



Assessment of Information and Communication Technology (ICT) Utilization for Teaching Science and Technical Subjects in Science and Technical Colleges for Sustainable Economic Recovery in North-East States, Nigeria

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ABSTRACT

The study investigated the level of ICT utilization in technical colleges for sustainable economic recovery in North East States of Nigeria. The study employed survey research design. The population of the study was all science and technical teachers. The instrument for the study was a structured questionnaire with 19 items which was validated by two experts each from science education and technology education departments, Modibbo Adama University of Technology Yola, Adamawa State Nigeria. The internal consistency and reliability of the instrument was estimated using the Cronbach's alpha to establish coefficient of 0.89. The study answered three research questions and tested three hypotheses. Data were analyzed using mean, standard deviation and ANOVA. The results showed that science and technical teachers do not utilize ICT resources in their process of instructional delivery and evaluation of learning. It was therefore recommended among others that National Board for Technical Education (NBTE) should incorporate the use of ICT resources as a tool for teaching into technical colleges' curriculum.

Keywords: Assessment, ICT, utilization, Economic Recovery

INTRODUCTION

The constant changes of Information and Communication Technology (ICT) in the last two decades has impacted the life of many people and the nature of jobs in all fields of science and technology. Education as the main vehicle for human resources development needs to heed to the constant changes in the world of work. In line with the rapid development and usage of ICT in the workplace, it is important that the current generation of students need to be well-prepared with ICT knowledge and skills for them to face the tasks in the world of work. ICT is become the way of life in this increasingly global economy, it is therefore imperative to be fully prepared to live in the ICT world. The United Nations Scientific Educational and Cultural Organisation (UNESCO, 2005) defined ICT as the combination of the computer, telecommunication and media technologies. They are electronic technologies used for accessing, processing, gathering, manipulating and presenting or communicating information in education system. It encompasses software, hardware and even the connectivity (Anderson & Baskin, 2002). Information and Communication Technologies (ICTs) continues to impact positively on every aspect of human existence, thereby creating a powerful force for changes on how people conduct their daily businesses (jobs) and in fact, determine the economic status of the Nation and/or increase business activity thereby recovering economy of a state that is in recession. An economic recovery is the stage of a given State's business cycle after recession. It's a period that the State's economy regains and exceeds

peak employment and output levels achieved prior to downturn. Economic recovery is a situation of increasing business activity indicating the end of a recession.

Economists use a variety of indicators, including gross domestic product (GDP), inflation, financial markets and unemployment to analyze the state of the economy and determine whether a recovery is in progress. This stage is characterized by an increase in consumers' confidence of the market. The bank lending rates are low, and Government and companies can afford to finance projects. There is an increase in productivity due to the increased aggregate demand in the economy. Increase in production allows companies to start employing, which in turn, increases the income of consumers who can now afford to purchase capital goods. The gross domestic product start to increase and the profit margins of companies starts rising. Therefore, States that are able to offer high skilled workforce will be able to attract potential investment in large amount for sustainable economic recovery. Hence, science and technical subjects has the capability of preparing high skilled workforce and the utilization of ICT in their teaching and learning will enhance the quality of the graduates and will make them the most sought after potential employees.

The use of ICT in teaching and learning can assist in reducing the teacher's workloads through its use for teaching preparation and instructional delivery, individualized and collaborative learning as well as learning evaluation. Thus teachers become learning facilitator, collaborator, coach, mentor, knowledge navigator, and co-learner and not only a dispenser of knowledge (Ogwo, 2005). Instructional content can be delivered in textual, audio, visual, and audio visual forms. Thus equity can be ensured for all categories of learners (disabled and geographically disadvantaged learners that cannot attend regular school etc). The use of ICT in teaching helps in the explanation of difficult scientific and technological concepts thereby increasing students' motivation and therefore, enhances the national economic status through their application of the scientific knowledge and technological skills gain to industries. The educational reform policies were aimed at integrating the use of ICT in teaching and learning in the Nigerian school system.

