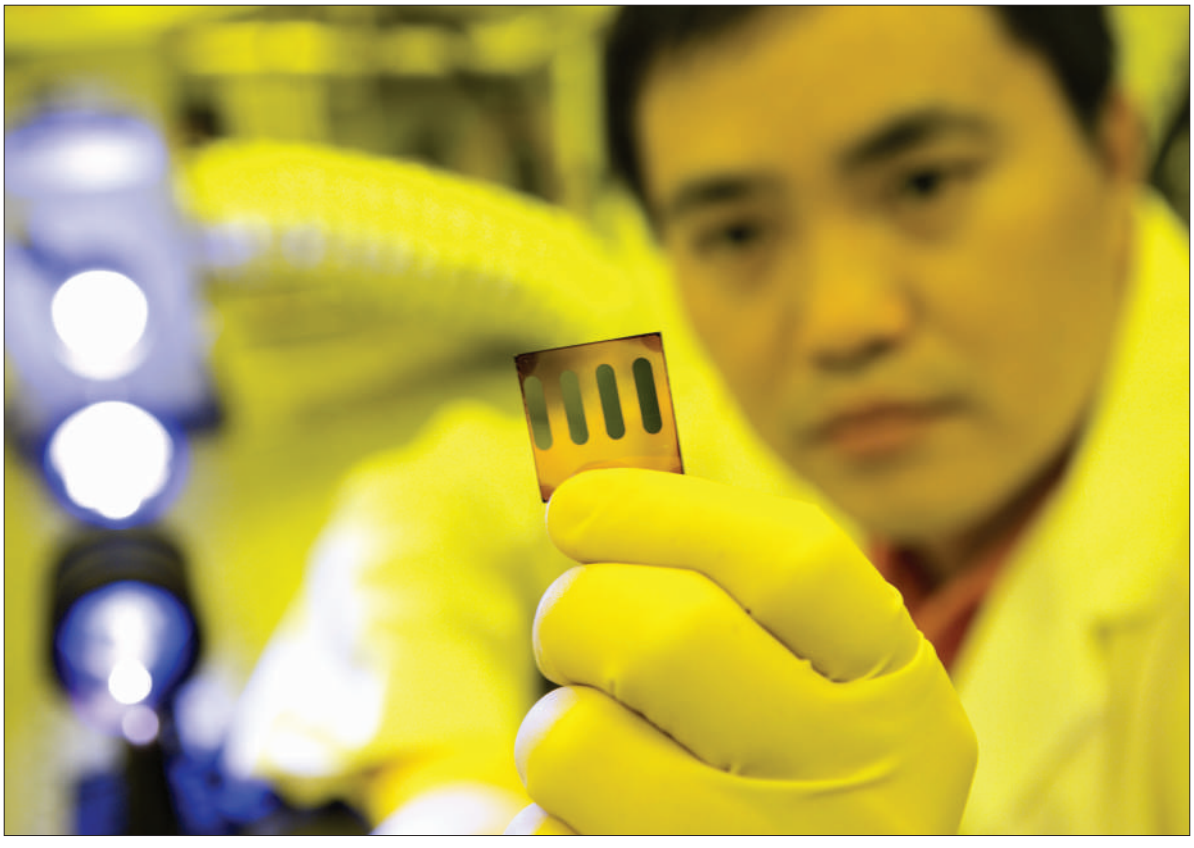

Singapore Journal of

Scientific Research

ISSN: 2010-006x

science alert

http://scialert.net/sjsr

Singapore Journal of Scientific Research 1 (1): 49-58, 2011
ISSN 2010-006x / DOI: 10.3923/sjsres.2011.49.58

Teacher's Awareness and Extent of Utilization of Information Communication Technologies for Effective Science and Health Education in Nigeria

[1]S.A. Onasanya, [2]R.A. Shehu, [1]O.O. Ogunlade and [3]A.L. Adefuye
[1]Department of Science Education, University of Ilorin, P.M.B. 1515, Ilorin, Nigeria
[2]Department of Human Kinetics and Health Education, University of Ilorin, P.M.B. 1515, Ilorin, Nigeria
[3]Department of Foundations and Instructional Technology, Tai-Solarin University of Education, Ijagun, P.M.B. 2118, Ijebu-Ode, Nigeria

Corresponding Author: S.A. Onasanya, Department of Science Education, University of Ilorin, P.M.B. 1515, Ilorin, Nigeria

