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Information Communication Technology and the African Student

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Abstract

To engage students, improve learning and become a cutting edge educator, it becomes necessary to combine traditional classroom instruction with online or mobile learning activities through the technological world which moves so fast and changes so rapidly. The objective of this study was to build an evidence-based framework that explains the challenge of the developing countries' students in respect of maximizing the full potentials of the computer for educational activities. Questionnaires were administered to 213 students of the

University of Ibadan and the Polytechnic, Ibadan, Oyo state of Nigeria. A major limitation to maximizing the full potentials of the computer is poor power energy supply. 62.9% of the population understudied pay to use computer for academic purposes. The cost per hour ranged between #50 to #100 plus. The benefits of collaborative learning and teaching with multiple instructors; integration of external expertise and video conferencing system to create geographically distributed discussion of panels of experts is visibly not maximized. Ultimately, the significant gain in economic productivity as a result of education which may be the most promising way to stimulate general economic growth is lost. This study strongly recommends improved access to computers for the African students.

Key Words: Information communication technology, education, challenges, development, statistics

Introduction

Education is the bane for development, while, sustainable development leads to poverty reduction. To engage students, improve learning and become a cutting edge educator, it is necessary to combine traditional classroom instruction with online or mobile learning activities through the technological world which moves so fast and changes so rapidly. Using the power of the internet, students can now learn different things wherever and whenever they want. The role of Information Communication Technology (ICT) in educational development is unquestioned, and very significantly, the place of energy for effective use of ICT cannot be over emphasized.

Classroom face to face instruction, often referred to as the traditional form of educational delivery has many advantages. This provides immediate feedback mechanism for both the teacher and students and as such, misunderstanding can be clarified and arrested at an early stage. The opportunity of learning through all the senses (multimodal pedagogy) is enabled. Also, the traditional educational delivery system provides an environment for social interactions in a manner that allows students to learn from one another and by so doing enhance their social skills. Above all, classroom instruction provides a great deal of flexibility to the teacher who can arrange and rearrange the classroom environment to meet the needs of the students, the contents and the pedagogy and consequently promote learning.

Despite all the benefits of traditional classroom instruction, it is highly limited in geographical coverage, access to information, access to learning resources, interaction with a larger audience and access to many possible instructors. Therefore, the traditional classroom instruction needs to be complimented with ICT.

The automation of information processing is part of a technology that evolved since the World War II in the scientific research associated with development of radar and the military systems for using radar data in directing combat fire control. Information technology is built on the twin foundations of information theory and physical advances in electronics, optics and other related sciences. Together, they are yielding to mankind entirely new tools, new resources and new capabilities. The technology is developing at an accelerating rate. The electronic computer was the first physical manifestation of the automation of information processing technology. The program learning activities can alter some fundamental concepts of industrial training and public education. Machine systems can pace the individual student, analyze his learning difficulties and mistakes as they occur and can introduce remedial instructions as needed. Information technologies encourage a degree of personal participation by the student which is impossible in normal classroom work (Diebold, 1962).

Technology can be used to facilitate the display of information, to increase access to external explicit information and to increase the sharing and construction of knowledge. Technology is not suggested as a panacea for educational problems, in fact many problems in education are social rather than learning related. Yet technology can enable the effective application of constructive, cognitive, collaborative and sociocultural models of learning. In short, ICT is primarily used to automate the information delivery function in classrooms (Leidner and Jarvenpaa, 1995).

Globally, ICT can enable collaborative learning and teaching with multiple instructors and integration of external expertise. It can be used for video conferencing system to create geographically distributed discussion panels of experts. Over the coming years, universities will face many challenges to the one-course, one-semester, one-instructor, one-site traditions of today's educational systems. This is because, no university can employ every

good instructor, no university can maintain every useful perspective on a domain and no student can attend every university (Alavi and Vogel, 1997).