The Nigerian National policy for Information and Technology (Federal Republic of Nigeria ([FRN, 2001) recognize the need for application of ICT in education which emphasize three major objectives namely: empower youths with ICT skills and to prepare them for competitiveness in a global environment, integrate ICT into the mainstream of education and training, and establishment of multifaceted ICT Institutions as centers of excellence. The document specifically noted the need for restructuring the education system at all levels to respond effectively to the challenges of manpower development, imagined impact of the information age and the allocation of a special industrial training development fund for education at all levels. To achieve these objectives, nine major strategies were outlined, among which include; making the use of ICT compulsory at all educational Institutions, developing ICT curricular for all levels of education, using ICT in distance education and ICT companies investing in education.

However, Yusuf (2005) noted in his analysis of the Nigerian National policy for Information Technology that the policy was inadequate for positive impact on the Nigerian education system. This, he noted, stems from the fact that the philosophical frame of reference is market driven, with little emphasis on the utilization of ICT in instructional delivery. If ICT should properly be utilized in teaching, it will definitely improve the quality of education and training in several ways such as increasing learners' motivation and engagement, facilitating the acquisition of basic skills and enhancing teacher training (Wadi & Sonia, 2004). New and emerging technologies challenge the traditional process of teaching and learning and the way education is managed. The new communication technologies has the promise to reduce the sense of isolation and open access to knowledge in many ways, thus changing the process of teaching and learning by adding elements of vitality to learning environment. The new technologies make it possible for complicated collaborative activities of teaching and learning by dividing it in space and time with seamless connectivity between them.

Nevertheless, ICT has turned from being a technology of communication and information to a curriculum creation and delivery system for educators and learners (UNESCO, 2004). There is an unresolved tension around the issue of ICT as a subject on its own that comprises the knowledge, skills and understanding to

make appropriate, productive use of ICT, or as a set of tools with which to deliver and absorb other subjects in the curriculum. Smith (1999) maintained that the focus is on the subject being taught or studied rather than developing pupils' skills with knowledge of the technologies. Dale, Robertson and Shortis (2002) predicted that qualitative and quantitative gaps between the pupils' and the teachers' understanding of the affordances of ICT as a technology of teaching are much greater than has been the case with any other teaching technology.

ICT, when used as a tool, has the potential to transform the way education is delivered. ICT can facilitate differentiation and individualization in education. This makes it possible to tailor both the content and the presentation of the subject matter to the individual background, experience and needs of students. According to Schiller and Tillett (2004) ICT enhances what is possible by providing what teachers are able to do, providing an entry point into the content and enquiries that were not possible without the use of ICT, extending what students are able to produce as a result of their investigations and providing teachers with the opportunities to become learners again.

Statement of the Problem

Stewart (1999), Afolabi (2001) and Olelewe and Amaka (2011) have shown that science and technical colleges that have not adopted the use of ICT in teaching and learning would be out of competition in the educational market. Despite the keenness of some Institutions to establish ICT education programmes, they are confronted with enormous problems that may impede the proper utilization of these programmes. The most significant of these is poor ICT penetration and usage among Nigerian science and technical colleges. Almost all the science and technical colleges in North Eastern States of Nigeria have inadequate ICT infrastructure namely lack of access to electricity and poor telecommunication facilities. Above all, this lack of access to much needed infrastructure is the result of insufficient funds' allocation to the institutions (Ololube, Ubogu & Egbezor, 2007). These observed short-comings cast doubts on whether the existing science and technical colleges in North Eastern States of Nigeria utilize ICT facilities in their teaching processes.

Purpose of the Study

The main purpose of this study was to investigate the level of utilization of Information and Communication Technologies (ICTs) in the teaching of science and technical subjects in science and technical colleges in North East States of Nigeria. Specifically, the study will:

1. determined the level of ICT utilization in instructional delivery process in science and technical colleges in North East States of Nigeria,
2. determined the level of ICT utilization in developing and planning lesson note in science and technical colleges in North East States of Nigeria,
3. determined the level of ICT utilization in evaluation of learning in science and technical colleges in North East States of Nigeria.

Research Questions

To achieved these objectives, the following research questions were developed

1. What is the level of ICT utilization in instructional delivery process in science and technical colleges in North East States of Nigeria?
2. What is the level of ICT utilization in developing and planning lesson note in science and technical colleges in North East States of Nigeria?
3. What is the level of ICT utilization in evaluation of learning in science and technical colleges in North Eastern States of Nigeria?

