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Appraisal of the Availability and Utilization of New Technological Resources for Science Curriculum Delivery in Nigerian Universities

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Abstract

The study investigated the availability and utilization of new technological resources for science curriculum delivery in Nigeria universities. The purpose of the study was to appraise the availability and utilization of new technological resources. A descriptive survey was used. The population comprised all science lecturers in four federal and five state-owned universities in South- East states of Nigeria. 78 science lecturers from federal and 62 from state universities formed the sample. Stratified random sampling and census techniques were used to select the sample. The instrument was a 36-item questionnaire developed by the researchers. The instrument was validated and reliability coefficient computed. Three research questions and three hypotheses guided the study. Data were analyzed using means, standard deviation and t-test statistics of p< 0.05. Results showed that some new technological resources are available. On the other hand all the listed new technological resources were under-utilized

except print materials. Implications of practice for sustainable development was proffered and recommendations were made among which is that federal and state governments should provide adequate quantity of new technological devices.

Introduction

Resources are vital tools in education in general and science education in particular. Resources in education encompasses all persons and things capable of conveying information, values, processes, experiences and techniques that can be used to actively engage learners in the learning process (Akpochafo, 2003). The teaching and learning of the basic sciences (Physics, Chemistry and Biology) at the university level require diverse human and material resources. However, the focus of this study is on the appraisal of the availability and utilization of material resources in science curriculum delivery of the basic sciences in Nigerian universities.

In this age of globalisation, there is an increasing demand on the universities to embrace the opportunities presented by technological development. The demand in Nigeria is expanding exponentially. This increase in demand for university education can be attributed to the advert of the knowledge-driven society (Katz, 2001) that is, a society that requires higher levels of skills and qualifications for employment. The old practice where a job is for life is no longer tenable as labour markets demand knowledge and skills that require regular updates. Emphasis, therefore in this computerized age is on life-long learning and the universities are expected to do this using new technologies.

To meet the changing world-wide demand for education, electronic learning (E-learning) has been adopted in the developed countries to overcome many of the barriers to university educational opportunity to a teeming population of students. There is need to appraise the extent to which science lecturers in Nigeria utilize new technological resources in science curriculum delivery.

The new teaching and learning technological resources can be classified into two:

1. Those that are primarily used for communication between people (human to human interaction) otherwise known as communication technologies. These permit communication between teachers and students. Examples include fax, radio, teleconferencing, videoconferencing and the internet.

2. Those which are primarily used by individuals on their own (human to computer interaction) called learning resources technologies. These are used to convey subject contents such as print materials, videotapes, audio tapes, television, computer-based course wares or softwares and CD-ROM (Compact Disk – Read Only Memory).

The teaching and learning of science subjects at the university level involves helping students to learn science, acquire problem-solving skills, develop critical thinking skills, and also helping them to know how and where to obtain needed information, develop the spirit of enquiry and above all prepare them for the process of life-long education (Inomiesa and Osakwe, 1998). To achieve these, the universities should deploy new technological resources in the teaching of basic sciences for maximum benefit. To keep pace with the rapid scientific and technological changes, there is urgent need to move beyond the passive learning activities that characterize lectures towards more engaged, active and investigative science lessons.

It has been proven by Felder and Brent (2004) that students irrespective of their age, tribe or school location are equally hungry for scientific knowledge. Information technologies ranging from videotapes and laser disks to powerful computing and communication technologies have the potential to recast the relationship between lecturers and their students during science lessons. The challenges facing university lecturers is being skilled, knowledgeable and having access to the new technological devices, being able to utilize them, as well as ability to adopt different approaches to science curriculum delivery.

A number of new laboratory devices are open to university lecturers for use in science laboratory instructions.

1. Use of Electronic laboratory (E-laboratory): E-laboratory is a new computer programme that mimics laboratory experiences. These devices are special media of instruction which have both visual and aural appeal. The utilization of these new technological resources in science instructions makes learning of science concepts clearer to the students and also enable students to engage in critical thinking, problem solving, and acquisition of new scientific knowledge and skills (Onyegegbu, 2006).