ABSTRACT

This study investigated science and health education teacher's awareness and extent of utilization of information communication technologies. It also examined the relationship between awareness, extent of utilization and teachers' gender. The research subjects were 240 science and health education teachers drawn from 40 secondary schools, randomly selected from 10 Local Government Areas of Oyo State. Two instruments were designed by the researcher and used for this study. These are 40 item computer literacy test (with reliability coefficient measure of 0.77) and the 20 item questionnaire on teachers' level of utilization of ICT's (with Cronbach alpha measure of 0.82). Data were analyzed using weighed means scores standard deviation and t-test. The analysis that the level of computer literacy of the science teachers examined is low. Their level of utilization of ICT resources was also found to be very low. From the 2 hypotheses tested, the result showed that there was significant difference between the mean scores for male and female science teachers in their level of (1) computer literacy (knowledge, t = 6.48; application, t = 3.62, application t = 3.34 and communication, t = 2.63) and (2) utilization of ICT's (t = 4.00). It also indicated that the males out performed their female counterparts in both instances, although, their level is very low. Therefore, all science teachers (especially the females) need to be motivated and provided with relevant ICT training experiences (at pre-service and in-service levels) in order to enhance their instructional delivery productivity. Recommendations and classroom implications were subsequently drawn for effective computer and science education.

Key words: Information communication technologies, science education, computer literacy, teachers' awareness, Nigeria

INTRODUCTION

The federal government maintained in his release on educational objectives for secondary education, as endorsed in the Federal Republic of Nigeria (1998), the need to equip students to live effectively in this modern age of science and technology. In order to enhance its attainment, science education has met with a revolutionary trend in the past few decades.

The major goal of science education is to develop scientifically literate individuals that are concerned with high competence for rational thoughts and actions. The objectives of science education in this country according to Onwu (1993) include the need to prepare students to:

- Observe and explore the environment
- Explain simple natural phenomena
- Develop scientific attitudes including curiosity, critical reflection and objectivity
- Apply the skills and knowledge gained through science to solve everyday problems in the environment
- Develop self-confidence and self-reliance through problem solving activities in science

In a bid to attain these objectives, several strategies and resources have evolved. The resources range from human to materials including the audio-visual/media materials that can be used to catch the attention learners during the lesson.

Towards the end of the 20th century and at the wake of the 21st century, it became apparent that national development depends on educational advancement which in turn depends on technological progress, (Adeyanju, 1998; Akindolu, 2002). Development in Information and Communication and Technology (ICT) has broken all national and international barriers and turned the world into a global village, making information available to everyday anywhere and at any time. Since, ICT improves the quality of education of a nation, then national development depends on the extent to which a nation used ICT facilities in education. Then one can ask, what is ICT? What are its various facilities and uses in education? How does it enhance science education and national development?

Information and Communication Technology (ICT) deals with the handling and processing of information, using all kinds of electronic devices (NCET, 1998).

These electronic systems can be used for broadcasting, telecommunications and all forms of computer-mediated communications. Information and Communication technology centered education covers the use of computers, on-line self-learning packages, interactive CDS, satellites, radio, optical fibber technologies, tele presence systems and all types of Information Technology (IT) hardware and software (Akindolu, 2002; Adebayo, 2002).

The roles and values of ICTs in science education are varied and these include the followings ICTs can:

- Foster students interest and motivation
- Promote students commitment to learning
- Make the lessons more exciting and interesting for both teachers and students
- Introduce the concept of new learning e.g., many on-line learning packages which give students greater control over what they learn and how they learn
- Bring students and teachers together for lectures, tutorials and one to one interactions across geographic locations
- Make students to do science effectively and conduct experiments as viewed on screen
- Facilitate the process of learning through interaction with simulations
- Make students visit different landscapes, museums, libraries and any other places (factories, industries, dams, ecological sites/habitats etc.) on time screen while staying at a place
- Promote distance science learning (e.g., summer school over the internet and the use of Integrated Digital Services Network (IDSN) for Masters' degree programme via interactive lectures; in virtual University in Britain in 1995)

However, the benefits of ICT or IDSN can only be enjoyed by a computer literate population. That is, the people (teachers students and the public) need to be computer literate. In a bid to

achieve this, the federal government made computer education one of the subjects to be offered in both junior and secondary schools (Federal Republic of Nigeria, 1998). Moreover, in May 2000, the Minister of Science and Technology introduced Fix-It-Yourself (FIY) computer assembly kits to be used in both secondary schools and tertiary institutions (Ayeoyenikan, 2000). Since, its introduction, there have been relatively few studies on the level of teacher's awareness and the extent of utilization of both the FIY kits and the ICTs.