Hypotheses

The following null hypotheses were formulated to guide the study.

1. There is no significant difference in the level of ICT utilization in instructional delivery process among science and technical teachers in science and technical colleges in North East States of Nigeria

2. There is no significant difference in the level of ICT utilization in developing and planning lesson note among science and technical teachers in science and technical colleges in North East States of Nigeria
3. There is no significant difference in the level of ICT utilization in evaluation of learning among science and technical teachers in science and technical colleges in North Eastern States of Nigeria

METHODOLOGY

The study adopted survey research design. The target population was 673 science and technical teachers in science and technical colleges in the North East States of Nigeria. A random sampling technique was used to select 237 science and technical teachers in science and technical colleges in North East States. A structured questionnaire as the instrument for data collection was developed by the researchers based on the literatures reviewed. The instrument was designed in line with the specific purpose of study. The instrument was arranged in two parts: I and II. Part I sought personal data such as name of the state while part II comprise items dealing with ICT utilization in teaching science and technical subjects. Teachers' ICT utilization was assessed using a four point scale of Highly Utilized (HU), Utilized (U), Sometimes Utilized (SU), and Not-Utilized (NU) with corresponding assigned values of 4, 3, 2, and 1 respectively. The instrument was face validated by two experts from the department of technology education, Modibbo Adama University of Technology Yola, Adamawa State Nigeria. The pilot test of the instrument was carried out using 15 mechanical engineering trades teachers, who were not included in the main study. The internal consistency and reliability of the instrument was estimated using the Cronbach's coefficient alpha. The overall reliability of the instrument was established at 0.89.

The researchers administered the copies of the instrument to the respondents with the help of three trained research assistants. A total number of 237 copies of questionnaire instrument were distributed to the respondents and later 219 copies were retrieved and used for the statistical analysis. Data collected was analyzed using mean and standard deviation to answer all the three research questions while ANOVA was used in testing the three null hypotheses at 0.05 level of significance. The responses of the teachers were grouped which ranges from 0-1.49 as Not Utilized (NU), 1.50-2.49 as Sometimes Utilized (SU), 2.50-3.49 as Utilized (U) and 3.5-4.5 as Highly Utilized (HU). Therefore, mean ratings that falls under any of the above ranges will be called as labeled. For the analysis of data concerning hypothesis where p-value is greater than or equals to 0.05, the hypothesis of no significant difference was not rejected at probability of 0.05 level of significance; but where the p-value is less than 0.05, the hypothesis of no significant difference was rejected at 0.05 level of significant. All statistical analysis was performed with Statistical Package for Social Sciences (SPSS) statistical soft ware.

RESULTS

Research Question 1: *What is the level of ICT utilization in instructional delivery process of teachers in science and technical colleges in North East States of Nigeria?*

Table 1: Mean Ratings of Teachers on the Level of ICT Utilization in Instructional Delivery

| S/n | ICT Utilization in Instructional Delivery Process | \bar{X} | δ | Remark |
|-----|--|-----------|----------|--------|
| 1. | The use of multimedia projectors in lesson presentation | 2.28 | 0.737 | SU |
| 2. | Using On-line methods for delivering lesson | 1.28 | 0.542 | NU |
| 3. | The use of tutorial packages on CD-ROMs/cards to deliver lesson | 1.28 | 0.524 | NU |
| 4. | Use of video, television, etc to deliver lesson | 2.40 | 0.646 | SU |
| 5. | Use of internet to post information to the class | 1.24 | 0.436 | NU |
| 6. | Use of virtual learning class with colleagues and students | 1.32 | 0.557 | NU |
| 7. | The use of internet chatrooms as discussion forum with students and colleagues | 1.24 | 0.436 | NU |

Table 1 indicates that the mean responses of the teachers on the level of ICT utilization in instructional delivery process ranged from 1.24 to 2.40. Five of the items fall under the range of 0-1.49 which is indicating “Not Utilized (NU)” while the use of multimedia projectors and video, television, etc were “Sometimes Utilized (SU)” to deliver lesson. The standard deviation (δ) of the items ranged from 0.436 to 0.737. This implies that teachers were very close in their responses.

