required
33	Install and set basic configuration options for equipments such as routers and switches	2.03	1.74	Not required
34	Create and maintain user accounts and permissions	2.11	1.69	Not required
35	Configuring network clients following detailed instruction	3.62	0.89	Required
36	Use electronic mail for teaching and evaluating learning	4.62	0.71	Required
37	Have good documenting ideas	3.74	0.86	Required
38	Monitor system logs	2.36	1.22	Required
39	Understand the organization of systems	2.92	0.87	Required
40	Teach and guide students on how to use the net for academic purposes	4.31	0.72	Required
41	Effect installation of software and CDs on server & troubleshooting	3.01	0.88	Required
42	Use desktop, video conferencing for professional assignments	3.66	0.78	Required
43	Perform basic setup and checkup of networked PCs	3.43	1.18	Required
44	Manage the structure of an intranet following detailed instruction	2.61	0.73	Required
45	Set disk space and printer quotas	2.34	1.06	Not required
46	Demonstrate understanding of technical systems	2.58	0.78	Required
47	Demonstrate problem solving ability	3.22	0.74	Required

As indicated in table 2 above 20 out of the 24 computer networking skills and competencies listed are required of science education graduates by secondary school principals in Enugu state. Specifically, item nos. 33, 34, 38 and 44 are not required of the graduates. Highly rated items in the list are 24, 30, 32, 36 and 40 and these items are directly related to teaching and learning.

HO_1

There is no significant difference between the mean response to computer operation skills and competencies required of science education graduates by principals of private and government secondary schools.

Table 3:
t-Test Analysis of Two Groups of Principals' Responses to Computer Operation Skills and Competencies Required of Science Education Graduates.

Groups	$\overline{X}$	SD	N	Df	t-cal.	t-cit	Decision
Private Sch. Principals	3.19	0.65	30				
				70	1.35	1.90	Not Significant
Govt. School Principals	3.34	0.61	42				

P>0.05

The hypothesis of no significant difference between the computer operation skills and competencies required of the science education graduates by principals of private and government secondary schools is not rejected but upheld. This is because as shown in table 3 above, t-calculated (1.35) is less than t-critical (1.90) at the appropriate level of significance and degree freedom.

HO_2

There is no significant difference between the mean response of principals of private and public secondary schools on computer networking skills and competencies required of science education graduates.

Table 4
t-Test Analysis of Two Groups of Principals Responses to Computer Networking Skills and Competencies Required of Science Education Graduate.

Groups	$\overline{X}$	SD	N	Df	t-cal.	t-cit	Decision
Private School Principals	3.92	0.10	30				
				70	0.060	1-960	Not Significant
Govt. School Principals	4.05	0.15	42				

In table 4 above, calculated t (0.060) is less than table t (1.960). The null hypothesis of no significant difference between the mean response of private and government secondary schools principals on the computer networking skills and competencies required of science education graduates is not rejected but upheld.

Discussion of Results

The study revealed that principals of both private and government secondary school. require science education graduates to possess both computer operation and networking skills and competencies.

The teachers require these to be able to function effectively in this information and communication technology age with little or no supervision. To meet with the requirement, the science education trainee teachers should therefore be taught these skills and made to acquire the competencies because it is becoming increasingly difficult for graduates to be employed partly because the jobs are not sufficiently available and partly because they lack the requisite skills and competencies. This was emphasized by Ajakemo (2001) when he stated that there are often gaps between what graduates posses as knowledge, skills and competencies and what are actually required for existing jobs. While competency is the ability required in using facts and knowledge, attitude and facts necessary for accomplishing a task (Achilike and Okwuanaso 2001), skill means the ability to pragmatically apply consciously and unconsciously knowledge in practical setting (Spitzberg & Cupach, 1984). To Idoko (2001), skill means ability and capacity acquired through deliberate, systematic and sustained effort to smoothly and adaptively carry out complex activities or job functions.

What the principals require of the science education graduates-the future teachers of science subjects, are quite apt considering the meaning of skill and competene. The need for these with respect to ICTs cannot be over-emphasized because according to Villeges & Reiners (2003), the use of computers and other information technologies regarded are as essential to everyday activity as there is increasing pressure to adapt teaching to accommodate new technologies. The science teachers should therefore possess adequate knowledge, skills and competencies in the new technologies especially the computer, the internet and services associated with them. It should also be noted that the groups of principals do not statistically differ significantly in their requirement of the science education graduates.

Implication and Conclusion

The implications of the result of the study include that non-possession of the requisite competencies and skills related to ICTs might partly be responsible for many science education graduates remaining unemployed years after graduation. Yet another implication is that the involvement of employers of labor and heads of educational institutions in the revision of the curriculum for teacher education programmes in institutions of higher learning is very necessary. It is the conclusion of the study that principals of both private and government secondary schools in Enugu state do not differ in their understanding of the ICTs skills and competencies needs of science teachers particularly as it concerns computer operations and networking. Their reasoning and expectation are line with the knowledge requirements for effective functioning in this 21st century.

Recommendations

The following recommendations are made based on the findings and conclusion of the study:

1. Employers of labor particularly in the education industry should be involved in the development, review and revision of curriculum of education programmes for higher educational institutions.
2. The curricula for science education programmes in universities should be reviewed for possible updating to include adequate relevant topics and contents that would enable the science teacher trainees acquire the ICTs knowledge, skills and competencies required of them by their would – be employers.
3. Lectures in the universities should also be assessed to determine the level of their possession of ICT knowledge, skills and competencies because one cannot give what he does not have.

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