Computer awareness refers to the ways in which computers may have an impact on education. Computer awareness programme familiarizes the students/teachers with the computer technology and the basic principles on which computer works including some elementary BASIC programming (Yusuf, 1998a).

With the introduction of computer education into secondary school curricula, there is an urgent need to examine the teachers' awareness of the extent of utilization of the various kits coupled with other uses of the computer such as in instructional delivery process (e.g., the use of Computer Assisted Instruction/Learning (CAL) and Computer Managed Instruction or Learning, (CMI) and educational administration.

Previous studies have also revealed some inconsistencies. While, some principals (of schools) sampled believed that their teaches are competent to teach computer education (Ayoola, 1994), another survey (Yusuf, 1997) on teachers' competence showed that less than 40% of the teachers in 16 sampled federal unity schools have the experience of using computer (Yusuf, 1997). The survey further revealed that less than 40% have acquired proficiency in the use of the software work processor, desktop publishing, database programming etc. Therefore, since teachers competence will form the foundation of the success of any computer education programme introduced into the school system, then the shortage of trained teacher is a barrier to the success of such programme as educational opportunities are lost and students level of awareness and utilization of computer programmes are hindered. However, since several empirical studies have also indicated an increased willingness among educators (including teachers) to use computers (Yusuf, 1998a), then it may be possible that some of the educators must have acquired self-improvement training skills to attain adequate proficiency on the use of the computers and its various uses, particularly as avenue for information and communication technologies.

This study is therefore, premised on two pertinent questions.

- What is the computer literacy level of secondary school science teachers?
- What is the teacher's level of utilization of ICT?

Two main hypotheses shall be tested in this study. The hypotheses addressed include:

- There is no statistically significant difference in the mean scores of male and female science teachers on all the sections for Computers Literacy Test (CLT)
- There is no significant difference between the male and female science teachers' scores on their level of utilization of ICTs

MATERIALS AND METHODS

This study was an ex-post facto research (Best, 1970; Leedy and Ormrod, 2005). The sample consisted of 240 science teachers including physical and health teachers from forty secondary schools. The sample schools were randomly selected from all secondary schools from ten local

Table 1: Reliability and weighting of CLT section

Section of CLT	Reliability	Weighting (%)
A. Knowledge of computer	0.74	24
B. Application of computer	0.78	28
C. Appreciation of computer	0.72	20
D. Communication in computer	0.82	28

Average = 0.77

government areas of Oyo State, Nigeria during the 2006/2007 academic period. Thirty six of the schools were co-educational (boys and girls) while, four of the schools were single sex: two boys and two girls. All the teachers used cut across different science subjects offered at secondary school level: Integrated Science, Physics, Chemistry, Biology, Agricultural Science, Introductory Technology and Physical and Health.

Instrument for data collection: Two instruments were used for this study.

Computer Literacy Test (CLT): Developed and validated by the researchers. The instrument had four sections with the reliability coefficients and weighting as in Table 1. The total score for each teacher in all the sections of CLT was 100%.

The criteria for determining the level of computer literacy was set by the researcher as follows:

Sixteen percent and above indicated high level of computer literacy, 59% and below indicated low level of computer literacy.

The sectional means for the sections were also fixed as follows:

$$S = 12, B = 14, C = 10 \text{ and } D = 14$$

The forty item CLT instrument also covers the basic computing concepts, modern computers generations, computer programming, software programme, stages involved in developing programmes, disk operating system/commands etc.

Questionnaire on teachers' level of utilization of ICT's (Q.T.U.I): This instrument was researcher-designed and consisted of 20 items to determine the teachers' level of utilization of ICT's. The items were arranged on a four point scale of utilization level; Very often; Often used; Rarely used and Never used. A Cronbach Alpha Measure of 0.82 was obtained as reliability index. The teachers were administered the CLT instrument first, followed by the questionnaire (Q.T.U.I).