2. Interactive computers: The use of interactive computers/video disc with laser player and colour T.V. monitors, micro computer based

instruction and computer-assisted instruction have been very helpful in science practical lessons. Science students using these new technological resources have consistently taken less time to complete the science laboratory activities than equivalent instruction delivered by the lecturer (Ulerich, Bybee and Ellis, 1998).

3. Computer-based technologies: Computer is a viable medium for the delivery of science instructions. It can be used to down load lectures from instructors to learners and also used to upload assignments from the learners to the instructors thereby promoting personalized/individualized tutoring. The internet and CD-ROM facilities available on the computer provide learners opportunity for current information in their courses. A number of computer-based technologies have been used for distribution of sample lesson plans on CD-ROMs, encouraged the interactive use of the web-based materials and use of computer conference to encourage discussing among learners.

The use of these new technological resources foster positive attitude towards the study of science and enhances achievement in science. There is need to appraise the extent of the availability and utilization of these new technological resources for science curriculum delivery in Federal and State universities in South-East State of Nigeria.

Problem of the Study

For some years now, Federal and State governments in Nigeria have found it increasingly difficult to fund university education adequately. Over the years university education in Nigeria has grown quantitatively as there has been astronomical increase in the number of universities in Nigeria from thirteen (13) in 1999 to fifty-three (53) in 2008. This rapid growth in number of universities is making serious financial demands on the nation's economy as it entails greater funding of university education by both federal and state governments. In recent years also, there has been an upsurge in the number of people seeking university education in Nigeria (Okebukola, 2003). Consequently the few material resources that were put in place for use by a few number of students can no longer sustain the teeming population of students securing admission into Nigerian universities. The result is that the few available resources were over stretched and become grossly inadequate over the years. Therefore, while university education has grown quantitatively, the quality of education has consistently reduced

geometrically or progressively over the years. This view was also supported by Okonjo (2002) who admitted that quality of education is declining as a result of increased enrolment and/or reduced funding.

Furthermore, research reports by Dabalen, Oni and Adekola (2000) on the labour market prospects of university graduates show that employers of labour are unwilling to recruit Nigerian graduates for the following reasons:

a. the graduates are poorly trained and unproductive on their jobs.

b. the graduates are unskilled, not computer literate and lack skills in operating most technological devices.

c. the graduates lack oral and written communication skills.

Inappropriate knowledge and skills among university graduates have contributed to graduate unemployment in Nigeria. These deficiencies in skills acquisition among Nigerian graduates could be attributed to poor quality of education and poor exposure of these science gadgets to innovative information and communication adequate. The purposes of the study therefore is to find out the extent to which these technological devices for science curriculum delivery are available and the extent to which they are properly utilized by lecturers for science curriculum delivery in Federal and State Universities in South-East States of Nigeria.

Purpose of the study

The general purpose of the study is to ascertain the availability and utilization of new technological resources in federal and state universities in South-East states of Nigeria. Specifically, the study sought to:

1. ascertain the availability of new technological resources in federal and state universities in South-East states.

2. determine the extent of utilization of new technological resources in federal and state universities.

3. ascertain the hindrances to the utilization of new technological resources in science curriculum delivery.

Research questions

1. To what extent are new technological resources available to science lecturers in federal and state universities for science curriculum delivery?

2. To what extent are new technological resources utilized by science lecturers in Federal and State universities for science curriculum delivery?
3. What are the hindrances to the utilization of new technological resources for science curriculum delivery by science lecturers in federal and state universities?

Hypotheses

$H0_1$: The mean responses of science lecturers in federal universities and those in state universities on the availability of new technological resources for science curriculum delivery would not differ significantly.

$H0_2$: There is no statistically significant difference between the mean responses of science lecturers in federal universities and those in state universities on the utilization of new technological resources for science curriculum delivery.

$H0_3$: The mean responses of science lecturers in federal universities and those in state universities on the hindrances to the utilization of new technological resources for science curriculum delivery would not differ significantly.