Apparently, ICT is highly versatile. It can be tailored to meet a variety of diverse challenges. The same network, server and peripheral devices such as personal computers or cell phones can help support distance education and remote health delivery and connect rural communities to global markets. Thus, ICT can help transcend traditional barriers of geography. It allows individuals and entities anywhere in the world access to the same information without the time and cost associated with physical transportation. This is an advantage substantially enhanced by the advent of wireless and satellite communications and voice-over internet protocol long-distance service. It also facilitates the transfer of know-how across the full spectrum of knowledge, allowing developing countries to reap productivity gains and harness state of the art technology (Steinberg, 2010). For instance, John (1997) observed new digital technologies offer exciting possibilities for innovation in African language instruction. Teaching pedagogies-methods and approaches-evolve rather slowly when compared with technology. Separation of the substance of language from technology prevents both instructors and students from fully appreciating the possibilities technology presents and the values that can be derived from it. The instrumental approach to the technology proposed, allows students to use computers with the supportive assistance of instructors as facilitators.

Tracey et al. (2002) observed new digital technologies and multimedia is transforming how we teach and learn. They are transforming our classrooms from spaces of delivery to spaces of active inquiry and authorship. New digital media are empowering students to become researchers, storytellers, historians, oral historians and cultural theorists in their own right. The digit format transforms student's capacity to synthesize, interpret, theorize and create new cultural and historical knowledge. In this way, digital formats potentially democratize learning and produce critical subjects and authors. While, Denzel et al. (2002) synthesized the knowledge available and identified the knowledge needed about ways that new digital technologies may affect student learning, particularly in sociology. The authors suggested that sociological perspectives can inform the structural and cultural contexts that shape key aspects of teaching and learning with digital technologies.

In a similar vein, Clotilde and Maria (2011) explained core aspects of the experience of the Omar Dengo Foundation of Costa Rica in the development of the deliberative capabilities in school age children project, a set of citizenship education programs based on the conception of children as citizens and on a particular conception of the role of digital technologies in the promotion of children's high order skills. Again, John (2002) examined the theoretical considerations and didactic concerns involved in the integration of new interactive digital technologies into the instructional process. Specific arguments for the integration of digital technologies with conventional instructional classroom practices were raised. Achieving effective and responsible use of computer-assisted language learning with digitized multimedia-based instructional learning materials is essential to the organization for improving comprehension of culturally authentic texts. Also, Kieran (2002) identified how the new technology if institutionalized will have an immediate and deep impact on how people read, listen, view and learn.

Still on the need to incorporate ICT with classroom instructions, Galician (2004) examined embracing media literacy education in schools and our lives. The study observed that in the 21st century, we simply cannot afford the human disempowerment of media illiteracy. The paper emphasized the need to make the research, teaching and practice of media literacy a lifelong endeavour, a personal and national priority in the mediated global world. It urges the media literacy advocates constructing theories to focus on media exposure, which is, capable of explaining the complex processes of message filtering and the construction of meaning from mediated messages. Armed with clearer evidence from the overlap of media literacy and cognitive psychology regarding how behaviour follows cognition. The study concluded we can better determine how to successfully engage schools, parents, social institutions and others in the media literacy movement.

Martine (2013) investigated the use of digital technologies to support inclusive practices in Early French Immersion (EFI) classrooms. The author found that the collaborative action research project contributed to empowering teachers in using digital technologies to support the implementation of new inclusive instructional strategies. The use of digital technologies allows for the implementation of inclusive instructional strategies by providing multiple means of representation, action and expression and engagement, based on the

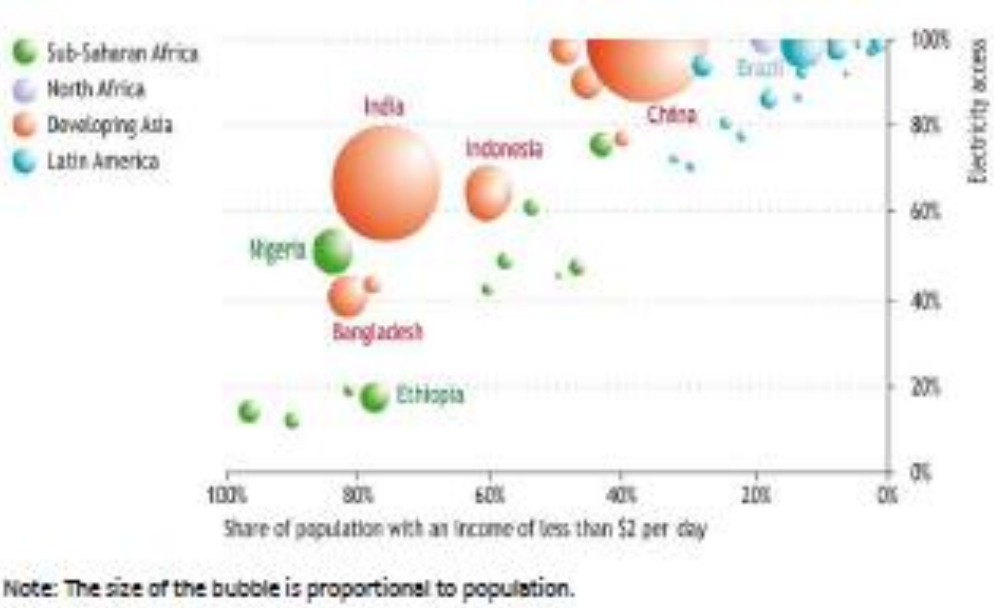
universal design learning framework. The findings also support the adoption of an e-inclusion approach in EFI classrooms to meet the needs of all learners.