RESULTS AND DISCUSSION

The research questions were answered by computing means and standard deviation scores of science teachers on CLT and Q.T.U.I. The null hypotheses were tested at 0.05 level of confidence using t-test and the results were as presented below:

Research question 1: What is the computer literacy level of secondary school science teachers?

From Table 2, the level of computer literacy of science teachers of this study is low. The overall mean of 54.86 with SD of 12.94 is lower than the criteria mean of 60 set for high level of computer literacy. The results also revealed that within the population, the computer literacy trend of male

Table 2: Means and standard deviation scores of science teachers on CLT

Variable (sex)	No. of cases	Mean	SD
All	240	54.86	12.94
Male	128	62.08	12.08
Female	112	46.60	12.55

Table 3: Test for male and female science teachers on all sections of CLT

CLT section	Variable (sex)	No. of cases	Mean	SD	t-value	df	t-critical	Remark
A. Knowledge	Male	128	17.52	3.68	6.48	238	0.000	*S
	Female	112	11.68					
B. Application	Male	128	17.44	3.68	3.62	238	0.000	*S
	Female	112	12.63	4.41				
C. Appreciation	Male	128	15.66	3.33	3.34	238	0.000	*S
	Female	112	11.46	3.54				
D. Communication	Male	128	11.45	4.62	2.63	238	0.012	*S
	Female	112	9.83	4.59				

*S: Significant at 0.05 level of confidence

science teachers is high compared to that of the females. With a mean score of 62.08 and SD of 12.08 the males out performed the females who have mean score of 46.60 with SD of 12.55. The finding indicates that the low level of computer literacy of secondary school science teachers may have been greatly influenced by the female teachers. This finding is in agreement with previous findings of Yusuf (1998b). The later reported that male teachers showed greater positive attitudes towards computer in education than the female teachers, with established significant difference. Therefore, this study has provided indications that gender could be an important variable in teachers' computer literacy level. This is worthy of note by educational planners, computer studies teacher/lecturers, guidance counselors and school administrators. Female science teachers need to be motivated more to acquire more knowledge, affects and skills in computer literacy programmes around them. Moreover, there is the need to provide computer experience for pre-service science teachers prior to their full employment as teachers.

Furthermore, serving science teachers should be required and supported to undergo in-service training on the use of computer. Such an exposure can enhance instructional delivery process and educational administration.

Research hypothesis 1: There is no statistically significant difference in the mean scores of male and female science teacher on all the sections for Computer Literacy Test (CLT).

From Table 3, the comparison of male and female teachers median scores on CLT sections revealed knowledge (17.52 vs 11.68); application (17.44 vs 12.63); appreciation (15.66 vs 11.46) and communication (11.45 vs 9.83). That is, the male teachers scored higher than their female counterparts in all the sections of CLT. Therefore, the males belong to higher computer literacy level than the females.

Using the assumed means of 12 for knowledge, 14 for Application, 10 for Appreciation and 14 for Communication, the Table 3 showed that the mean scores for males are higher than the set means in all the sections except for communication in computer. This confirms that the male science teachers are unable to communicate computer ideas and skills to either their female counterparts or their students. This tendency could have affected transfer of learning because they are unable to relate their computer ideas/information to others.

Although, the female science teachers appreciate the role of computer as much as their male counterparts, (as shown in their means scores being higher than the assumed means), yet they lag behind in computer knowledge, application and communication. This may also affect their level of computer interaction, acquisition of information and its usage. Moreover, the values of 6.48, 3.62, 3.34 and 2.63, respectively are higher than the critical values of 0.000, 0.000, 0.000 and 0.012, respectively at 0.05 confidence level and 238 degrees of freedom.

From the above findings, the null hypothesis was therefore not accepted, because the means scores of male teachers are significantly higher than those of the females on all the sections of CLT. This finding is in agreement with the findings of Yusuf (1998b), who reported significant difference between male and female teachers' attitudes towards computers literacy with males possessing greater positive attitudes than their female counterparts.

Research question 2: What is the teachers' level of utilization of ICTs?

From Table 4 and 5, the extent of science teachers' utilization of ICT resources is low. The overall weighted mean of 1.39 with SD of 3.2 is lower than the criteria weighted mean score of 2.50 set for high level of utilization of ICTs. The results further revealed that the extent of utilization of ICTs of male science teachers is higher compared to that of the female. This finding indicates that both male and female teachers underutilize the ICT resources for science teaching learning.

