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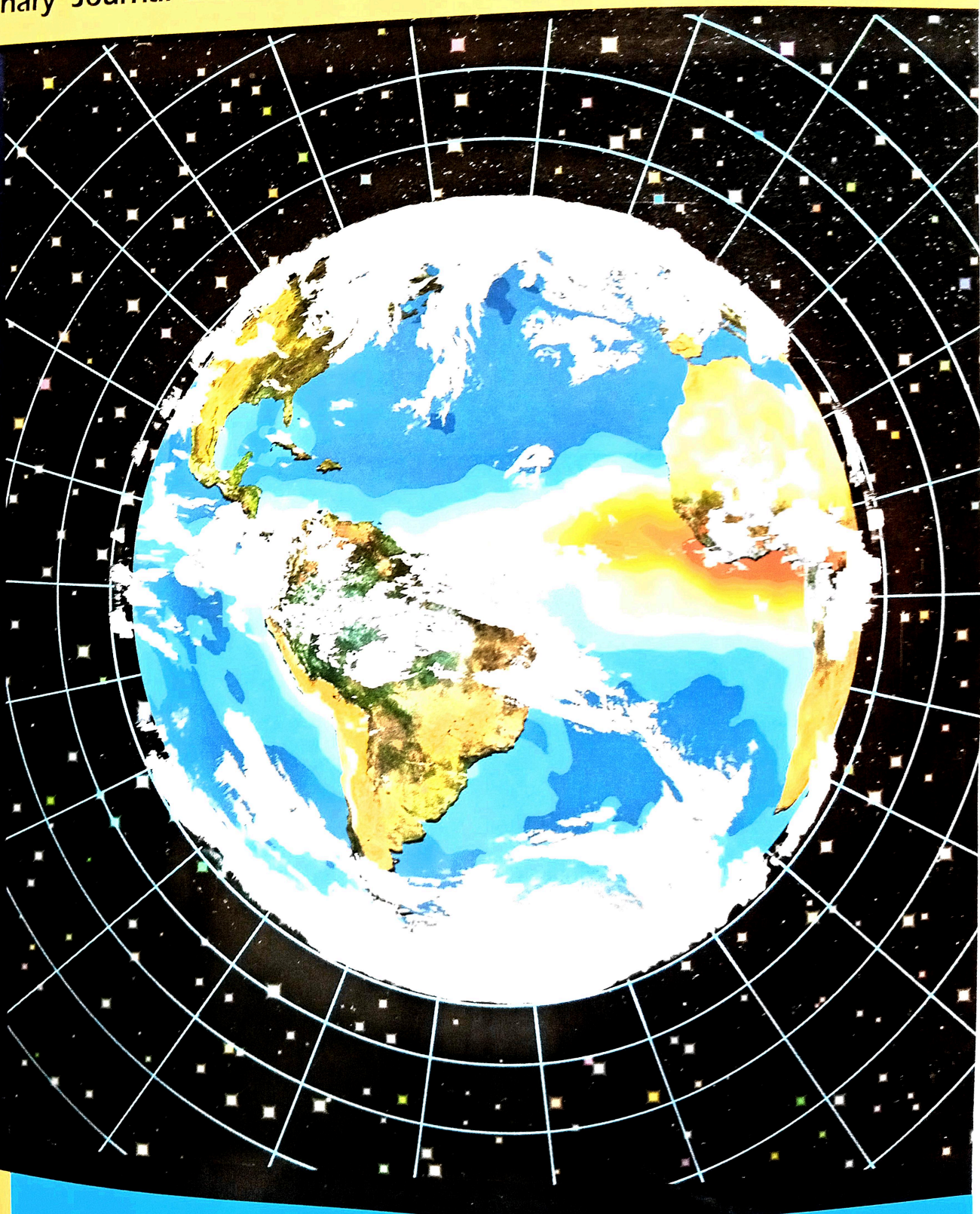

Information and Communication Technology (ICT) Skills needed by Industrial Technology Education Students in Universities for Effective Participation in Electronic Learning

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Abstract

The main purpose of the study was to determine the Information and Communication Technology (ICT) Skills needed by Industrial and Technology Education (ITE) students for effective electronic learning. One hundred and twenty 500-level students of the ITE department, Federal University of Technology, (FUT) Minna were used for the study. Survey research design which employed the use of 45-item structured questionnaire based on Likert's five point rating scale was used for data collection. The instrument was duly validated both in face and content by specialists from ITE and Computer science departments of FUT Minna and was trial tested on thirty 500-level students of the Department of Technology Education, Modibbo Adama University of Technology, Yola. A reliability index of 0.73 using Cronbach Alpha was established. Mean was used to answer the three research questions that guided the study while z-test was used to test the three null hypotheses at 95% confidence interval. Findings were made among which is that ITE students needed all the word processing and the internet skills for effective utilization of electronic learning. Recommendations based on the findings were also made in addition to the training programme, ICT facilities should be adequately provided for the infusion of ICT in the ITE curriculum.