Methodology

The study was a descriptive survey design, which was carried out in both federal and state universities in South-East states of Nigeria. The population comprised all basic science lecturers in the nine universities in South-East states. The sample consisted of 78 lecturers from federal universities and 62 lecturers from state universities. Stratified random sampling technique due to location was used to select two federal and two state-owned universities out of four federal and five state universities. Thus 140 lecturers participated in the study. Three research questions and three hypotheses guided the study. The instrument for data collection was a 36-item questionnaire structured on a 4 – point modified Likert-type scale developed by the researchers. The questionnaire was validated by two science educators and one expert in measurement and evaluation from University of Nigeria, Nsukka. The comments and suggestions of these experts were incorporated to build up the final draft.

The instrument was trial tested on ten (10) science lecturers drawn from Federal University of Technology, Owerri and Anambra State University, Uli. These two universities were not included in the main study. The result was used to compute the internal consistency of the instrument using Cronbach Alpha technique. A reliability index of 0.85 was established.

The questionnaire was administered to the respondents through the help of four research assistants. The questionnaires were retrieved on the spot thereby ensuring 100% return. The research questions were answered using means and standard deviation. A mean of 2.50 and above indicated that the respondents agreed with the item on the questionnaire while a mean of 2.49 and below indicated disagreement with the item on the questionnaire. The null hypotheses were tested using t-test statistic at $\alpha = 0.05$ level of significance.

Results

The results were presented according to research questions on tables 1, 2 and 3 while the hypotheses were presented on table 4, 5, 6.

Table 1 shows that items 1,8,10 and 12 have mean scores above the cut off mean of 2.50. This means that these technological resources are available; while the other items have mean scores below the cutoff point of 2.50. This indicates that these technological resources are not available in the universities.

From table 2, the mean rating of item 16 is above 2.50. This means that print materials are utilized for science curriculum delivery while items 17 – 30 have mean ratings below 2.50. This means that these new technological resources are not utilized in science curriculum delivery in Federal and State Universities.

From table 3, the mean ratings of all the items (items 31-36) are above 2.50. This indicates that all the statements are hindrances to the utilization of new technological resources for science curriculum delivery.

Table 4 shows that t-calculated is 0.161 as against t-critical of 1.96 therefore t-calculated is less than t-critical. Hence the null hypothesis of no statistically significant difference between the responses of respondents in federal and state universities on availability of new technological resources was not rejected.

Table 5 indicates that t-calculated is 0.081 while t-critical is 1.96. T-calculated is less than t-critical showing that there is no statistically significant difference between the mean responses of science lecturers from federal and state universities. Therefore, the null hypothesis was not rejected.

Table 6 indicates that t-calculated of –1.963 is less than t-critical of 1.96. This shows that there is no significant difference between the mean responses of respondents from Federal and State universities on hindrances to the utilization of new technological resources for science curriculum delivery. Hence the null hypothesis was not rejected.

Discussion of Result

The result of this study showed that most of the new technological resources were not available in the Federal and State universities. The result of this study showed that print materials, computer and its gadgets, intranet connections and audio and video tapes were the few new technological resources available in the universities. The other new technological resources such as over-head projectors, digital video disc, Interactive CD-ROM, Television, radio, fax machine, Internet connectivity, Extranet wide Area Network (WAN), Satellite broadcast, World Wide Web (www) and computer software programmes were among the new technologies that were not sufficiently available in the universities. The findings of hypothesis one also revealed that there was no significant difference on the responses of the respondents on the availability of these new technological resources in both Federal and State universities. This result is indicative of the underfunding of the universities in Nigeria by the Federal and State governments; hence there is dearth of new technological resources in Nigerian universities. Uzodimma (2008) buttressing this point stated that the amount of money available to higher institutions in Nigeria for procurement of quality instructional, learning and research facilities and their maintenance is grossly inadequate. Thus, the rapid technological changes and increased globalization in the knowledge world and the society and the issue of ICT and its connectivity calls for increased funding for procurement of these technological resources in the universities.