Research Question 2: *What is the level of ICT utilization in developing and planning lesson note of teachers in science and technical colleges in North East States of Nigeria?*

Table 2: Mean Ratings of Teachers on the Level of ICT Utilization in Planning and Developing Lesson Note

| S/n | ICT Utilization in Planning and Developing Lesson Note | \bar{X} | δ | Remark |
|-----|--|-----------|----------|--------|
| 1. | Use of virtual library in improving students learning at any time | 1.28 | 0.458 | NU |
| 2. | Using internet search engines to explore teaching/learning materials | 3.12 | 0.781 | U |
| 3. | Accessing/downloading original source of document from internet | 3.16 | 0.688 | U |
| 4. | Teachers use internet to explore different options of materials | 2.08 | 0.702 | SU |
| 5. | The use of internet to access recent technological advancement | 2.40 | 0.707 | SU |

Table 2 indicates that the mean responses of the teachers on the level of ICT utilization in planning and developing lesson notes ranged from 1.28 to 3.16. One of the items fall under the range of 0-1.49 which is indicating “Not Utilized (NU)”, two fall on the range of 1.50-2.49 that is “Sometimes Utilized (SU)”, and the remaining two fall under 2.50-3.49 indicating “Utilized (U)”. The standard deviation (δ) of the items ranged from 0.458 to 0.781. This implies that the teachers were very close in their responses.

Research Question 3: *What is the level of ICT utilization in evaluation of learning in science and technical colleges in North Eastern States of Nigeria?*

Table 3: Mean Ratings of Teachers on the Level of ICT Utilization in Evaluation of Learning

| S/n | ICT Utilization in Evaluation of Learning | \bar{X} | δ | Remark |
|-----|--|-----------|----------|--------|
| 1. | The use of emails in giving and assessing the students’ assessment | 1.24 | 0.523 | NU |
| 2. | Use of ICT resources to generate assessment questions | 1.72 | 0.542 | SU |
| 3. | Use of ICT resources in conducting exams for students | 1.16 | 0.374 | NU |
| 4. | Use of ICT resources in marking students’ exams | 1.12 | 0.332 | NU |
| 5. | Use of ICT resources in computing students’ results | 1.24 | 0.523 | NU |
| 6. | Use of ICT resources in data analysis and presentation of results | 1.28 | 0.458 | NU |
| 7. | Use of ICT resources in storing, retrieval and sharing results | 3.60 | 0.501 | HU |

Table 3 indicates that the mean responses of the teachers on the level of ICT utilization in planning and developing lesson notes ranged from 1.12 to 3.60. Five of the items fall under the range of 0-1.49 which is indicating “Not Utilized (NU)”, while one fall under 1.50-2.49 indicating “Sometimes Utilized (SU)” and the remaining one item is “Highly Utilized (HU)”. The standard deviation (δ) of the items ranged from 0.332 to 0.542. This implies that the teachers were very close in their responses.

Hypotheses 1: There is no significant difference in the level of ICT utilization in instructional delivery process among teachers in science and technical colleges in North East States of Nigeria

Table 4: Analysis of Variance (ANOVA) of the Mean Ratings of Teachers’ Responses on the Level of ICT Utilization in Instructional Delivery Process in Science and Technical Colleges in North-East States

| Source of variation | Sum of square | df | Mean square | F-cal | P-value | Remark |
|---------------------|---------------|----|-------------|-------|---------|--------------|
| Between groups | 0.39 | 4 | 0.010 | 0.032 | 0.998 | Not rejected |
| Within groups | 9.063 | | 0.302 | | | |
| Total | 9.102 | | | | | |

$N_{Adamawa}=38, N_{Bauchi}=41, N_{Gombe}=52, N_{Taraba}=29, N_{Yobe}=59, P>0.05.$

Table 4 shows that there is no significant difference in the level of ICT utilization in instructional delivery process among teachers in science and technical colleges in North East States of Nigeria. This is evident from the table since the P-value of 0.998 is greater the 0.05 level of significant. The second null hypothesis 1 was not rejected.