Keywords: Industrial Technology Education, Information and Communication Technology, Teaching and Learning, Universities.

Introduction

The United Nations Educational, Social and Cultural Organization (UNESCO) (2004) World Education Report titled 'Teachers and Teaching in a Changing World' stressed that the young generation is entering a world that is changing in all spheres; scientific and technological, political, social, economic and cultural. The emergence of knowledge-based society is changing the global economy and the status of education. The major challenge confronting the educational system, according to the UNESCO report is how to transform the curriculum and teaching and learning processes to provide students with the skills to function effectively in this dynamic, information rich and continuously changing environment. In view of this, Okebukola (2006) stressed that the technology based global economy poses challenges to especially many developing countries as national economies become more internationalized with the increasing flow of information, technology, products, capital and people between nations. This new economic environment is thus creating a new era of global competition for goods, services and expertise. All of these changes are producing dramatic shifts in the political, economic and social structures of many countries around the world. This shift demands new knowledge and skills in the workforce through information and communication technology also known as ICT. Information and communication technology have changed the nature of work and types of skills needed in most fields and professions including industrial and technological education programme. This process of acquiring knowledge and skills through the use of the modern ICT devices is referred to electronic learning (e- learning) (Tinio, 2008).

Chitanana, Makaza and Madzima (2008) have noted that many nations are now engaged in a number of efforts to effect changes in the teaching and learning process to prepare students for information and technology based society. Chinda and Apagu (2011) in buttressing this finding stressed that the new technologies are also posing challenges to the traditional conception of both teaching and learning and more especially to industrial and technology education programmes in universities. The major implication of these challenges to universities and other educational institutions as noted by Chinda (2012) is that in addition to provision of ICT facilities, both teachers and students of industrial and technology education programmes should be ICT skillful enough to use the computer, surf the internet and use the internet technologies during the pre-service

training to enable them effectively use and infuse ICT in their teaching activities after graduation if they should compete globally.

Thus the evolution and development of ICT has resulted in a paradigm shift in the educational system. ICT is changing the way people learn, offering new alternatives to the traditional classroom. In the new economy, it is essential for learners to have access to education anytime and anywhere. Haddad and Draxler (2002) stated that lifelong learning and training for the workplace can no longer be confined to the traditional classroom. It is unrealistic and unaffordable to continue to ask learners to a designated place every time they have to engage in learning. ICT allows the delivery of education to adapt to an individual needs as opposed to having the individual adapt to how the instruction is delivered. Education will not be a location anymore, but an activity: a teaching and learning activity (Haddad & Draxler, 2002).

Besides the potential of ICT to provide education to anyone, anytime and anywhere, it encourages speed and accuracy in technical and engineering drawing practices and also provide students with necessary knowledge to operate several industrial machines that have advanced from analogue to digital in operation. ICT can facilitate increased level of production in our industries following its provision for speed and accuracy in carrying out the process of production. It is possible to acquire important textbooks via the internet which will help to improve teaching and learning of industrial and technology education. ICT also helps a lot in speeding up the learning process, the provision for students to communicate to their supervisors via the internet. These are few among the numerous advantages of ICT in education.

Despite the enormous gain from the use of ICT in education, lack of knowledge and ICT skills have not allowed Industrial and Technology Education (ITE) students to experience these advantages. Studies by Chinda (2012) on ICT retraining needs for e-learning implementation also revealed that although both male and female ITE teachers have low level of ICT skills, the level of ICT skills possessed by male ITE teachers is higher than their female counterpart. The report indicated that female teachers have phobia especially for the computer. It is against this background that this study intends to determine the ICT skills needed by industrial and technology education students in universities to improve their e-learning.