While, Nigel (2011) observed electronic technologies are reshaping everyday life dramatically. At least in the western world, the digital revolution is seeping through daily life, reaching into office spaces by means of email communications, PowerPoints, e-books and Skype, into homes via consumer and social websites and computer games, and into pockets through credit cards, i-Pods and i-Phones. If daily lives have changed over the past two decades, so, too, has the production of knowledge, new search engines and google scholar. Synchronous staging of worldwide news on internet sites contribute to an exponential growth of knowledge. Punctuate those changes with the development of new virtual identities constructed from webs of relationships and communities, and the contemporary era emerges as one of profound social transformations. The author concluded that digital technologies unframed the lives of young people and that technological media are co-constitutive elements in the production of knowledge. Some other authors have examined the significance of ICT to a country's level of modernization, telecommunications and exciting and dynamic development (Abid, Shirin and Qazi, 2001; Corbett, 2001; Lee et al., 2007; Natascha et al. 2009; Kaul, 2012).

Two major reasons for ICT's failure to deliver on some of its potentials in Africa is the limited availability of computers and poor energy supply. Amongst several others is the lack of skilled workers to maintain equipment and train potential users. Also, poor government technological policies that have made costs for internet connection out of reach, and the lack of applications tailored to meet the unique needs of developing countries. This study investigates the availability of computers as teaching aids for educational development in selected institutions of higher learning in Nigeria. The objective is to build an evidence-based framework that explains the challenge of the developing countries' students in respect of maximizing the full potentials of the computer. The basic underlying assumption is that computers are the simplest interactive instructional devices and that energy is a fundamental requirement for its functionality. Our findings should enable the orientation of educational development strategies targeted towards students in the developing countries.

Energy, Information Communication Technology, Poverty and Development

The international community has long been aware of the close correlation between income levels and access to modern energy (Fig. 1). Countries with a large proportion of the population living on an income less than $2 per day tend to have low electrification rates. As income increases, access to electricity rises at a faster rate. For 2030, the Universal Modern Energy Access Case concludes, bringing electricity to the 1.2 billion people who would otherwise not have access to it by 2030 would require additional cumulative investment. While, the New Policies Scenario indicates $700 billion in 2010-2030 or $33 billion per year. Compared to the projections in the New Policies Scenario in order to acheive the stated interim goals by 2015, number of people without electricity will need to be about 395 million less. This demanding target in the New Policies Scenario is not acheived even in 2030 (International Energy Agency, 2010).



Sources: International Energy Agency 2010, p.12

Figure 1: Household income and electricty access in developing countries

Although, electricity will progress over the period to 2030, the need will grow as the population increase. In the New Policies Scenario the number of people lacking access to electricity in 2015 is still around 1.4 billion practically unchanged from today. In the New Policies Scenario without additional, dedicated policies, there are 1.2 billion people still lacking access to electricity in 2030 (Table 1). The electrification rate in developing countries increases from 73% in 2009 to 81% in 2030. China is projected to acheive universal electrification soon after 2015. In developing Asian countries apart from China and India, the electrification rate rises to 82%, but 252 million people still lack access in 2030. Electricity access in Latin America is nearly universal by 2030. In Sub- saharan Africa, the absolute number of people lacking access is projected to continue to rise , despite an increase in the electrification rate. By 2030, the region accounts for 54% of the world total, compared with 41% in 2009.