The result of this study in table 2 also showed that only print materials were utilized in Science curriculum delivery while the other listed new technological resources were not sufficiently utilized (Onyegegbu, 2006). The study also showed that there was no significant difference on the

responses of the respondents on the utilization of these technological resources in both Federal and State universities. The finding that new technological resources are not sufficiently utilized in science teaching is not surprising as some university lecturers are not committed to their duties and responsibilities. They exhibit non-challant attitude towards the utilization of new technological resources. Furthermore many science lecturers prefer to use printed materials so as to give them opportunity to sell handouts and text books that lack quality (Uzodimma, 2008).

Lecturers and all stakeholders in education should know that the world is changing drastically in the area of technology and need people of highest potential in science curriculum who can deliver with understanding, with verve and with success. This would make undergraduates to fit into the new technological world. Also, many science lecturers are poorly motivated, some lack the technical skills in the use of these new technological devices, hence are not enthusiastic in their teaching. For the fact that some lack the technical skills in the use of these new technological resources hence shy away from using them. This situation in Nigerian universities does not differ remarkably from what obtains at the secondary education level. For instance, Okoli and Osuafor (2008) and Ifeakor (2008) reported a similar situation on the state of material resources in secondary schools. From their respective studies they found out that resources are poorly provided and under utilized by science teachers in secondary schools.

Implications of Practice for Sustainable Development

The non-availability and non-utilization of new technological resources for science curriculum delivery in Nigerian universities have serious implications for the quality of graduates from Nigerian university education system. Many graduates fail to acquire the relevant skills needed for the world of work in this 21st century. Many do not possess the technical skills needed to operate ICT gadgets. Hence according to the former Honourable Minister of Education in Nigeria, Mrs Obiageli Ezekwesili during the education summit in Abuja, in October, 2006, the research evidence showed a wide gap between the certificates some of the graduates from Nigerian universities carry about and what they can do in terms of applicability. Many graduates from the university system are unemployed and some are unemployable. Consequently in the face of unemployment, poverty and hunger persist and these invariably affect in no small measure the sustainability of the socio-economic development of the country. For

university education in Nigeria to produce graduates with intellectual capacities, sound technological ideas and skills there is need to provide adequate number of technological resources as well as lecturers with proper skills in utilization of ICT component for effective science curriculum delivery.

Conclusion

The glaring challenge in Nigerian University education is the provision and utilization of new technological devices that will enable university graduates meet the demands and challenges in a fast changing world. These new technological devices are redefining science curriculum delivery, hence, science lecturers in the universities must arm themselves with appropriate knowledge and skills for usage of these technological resources in curriculum delivery.

Recommendations

Based on the findings of the study the following recommendations were made:

1. Federal and various State governments should provide adequate quantity of new technological devices such as computers, CD-ROMS, video disc/tape players as well as readymade soft ware packages in various topics and drills for the universities.
2. Science lecturers should be equipped with appropriate skills in the use of the technological devises.
3. Curriculum planners should integrate some ICT into specific science subjects.
4. Science lecturers should be properly motivated through promotions, allowances and acknowledgement and reward for excellence.
5. Funds should be made available for the purchase of standby electricity generating sets for use in case of power outage.
6. Review of the existing Teacher Education Programme to a corporate skills in the use of new technological devices in science curriculum delivery.
7. In-service training programme should be organized for serving teachers through sponsoring them to workshops, seminars and conferences.

8. National University Commission (NUC) should organize accreditation programmes more regularly to ensure that these new technological devices are available and properly utilized in various universities.

9. Philanthropists, non-governmental organisations (NGOs) and other stakeholders in education should provide financial aid to universities for the purchase of the new technological devices for teaching and learning.

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Table 1: Mean responses and Standard Deviation (SD) of Science lecturers from Federal and State Universities on the Availability of New Technological resources for Science Curriculum Delivery