Table 4: Frequency percentage and weighted mean scores of male and female teachers extent

ICT resources	Sex	No. of cases	Very often	Often 01	Rarely R.A	Never NE	W.M.S
A. Online self learning packages	Male	128	2(2)	14(11)	0(0)	112(87)	1.28
	Female	112	0(0)	4(4)	0(0)	108(96)	1.08
B. Interactive CDs, offline (CD ROMS)	Male	128	4(3)	24(19)	8(6)	92(72)	1.53
	Female	112	2(2)	147	6(5)	90(80)	1.37
C. Satellite, chips	Male	128	2(2)	417	0(0)	122(95)	1.12
	Female	112	2(2)	206	0(00)	108(96)	1.10
D. Radio, T.V	Male	128	22(17)	106(83)	0(0)	0(0)	317
	Female	112	4(4)	78(69)	30(27)	0(0)	277
E. Optical fibber technologies	Male	128	0(0)	0(0)	0(0)	128(100)	1.00
	Female	112	0(0)	0(0)	0(0)	112(100)	1.00
F. Telephony (Internet) access via	Male	128	0(0)	4(3)	0(0)	124(97)	1.06
cellular phone network	Female	112	0(0)	2(2)	0(0)	110(98)	1.04
G. Other software packages							
i. Wordstar, Word Perfect, Ms Word etc.	Male	128	6(5)	12(9)	8(6)	102(80)	1.39
	Female	112	2(2)	4(4)	2(2)	104(92)	1.16
ii. Play games	Male	128	4(3)	12(9)	6(5)	106(83)	1.32
	Female	112	2(2)	2(2)	2(2)	106(94)	1.12
iii. Mathematical packages, statistical	Male	128	6(5)	12(9)	2(2)	108(94)	1.35
packages (SPSS, SAS, MSTART).	Female	112	2(2)	4(4)	0(0)	106(94)	1.14
SCORBATT, etc.				Average	Weighted	Mean score	1.39

Table 5: Means and standard deviation scores of science teachers on extent of utilization of ICT resources

Variable (sex)	No. of cases	Mean	SD
All	240	1.39	3.29
Male	128	1.47	3.07
Female	112	1.31	3.50

Table 6: The t-test for all male and female Science Teachers on the extent of Utilization of ICT resources

Variable (sex)	No. of cases	Mean	SD	t-value	Remark
Male	128	1.47	3.07		
Female	112	1.31	3.50	4.0	*S

df: 238; *S: Significant at 0.05 level

Table 7: t-test for male and female science teachers on their extent of utilization

ICT Resources	Items	Variable sex	No. of cases	Mean W.M.S	SD	t-value	Remarks
A. Online self learning packages	1.2	Male	128	1.28	0.97	2.22	*S
		Female	112	1.08	2.93		
B. Interactive CDS, offline (CD ROMS)	3.4	Male	128	1.53	1.24	2.42	*S
		Female	112	1.37	0.19		
C. Satellite, chips	5.6	Male	128	1.12	2.39	0.53	NS
		Female	112	1.10	2.74		
D. Radio, T.V. video etc.	7.8	Male	128	3.17	15.73	3.77	*S
		Female	112	2.77	13.04		
E. Optical fibre Technologies	9	Male	128	1.00	3.45	0.00	NS
		Female	112	1.00	2.21		
F. Optical fibre (Internet Access via Cellular Phone)	10.11	Male	128	1.06	2.92	0.50	NS
		Female	112	1.04	3.31		
G. Other software packages	12.14	Male	128	1.39	0.00		*S
i. Word Star, Word Perfect, Ms Word	13	Female	112	116.00	2.17		
ii. Play game	15.16	Male	128	1.32	0.62	2.23	*S
	13	Female	112	1.12	2.55		
iii. Mathematical packages, Statistical SPSS, SAS etc.	17.18	Male	128	1.35	0.35	2.20	*S
		Female	112	114.00	2.36	-	

df: 238; t-table: 1.96; *S: Significant; NS: Not significant; 0.05 level of significance

Research hypothesis 2: There is no significant difference between the male and female science teachers' scores on their level of utilization of ICTs.

The comparison of male and female teachers on their extent of utilization of ICTs revealed mean scores of 1.47 with SD 3.07 for males and 1.31 with SD 3.50 for females. The t-value obtained is 4.00, which is higher than the table t-value of 1.96 at 0.05 level of significance (df = 2.38). Therefore, the null hypothesis was not accepted. That is, there exists a significant difference between the male and female science teachers in their level of utilization of ICTs, with the male out-performing their female counterparts with higher mean scores (Table 6).