Table 1: Number of people without access to electricity and electrification rates by region in the New Policies Scenario (million)

			2009	2015	2030	2009	2015	2030
	Rural	Urban	Total	Total	Total	%	%	%
Africa	466	121	587	636	654	42	45	57
Sub-Saharan Africa	465	120	585	635	652	31	35	50
Developing Asia	716	82	799	725	545	78	81	88
China	8	0	8	5	0	99	100	100
India	380	23	404	389	293	66	70	80
Other Asia	328	59	387	331	252	65	72	82
Latin America	27	4	31	25	10	93	95	98
Developing Countries*	1229	210	1438	1404	1213	73	75	81
World**	1232	210	1441	1406	1213	79	81	85

*Includes Middle East countries; **Includes OECD and transition economies

Source: International Energy Agency 2010,p.18

On annual basis, cumulative time of electrical supply interruptions is equivalent to about three months of production time lost, a significant duration that implies little or no production. Table 2: summarizes the reliability of electricity supply in Sub-Saharan Africa and developing countries in general.

Table 2: Summary of electricity supply reliability in Sub-Saharan Africa and developing countries

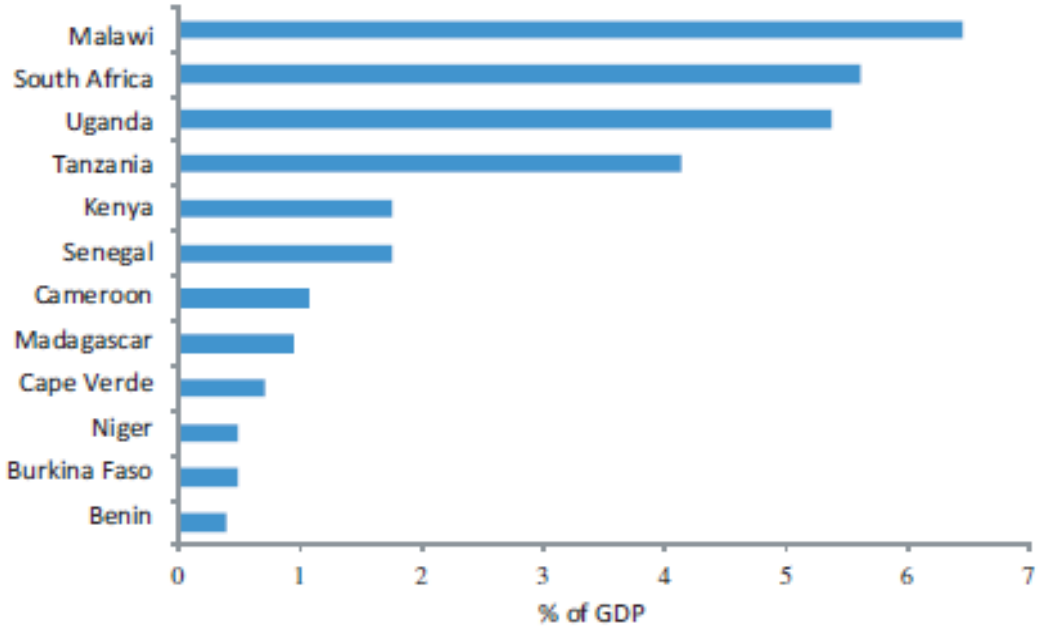
Indicator	Sub-Saharan Africa	Developing Countries
Cumulative electrical interruptions (days/year)	90.9	28.7
Lost Production (% of turnover)	6.1	4.4
Firms owning/sharing generators (% of total)	47.5	31.8
Number of days for new electrical connection	79.9	27.5

Source: International Energy Agency 2010, p. 35

At the macroeconomic level, lack of a reliable supply of electricity is estimated to have a significant impact on economic growth and productivity. Fig. 2 shows the proportion of GDP lost to unreliable electricity supply in some countries in Sub-Saharan Africa (Vivien and Briceno-Garmendia, 2010).