Purpose of the study

The main purpose of this study was to identify the ICT skills needed by students of industrial and technology education to improve

their online learning. Specifically, the study sought to determine:

1. The word processing skills needed by ITE students
2. The internet skills needed by ITE students to enable them utilize e-learning
3. The programming skills needed for effective operation of industrial machines and equipment.

Research Questions

Three research questions in accordance with the purposes guided the study as follows:

1. What are the word processing skills needed by ITE students for e-learning?
2. What are the internet skills needed by ITE students for e-learning?
3. What are the programming skills needed by ITE students that enable them operate industrial machines and equipment?

Hypotheses: Three null hypotheses in line with the research questions were formulated and tested at 95% confidence interval

HO_1: There is no significant difference between the mean ratings of male and female ITE students on the word processing skills required for e-learning.

HO_2: There is no significant difference between the mean ratings of male and female ITE students on the internet skills they require for e-learning.

HO_3: There is no significant difference between the mean ratings of male and female industrial technology education students on the programming skills needed by ITE students.

Methodology

Survey research design was adopted for the study. A random sample of one hundred and twenty students of the Department of Industrial and Technology Education, Federal University of Technology Minna were used for the study. Data was collected personally by the researchers through a 45-item structured questionnaire called Information and Communication Technology Skills Needs of Industrial and Technology Education Students (ICTSITES). The instrument which was based on a five point rating scale was face and content validated by two specialists each from Industrial and Technology Education and Computer Science Departments of Modibbo Adama University of Technology (MAUTECH) Yola. In order to determine the internal consistency of the instrument, it was trial tested on thirty 500-level students of the Technology Education Department MAUTECH,

Yola and Cronbach Alpha was used to calculate the reliability index which yielded 0.73.

Mean was used to answer the research questions while the three hypotheses were tested using Z-test at 0.05 level of significance. Decision on each item was based on real limits of numbers and since the average of the five point rating scale is 3.00 which coincides with the undecided option on the rating scale, the upper limit of point 3.00 which is 3.50 was used to judge whether an item is 'agree' or not. In this case, items with mean rating of 3.50 and above were regarded as agree while mean ratings below 3.50 were regarded as disagree.

Results and Discussions

The results of the study were presented in tables and the presentations were done in accordance with the research question and the hypotheses. In each case the research questions and the hypotheses were re-stated followed by the table that displays the results.

Research Question 1: What are the word processing skills needed by students for e- learning?

Table 1: Mean ratings of ITE students on word processing skills needed for e-learning

S/N	Skills	Mean	Remarks
1.	Typeset, edit and format a document properly	3.89	Agree
2.	Create documents using word processing packages such as Microsoft Office Word, Adobe Page Maker.	4.02	Agree
3.	Produce graphical document which include newsletter, simple posters and image intensive design such as glossy magazines or news paper.	3.52	Agree
4.	Wrap word content with other multimedia data such as charts, shapes, clip arts, pictures, symbols, equations, tables etc.	3.66	Agree
5.	Name, save and resave documents to different locations.	3.71	Agree
6.	Utilize tools, templates, and resources available in any word processing package.	3.14	Not Agree
7.	Prepare work documents using page setup feature, including adjust to margin, paper size, page orientation etc.	3.98	Agree
8.	Find and replace word within large content using the find, replace and Go to tools.	3.86	Agree

Table 1: Mean ratings of ITE students on word processing skills needed for e-learning cont'd

S/N	Skills	Mean	Remarks
9.	Drag and drop contents within a word processing package and from external sources.	3.66	Agree
10.	Understand the functionality of moving and copying text using basic commands such as cut, copy, pastes, undo, redo etc.	3.83	Agree
11.	Effectively use and manipulation of in-build dictionary for spelling error check, grammatical structure of statements and paragraphing.	3.99	Agree
12.	Effectively use keyboard shortcuts for manipulating commands.	4.03	Agree
13.	Print and set up the print properties preference of a work	4.52	Agree
14.	Understand the importance of and method of proof-reading documents such as spelling and grammar checking	3.72	Agree
15.	Use digital publishing using word processing packages.	3.56	Agree
16.	Batch mailings or mail merging using a form letter template and an address database	3.82	Agree
17.	Create tables of contents with section titles and their page numbers	3.62	Agree
18.	Create tables of figures with caption titles and their page numbers	3.55	Agree
19.	Cross-reference with section or page numbers	3.67	Agree
20.	Work with new version of a document	3.58	Agree

From table 1, ITE students rated 19 out of 20 items on word processing skills as needed. This is because as shown in the table the items were rated above 3.50 which was the cut-off point. Only the item on the ability to use tools, templates and resources available in any word processing package was rated low, that is, $\bar{X} = 3.14$. On the whole, the grand mean of the twenty items stood at $\bar{X}G$ 3.60 which is significantly higher than the cut-off point. This implies that ITE

students need to acquire all the word processing skills to be active players in the electronic learning process.