S/N	Availability of New Technological Resources	Federal Universities		State Universities	
		Mean	**SD**	**Mean**	**SD**
1.	Print materials	2.90	0.98	3.10	1.10
2.	Over head projector	1.55	0.87	1.36	0.94
3.	Digital Video Disc (DVD)	0.84	0.76	0.76	0.54
4.	Interactive CD-ROM	1.61	0.66	1.87	0.62
5.	Television	2.32	1.24	2.10	0.81
6.	Radio	2.20	0.88	2.41	0.77
7.	Fax machine	0.89	0.76	0.79	0.59
8.	Computer and its gadgets.	2.87	0.80	2.61	0.85
9.	Internet connectivity	1.99	0.01	1.89	0.88
10.	Intranet/Local Area	2.95	0.79	2.91	0.72
11.	Network, LAN)	1.54	1.05	1.68	1.15
12.	Extranet (Wide Area	2.75	0.69	2.81	0.75
13.	Network, WAN)	1.54	0.99	1.51	0.82
14.	Audio and Video tapes	0.94	0.31	0.85	0.21
15.	Satellite broadcast	0.71	0.22	0.66	0.23
	World wide web (www)				
	Computer software programmes				
	Grand mean	**1.84**	**0.08**	**1.82**	**0.663**

Table 2: Mean responses and Standard Deviation of Respondents on the Extent of Utilization of New Technological Resources for Science Curriculum Delivery

S/N	Extent of Utilization of new technological resources	Federal Universities		State Universities	
		Means	**SD**	**Means**	**SD**
16.	Print materials	3.21	0.61	3.15	0.72
17.	Overhead projector	0.81	0.36	0.66	0.27
18.	Digital video Disc (DVD)	0.76	0.34	0.54	0.31
19.	Interactive CD-ROM	1.54	0.56	0.99	0.27
20.	Television	1.43	0.41	1.20	0.48
21.	Radio	2.10	0.73	1.54	0.78
22.	Fax machine	1.10	0.44	0.76	0.39
23.	Computer and its gadgets	2.10	0.61	1.99	0.62
24.	Internet connectivity	1.91	0.67	1.43	0.55
25.	Intranet/Local Area	2.34	0.84	2.33	0.71
26.	Network (LAN)	0.81	0.38	0.57	0.21
27.	Extranet/Wide Area	1.64	0.41	1.35	0.34
28.	Network (WAN)	0.84	0.36	0.59	0.33
29	Audio and Video tapes	0.79	0.34	0.68	0.33
30.	Satellite broadcast	0.51	0.77	0.67	0.21
	World wide web (www)				
	Computer software programmes				
	Grand mean	**1.366**	**0.522**	**1.110**	**0.435**

Table 3: Mean responses and Standard Deviation of Respondents on the Hindrances to the utilization of New Technological Resources for Science Curriculum Delivery

S/N	Hindrances to New Technological Resources	Federal Universities		State Universities	
		Means	**SD**	**Means**	**SD**
31.	Lack of fund to equip the science laboratories with new technological resources.	3.94	0.97	3.84	0.98
32.	Lack of ICT gadgets and internet connectivity	2.96	0.74	3.26	0.81
33.	Lack of electric power supply or standby electric generating set	3.19	0.88	3.99	0.89

34	Lack of appropriate skills to operate e-learning.	3.26	0.91	3.40	0.77
35.	Lack of motivation of lecturers to use these gadgets.	2.64	0.66	2.72	0.71
36	Time factors in terms of curriculum overload.	2.76	0.62	2.88	0.78
	Grand Means	**3.071**	**0.79**	**3.34**	**0.82**

Table 4: t-test of the mean responses of respondents in Federal and State Universities on the Availability of New technological resources for science curriculum delivery

Source Of Variation	**N**	**X**	**SD**	**df**	**t-cal**	**t-crit**	**P<0.05**
Federal University	78	1.84	0.80	138	0.161	1.96	Not significant
State University	62	1.82	0.663				

Table 5: t-test on mean responses of respondent in federal and state universities on the utilization of new technological resources for science curriculum delivery

Source of Variation	**N**	**X**	**SD**	**df**	**t-cal**	**t-crit**	**P<0.05**
Federal University	78	1.366	0.522	138	0.081	1.96	Not significant
State University	62	1.110	0.435				

Table 6: t-test on mean responses of respondents in federal and state universities on the hindrances to the utilization of new technological resources for science curriculum delivery

Source of Variation	**N**	**X**	**SD**	**df**	**t-cal**	**t-crit**	**P<0.05**
Federal University	78	3.071	0.79	138	-1.963	1.96	Not significant
State University	62	3.34	0.82				