Per capita energy consumption is significantly less than that in industrialized countries. Nevertheless, the annual rate of growth in energy consumption in the developing countries is three to four times higher than in industrialized countries. These figures mask very unequal access to energy worldwide. In Africa, per capita consumption remains very low whereas in Asia it has almost doubled since 1970. On the present trends, energy demand and intensity (that is, the relationship between consumption and the gross domestic product) will increase sharply in most developing countries (particularly in Asia).

Despite the energy situation, innovating technology could permit the creation of an information utility for the purpose of fostering equal social opportunity across the globe. ICT could make possible the provision of quality education through equal access to learning opportunities across the globe at an economical rate. Significant gains in economic productivity as a result of education may be the most promising way to stimulate general economic growth (Parker and Dunn, 1972). The coordination, direction and control of all social activities depend on ICT. As population and social networks increase in scale, institutions become more complex and the physical environment is more thoroughly modified or synthetic, then information become ever more valuable (Coates, 1992).



Source: Vivien and Briceno - Garmendia, 2010, p.184

Figure 2: Proportion of GDP lost due to unreliable power supply in some Sub-Saharan African countries in 2007

ICT enrich the lives of people everywhere. It can bring ideas and experience to even the most isolated, opening to them the world outside their village, town and country. Experience can be shared with the world at large, at the tap of a keystroke or the touch of a cell phone keypad. It also, empowers individuals to participate in the social and political institutions of their community, giving voice to those who have traditionally been excluded. ICT based solutions have already proved their value in addressing several specific challenges identified in the UN's Millennium Developments goals (MDG's). Health care workers in more than 150 countries for example use Health Net to bring needed expertise and help deliver health services in unobserved, often remote communities. Also, distance learning initiatives such as those at the University of South Africa, are training a new generation of teachers, who are critical to meeting the MDG's objective of universal primary education by 2015.The role of ICT is not confined to internet related projects, for example

radio and telephone-based services are making real contributions in areas such as training of health workers in Uganda and Kenya (Steinberg, 2010).

Computers have powerful multimedia capability, storage capacity, and connections to digital cameras that make it possible to tell the story of a community, capture unforeseen images and conduct face to face discussions from distant locations. There is no question that information technology makes the world smaller, overcoming boundaries of time and space, connecting communities around the globe. International education efforts have much to gain from these new capabilities (Roberts, 2004). Clearly, only an improvement in capacity building through education can help to increase per capita consumption and eradicate extreme poverty in Africa.

Methodology

A total of 213 questionaires were adminstered out of which 110 was to students of the University of Ibadan,Oyo State, Nigeria, while 103 was to students of the Polytechnic Ibadan, Oyo State, Nigeria. These two higher institutions of learning happen to be amongst the oldest institutions in the western part of the country. The population of respondents constitute 51.6% from the University of Ibadan,Oyo State, Nigeria and 48.4% from the Polytechnic Ibadan, Oyo State, Nigeria.

The faculties/schools of the interviewee include Technology (11.8%); Social Science (9.0%); Science (18.0%); Art (7.6%); Veterinary Medicine (1.9%); Agriculture & Forestry (5.7%); College of Basic Medical Sciences (3.3%); Law (1.4%); College of Medicine & Surgery (2.8%); Education (2.4%); Institute of African Study (0.5%); Pharmacy (1.4%); Public Health (0.5%); Financial & Management studies (21.8%); Business & Communication (10.4%) and Environmental Studies (1.4%).

The departments of study of the respondents include industrial Engineering (0.9%); Chemistry (0.9%); Veterinary Medicine (1.4%); Wildlife & Ecotourism Management (0.9%); Biochemistry (2.8%); Animal Science (0.9%);Microbiology (0.9%); Law (1.4%); Geography (0.9%)'; English (1.4%); Classics (0.5%); Philosophy (0.9%); Medicine %Surgery (2.4%); Aquaculture & Fisheries (0.9%); Communication & Language Art (1.4%); Linguistics (0.5%); Education Management (0.5%); Pharmacy(0.9%); Economics (5.7%); Agricultural Extension & Rural Development (1.9%); Geology (0.5%);