However, the findings in Table 7 showed a general low level of utilization of ICTs for all sections except section D. The mean scores obtained for males (3.17) and for females (2.77) are higher than the criteria weighted mean score of 2.50 set for high level of utilization of ICTs. That is, both male and female science teachers utilize the radio and T.V resources for science instruction.

Furthermore, a significant difference was obtained between the males and female in their use of section A – on line self learning packages (t = 2.22); B – Internet (CDS, offline CD-ROMS (t = 2.42); D – Radio, T.V. (3.77); G (1) Wordstar, Microsoft (t = 2.42); G (2) Play games (t = 2.23) and G (3) Maths Packages (t = 2.20). These t-values were observed to be higher than the table t-value of 1.96 at 0.05 level of significance (df = 238). No significance difference exists between the male and female teachers in their use of section C – Satellite (t = 0.53) and F-Telephony (t = 0.50).

In this study, it was also observed that both male and female teachers rarely or never used satellite, telephony and optical fibber technologies. This finding confirmed that the computer

literacy level of all the teachers is really low coupled with their low level of utilization of ICTs resources for science teaching and learning. Moreover, this study also revealed that gender could be an important variable in teacher's level of utilization of ICTs. Therefore, female science teachers need to be provided with relevant ICTs/computer experiences and training in order to enhance their instructional delivery process. This assertion is in line with previous works (Yusuf, 1998a, b; Bilesanmi-Awoderu, 1998). Some of the reasons accrued to those deficiencies include non-availability of facilities and equipment to facilitate computer education; lack of funds (finance) to procure equipment; hot climatic condition; irregular power supply and teacher incompetence.

Non-availability of facilities and equipment: Most public schools lack needed facilities and equipment (Yusuf, 1998b). Such facilities included computer laboratory, chairs, tables, packages, electricity etc. A survey by Ayoola (1994) revealed that most of the teachers in Federal Unity Schools sampled indicated inadequate facilities and materials for implementing computer education programme.

Lack of funds (finance): In spite of the falling cost of computer, it is still not cheap to install in public schools. Even, other electronic devices, the conventional opague projector, radio, television and video players and tapes are not available in most schools. Hence, there is need for P.T.A companies and non-governmental organization's support.

Hot climatic condition: The absence of Air Conditioner (A/C) in most schools creates problems of durability for equipment purchased. Hence, there is need for government to provide electric fans and A/C to schools.

Irregular power supply: Lack of electricity in most schools coupled with it's irregular supply where it is available create problem for effective integration of computer and other electronic devices in Nigerian schools.

Teachers' incompetence: As shown by Yusuf (1997)'s survey, less than 40% of the teachers in 16 sampled Federal Unity Schools were found to possess the experiences of using computer. Less than 40% also had proficiency in the use of software, word processor, desktop publishing, database programme. This finding is synonymous with the result obtained in this survey.

The teachers incompetence on the basis of computer operation (keyboard skills, diskette formatting etc.) has gross implications on their inability to use computer based ICTs, software packages (e.g., self learning CDS, CD ROMs Statistical/Mathematical packages, computer assisted instructional packages, Computer Managed Instruction (CMI), graphical illustrations, conferencing etc. Therefore, the need for computer training of teacher's pre-service and in-service cannot be over-emphasized.

As proposed by Aremu (2002) and Cox (2000), the use of ICT in science classes demands that a science teacher should:

- Identify the topics that any of the ICT modes could be applied to
- Select the learning aids and objectives for the contents covering the cognitive, affective and psychomotor domains
- Source for ICT resources that can meet the set aims and objectives. For example, the use of self learning or data handling package to help in experiments, CD, ROMs to explain scientific concepts, or video tape on photosynthesis, reproduction wild vegetation, deserts life in Biology

- Ensure the students can handle ICT resources with adequate skills in order to carry out the experiment/activity mapped out for them
- Discuss before and after the use of ICT, using questions, group work, discovery approach, students' demonstrations etc to ascertain their comprehension of the lesson and adequate acquisition of relevant knowledge, attitude and skills
- Ensure important aspects are covered using enough lesions and give students assignment to finish up the package in their spare time
- Use cooperative learning group, which can be heterogeneous, but not more than 4-5 students per group, to allow for accessibility
- Introduce the students to the goals/objectives of the lesson first before working on any ICT
- Guide the students' ICT activity and give enough time for students' discussions, analysis and evaluation of their attainments
- Allow students to repeat the ICT activity in related homework exercise in order to practice what they have learnt and this aids retention and transfer of learning