Hypotheses 2: There is no significant difference in the level of ICT utilization in developing and planning lesson note among teachers in science and technical colleges in North East States of Nigeria

Table 5: Analysis of Variance (ANOVA) of the Mean Ratings of Teachers' Responses on the Level of ICT Utilization in Developing and Planning Lesson Note in Science and Technical Colleges in North-East States

| Source of variation | Sum of square | df | Mean square | F-cal | P-value | Remark |
|---------------------|---------------|----|-------------|-------|---------|--------------|
| Between group | 0.148 | 4 | 0.037 | 0.043 | 0.996 | Not rejected |
| Within groups | 12.850 | | 0.857 | | | |
| Total | 12.998 | | | | | |

$N_{Adamawa}=38, N_{Bauchi}=41, N_{Gombe}=52, N_{Taraba}=29, N_{Yobe}=59, P>0.05.$

Table 5 indicates that there is no significant difference in the level of ICT utilization in developing and planning lesson note among teachers in science and technical colleges in North East States of Nigeria. This is evident from the table since the P-value of 0.996 is greater the 0.05 level of significant. The second null hypothesis 2 was not rejected.

There is no significant difference in the level of ICT utilization in evaluation of learning among teachers in science and technical colleges in North Eastern States of Nigeria

Table 6: Analysis of Variance (ANOVA) of the Mean Ratings of Teachers' Responses on the Level of ICT Utilization in Evaluation of Learning in Science and Technical Colleges in North-East States

| Source of variation | Sum of square | df | Mean square | F-cal | P-value | Remark |
|---------------------|---------------|----|-------------|-------|---------|--------------|
| Between groups | 0.126 | 4 | 0.031 | 0.040 | 0.997 | Not rejected |
| Within groups | 27.225 | | 0.778 | | | |
| Total | 12.351 | | | | | |

$N_{Adamawa}=38, N_{Bauchi}=41, N_{Gombe}=52, N_{Taraba}=29, N_{Yobe}=59, P>0.05.$

Table 6 shows that there is no significant difference in the level of ICT utilization in evaluation of learning among teachers in science and technical colleges in North Eastern States of Nigeria. This is evident from the table since the P-value of 0.997 is greater the 0.05 level of significant. The second null hypothesis 3 was also not rejected.

DISCUSSION

The main contribution of this study is the discovery of the level at which science and technical subjects teachers utilizes ICT in teaching in science and technical colleges in North East States of Nigeria. The findings of the study related to research question 1 indicated that teachers do not utilize ICT in their process of instructional delivery. The study only indicated that teachers sometime utilize multimedia projector, television, videos etc in their instructional delivery. This finding agrees with Oluwatumbi (2015) and disagrees with the finding of Olelewe and Amaka (2011) which revealed that ICT resources are most effectively utilized by computer educators in divers ways mostly in the use of tutorial packages on CD-ROMs as well as intensive use of internet chat rooms and search engines in their teaching and learning process. The finding of the study related to research question 2 revealed that teachers utilize search engines to explore, access, and downloads teaching materials from the internet. The study also discovers that sometimes teachers utilize internet to access recent technological advancement. The study further revealed in relation to research question 3 that teachers sometimes utilize ICT resources to

generate assessment questions for evaluating students learning and highly utilizes ICT resources in storing, retrieving and sharing students' results. The analysis of data relating to the research hypotheses indicated that there is no significant difference among the teachers response relating to their usage of ICT in teaching science and technical subjects in science and technical colleges in North East State of Nigeria.

CONCLUSION

The findings of this study have shown that science and technical teachers in science and technical colleges in North East State of Nigeria lagged behind in ICT resources utilization in instructional delivery and evaluation of students learning. The effective utilization of ICT resources in science and technical colleges requires that teachers integrate it in their teaching activities. Hence, the utilization of ICT in instructional delivery, planning and developing lesson note as well as evaluation of students' learning will significantly be of great benefit to our society.

RECOMMENDATIONS

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

1. National Board for Technical Education (NBTE) should incorporate the use of ICT resources as a tool for teaching into their curriculum.
2. Science and Technical teachers should see the need for adopting the current methods in teaching and learning using interactive learning tools such as laptops, television and multimedia projectors, computer software/packages (learning tutors on CD-ROMs/cards) that combine text, sound, colourful images etc., that can provide challenging and authentic content that enhances students learning process.
3. The Ministry of Education should ensure that adequate ICT resources needed for proper utilization of ICT as a tool for teaching and learning in science and technical colleges are provided in right number.

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