Research Question 2: What are the various internet skills required by students of industrial and technology education for e-learning?

Table 2: Mean Ratings of ITE students on the Internet skills needed for e-learning

S/N	Skills	Mean	Remarks
1.	Understand the internet first as a global network of computers and how to initiate connection to it.	4.53	Agree
2.	Technical know-how in the use of internet-connection gadgets such as modem, routers etc., as the case may be.	4.66	Agree
3.	Navigate the World Wide Web (www) to locate and view multimedia-based information residing on server machines.	4.32	Agree
4.	Understand the different web-browser applications and how to use them.	4.28	Agree
5.	Utilize internet applications such as Download Accelerator for downloading files/documents from the internet.	4.30	Agree
6.	Utilize search engines through the proper use of search argument in searching for information via the world wide web e.g. Google.	4.12	Agree
7.	Identify various website available to offer solution to clients online.	4.05	Agree
8.	Execute Website design and domain name registration.	3.76	Agree
9.	Execute Website hosting.	3.12	Not Agree
10.	Execute Web publishing.	3.42	Not Agree
11	Post ones own web pages to make a positive impact.	3.76	Agree
12.	Build online learning communities through internet collaboration.	4.58	Agree

The mean ratings by the ITE students on the internet skills needed as shown in table 2 indicate that out of the 12 skills identified for this study, 10 skills were rated above the cut-off point of 3.50. This implies that ITE students need to acquire these skills for them to improve their electronic learning. Two items were rated low, that is, below 3.50, which show that ITE students do not necessarily require

these skills. However, the grand mean of the items on internet skills needed by students stood at $\bar{X}G$ = 4.08. The value of this grand mean implies that Industrial Technology Education (ITE) students require all the internet skills to improve their electronic learning.

Research Question 3: What are the programming skills required for effective operation of industrial machines and equipment needed by industrial and technology education students?

Table 3: Mean ratings of ITE students on the programming skills needed

S/N	Skills	Mean	Remarks
1.	Pay attention to details in programming.	3.72	Agree
2.	Remember in programming things such as syntax, prewritten functions, variables, bugs.	3.61	Agree
3.	Think abstractly on several levels	3.52	Agree
4.	Use various programming languages in solving specific problems.	3.96	Agree
5.	Understand programming techniques such as Object Oriented Programming design	3.86	Agree
6.	Understand programming keywords, data types, variable, operators, control structures, statements etc.	4.26	Agree
7.	Utilize available programming tools such as Integrated Development Environments IDEs, Software Development Kits SDks and Compliers for writing program.	4.35	Agree
8.	Debug programs written with errors.	3.87	Agree
9.	Compile and run written programs.	3.69	Agree
10.	Re-use available program codes for solving a problem.	3.96	Agree

Table 3: Mean ratings of ITE students on the programming skills needed, cont'd

S/N	Skills	Mean	Remarks
11.	Team-up with other programmers to cooperate as a software team for developing applications.	4.32	Agree
12.	Possess wide knowledge of the functionalities and capabilities of different programming languages such as platform independency, and area of technology it covers.	4.35	Agree
13.	Study and read codes	4.26	Agree

The results shown in table 3 are the mean ratings of ITE students on the programming skills needed to improve their electronic learning. Out of the 17 items (skills) generated on programming skills, none of the skills were rated below 3.50, the cut off point for this study. This implies that all the programming skills identified in this study are needed by ITE students to improve their learning. Furthermore, the grand mean of the item was $\bar{X}G = 3.97$ indicating that all the programming skills identified are needed by students of ITE.

Ho_1: There is no significant difference between the mean ratings of male and female ITE students on the word processing skills required for e-learning.

Table 4: Z-test of difference between male and female ITE students on the word processing skills needed

Groups	N	X	SE	z-Cal	z-Crit	Remarks
Male	25	3.88	0.88			
				0.67	±1.96	Accept Ho_1
Female	95	4.03	0.93			

The result of Z-test of difference between male and female ITE students shown in table 4 indicated that significant difference does not occur between the mean ratings of male and female ITE students on the word processing, skills needed by ITE students. This is because the value of the z-calculated was 0.67 compared to the two-tail z-critical which is ±1.96 is greater. Hence, the null hypothesis was upheld.