Based on the finding of this survey, the following recommendations are advanced:

- The required ICT infrastructure should be provided in schools by government, companies, religious groups, NGOs, social organizations, P.T.A's etc.
- The government should ensure regular supply of electricity in schools
- Science teachers should be trained on the use of ICT resources for science teaching and learning particularly, the use of different software packages, CDS, CD ROMs, videotapes on science concepts and processes etc.
- Computer literacy programme should be provided for both pre-service and in-service teachers and full integration of ICT resources into Science Education Programme at teacher preparatory level should be ensured
- More efforts should be intensified to motivate female science teachers on the use of the computer and other ICT resources vis-α-vis its application to science instructions
- The government should establish and fund computer education research and development centers (as National Educational Technology Centre Units) in each state of the Federation, equipped with necessary facilities/equipment and train manpower to produce software for computer and science education. This will foster easy access to ICT materials
- The federal government should link all tertiary institutions to the global telecommunications network (Internet) to enable lecturers and students benefit from research collaboration, video conferencing, resources sharing, distance learning and other services available in the Internet

In this present era of technology revolution, a functional ICT centered-education system can launch this country into the high-tech race of the new millennium thereby fostering the process of information organization and retrieval for sustainable educational development.

REFERENCES

Adebayo, A.A., 2002. New trend in access to information communication technology: Its implications to the content of Africa S.T.A.N. Proceedings of 43rd Annual Conference and Inagural Conference of CASTME Africa Proceedings, June 13, Heinemann Educational Books, Nigeria, pp: 551-553.

Adeyanju, I.J., 1998. Teacher communication and educational technology for sustainable national development. J. Nig. Assoc. Educ. Media Technol., 7: 80-87.

Akindolu, L.R., 2002. Information and communication technology (ICT) centered education: A necessity for national development. Nig. J. Comput. Literacy, 3: 10-18.

Aremu, A., 2002. Information communication technologies and the development of scientific knowledge and skills in primary school children. Nig. J. Comput. Literacy, 3: 1-9.

Ayeoyenikan, S., 2000. Schools get computer assembly kits. The Guardian. 14th May, pp: 16.

Ayoola, L.M., 1994. Relevance of schools management capability on the introduction of an innovation: A case study of secondary school computer education in Nigeria. J. Nig. Assoc. Educ. Media Technol., 4: 503-510.

Best, J.N., 1970. Prentice-Hall Series in Educational Measurement, Research and Statistics. Prentice-Hall, Englewood Cliffs, New Jersey, ISBN: 0137739788.

Bilesanmi-Awoderu, J.B., 1998. Perception of the university communities towards the introduction of computer science into all university programmes: A case study of Ogun State, University. Nig. J. Comput. Literacy, 2: 108-116.

Cox, M.J., 2000. Information and Communication Technologies, Their Role and Value for Science Education. In: Good Practice in Science Teaching-What has to say, Monik, M. and J. Osborne (Eds.). Open University Press, USA.

Federal Republic of Nigeria, 1998. National Policy on Education, Lagos Federal. Government Press, Nigeria.

Leedy, P.D. and J.E. Ormrod, 2005. Practical Research: Planning and Design. 8th Edn., Prentice Hall, Upper Saddle River, New Jersey, pp: 352.

NCET, 1998. Approaches to the IT capacity (Key stages 1 and 2). Coventry, National Council for Educational Technology.

Onwu, G.O., 1993. Science in Nigeria primary schools: What went wrong? Ilorin J. Educ., 13.

Yusuf, M.O., 1997. An investigation into teachers competence in implementing computer education in Nigerian secondary schools. J. Sci. Teaching Learning, 3: 54-63.

Yusuf, M.O., 1998a. A study of the dimensions of teacher's attitudes towards computer education in Nigerian secondary schools. Nig. J. Comput. Literacy, 2: 47-58.

Yusuf, M.O., 1998b. Computer education in Nigerian secondary schools: Problems and prospects. J. Nig. Assoc. Educ. Media Technol., 8: 23-31.