Ho_2: There is no significant difference between the mean ratings of male and female ITE students on the internet skills they require for learning. Z-test was also used to test this hypothesis at 0.05 level of significance.

ble 5: Z-test of difference between male and female Industrial and Technology ucation students on the internet skills needed to improve e-learning.

Groups	N	X	SD	SE	Z-Cal	Z-Crit	Remark
Male	95	4.01	1.23	0.085			
					0.26	±1.96	Accept Ho_1
emale	25	4.12	0.85	0.101			

e z-test result shown in table 5 licates that the value of the z-culated is 0.26 while the two-tail ritical value is ±1.96. Thus z-culated is less than the z-critical 0.05 level of significance. This plies that the null hypothesis hich states that significant ference does not exists between e mean ratings of male and female dustrial and technology education udents on the internets skills eded by ITE students was upheld.

Ho_3:There is no significant difference between the mean ratings of male and female industrial technology education students on the programming skills needed to operate industrial machines and equipment.

Again, z-test of difference between the mean ratings of male and female students was used to test this hypothesis at 0.05 level of significance. Table 6 below shows the result obtained.

ble 6: Z-test of difference between male and female Industrial Technology ducation students on the programming skills needed to operate industrial achines and equipment

roups	N	X	SD	SE	Z-Cal	Z-Crit	Remark
lale	95	3.96	1.23	0.171			
					-1.02	±1.96	Accept Ho_3
emale	25	4.01	0.96	0.098			

ne z-test result depicted in table 6 nows that the z-calculated value hich is -1.02 is less than the value tail z-critical which is ±1.96. This also implies that the null hypothesis is upheld.

Findings of the Study

The findings of the study were presented in accordance with the research questions and the hypotheses.

1. All the word processing skills identified in the study except one (item no. 6 on table) are needed by ITE students. Significant difference does not exist between the mean ratings of male and female industrial and technology education students on the word processing skills needed for electronic learning.
2. ITE students need 10 out of the 12 internet skills to make them active participant in the e-learning process. Significant difference does not exist between the mean ratings of male and female industrial and technology education students on the internet skills needed for electronic learning.
3. All the thirteen items (skills) on programming are needed by ITE students. Also significant difference does not occur between the mean ratings of male and female ITE students on the programming skills needed to operate industrial machines and equipment.

Discussions

The findings of the study with regards to research question two indicates that ITE students require all the word processing skills identified to enable them to be active participant in the electronic learning. This finding conforms to Chinda (2012) who carried out a similar study on technology education lecturers' ICT skills retraining needs and found that the lecturers require all the ICT (computer, internet and world wide web) skills identified in the study. The study also conforms to findings by Chitanana, Makaza and Madzima (2010). This finding therefore implies that ITE students need to be given adequate training on the ICT skills in education at the pre-service level for them to effectively deliver Industrial and Technology Education programme to their students after graduation from the university.

The result of the findings with regards to research question two also indicated that more than 95% of the internet skills are needed by ITE students. This finding conforms to the findings made by Newhouse (2002) and Chinda and Apagu (2011) who in their separate studies found that industrial and technology education students and lecturers needed some basic internet skills to enable them benefit maximally from the electronic teaching and learning.

Finally, the result of the study with respect to research question three revealed that all the programming skills are needed by industrial and

technology education students for them to be active players in this information age to facilitate effective delivery of ITE to their students after graduation. The finding is in line with the findings made by Miller (1997) and Ohakwe (2008). The programming or software skills are needed to manipulate industrial machines and equipment. The findings also implied that students of ITE programme in Universities require urgent and adequate training to acquire ICT skills to enable them utilize and infuse ICT in education.

Recommendations

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

1. ITE departments in universities should identify where the use of ICT could be employed to best affect and promote electronic learning among students.
2. Provide adequate ICT infrastructure to support ITE teachers and students to acquire the ICT skills to enable them to be active players in the new information society.
3. Establish collaboration with other universities within and outside Nigeria and outsource expertise.
4. Organize workshops on regular basis for both students and teachers on the use of ICT to deliver ITE.
5. ICT should be infused in the training programme of ITE students to acquire the skills that would enable them deliver their instructions online in accordance with the modern trend in teaching and learning.

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