Computer Science (5.7%); Political Science (1.4%); Zoology (4.7%); Agricultural Economics (0.9%); Archaeology & Anthropology (0.9%); Mathematics (1.4%); Pharmaceutical Microbiology (0.5%); Teacher Education (0.9%); Veterinary Public Health and Preventive Medicine (0.5%); Library & Information Science (0.5%); Mechanical Engineering (1.4%); Electrical Electronics Engineering (1.9%); Civil Engineering (6.6%); Food Technology (0.5%); Institute of African Study (0.5%); Agricultural Engineering (0.5%); Statistics (1.4%); Sociology (0.5%); Chemical Pathology (0.5%); Urban & Regional Planning (0.5%); Adult Education (0.5%); Psychology (0.5%); Religious Study (0.9%); History (0.9%); Human Nutrition (0.5%); Accountancy (12.7%); Office Technology (0.5%); Marketing (2.4%); Music (1.9%); Business Administration (0.9%); Banking & Finance (5.7%); Quantity Surveying (1.4%); Purchasing Power & Supply (0.9%); Science Laboratory Technology (0.9%); Public Administration & Local Government Studies (2.8%) Insurance (3.3%); Mass Communication (0.9%) and Architecture (0.5%).

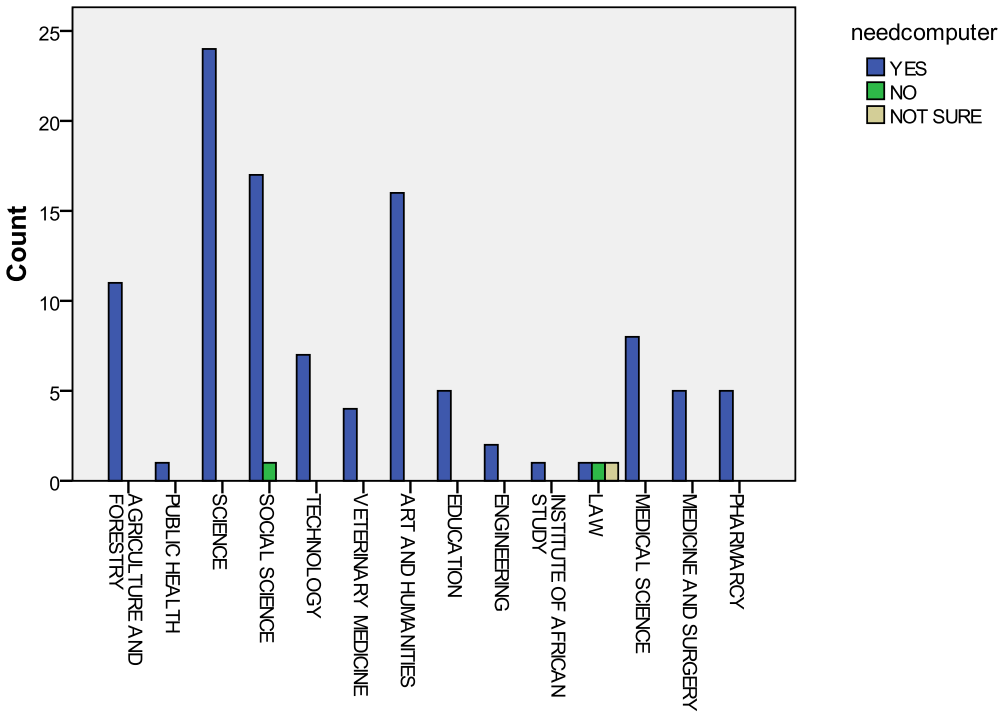
The levels of study for all respondents was categorized as Freshers-new intakes (4.3%); Regulars-second year through to a year before final year (48.1%); Finalists-final year (27.6%) and Postgraduates-masters/doctorate (20%). While, gender of respondents includes Male (71.2%) and Female (28.8%). The age (years) was categorized into 18-25 (66.4%); 26-30 (23.7%); 31-35 (7.5%) and >30 (2.4%).

Results

Computers as Interactive Tools for Learning

46.2% of the students attested to their departments having computers as an interactive tool for learning, 42% claimed their departments of study had no computers, while, 11.8% were not sure whether or not their departments had computers for students use. 96.2% see the need for computer as an interactive tool for learning, while, 1.9% claimed they had no need of the computer and another set of 1.9% were not sure whether or not they needed computer for learning (Fig. 3).

Figure 3: Frequency distribution of responses to the need of computer for learning for selected departments

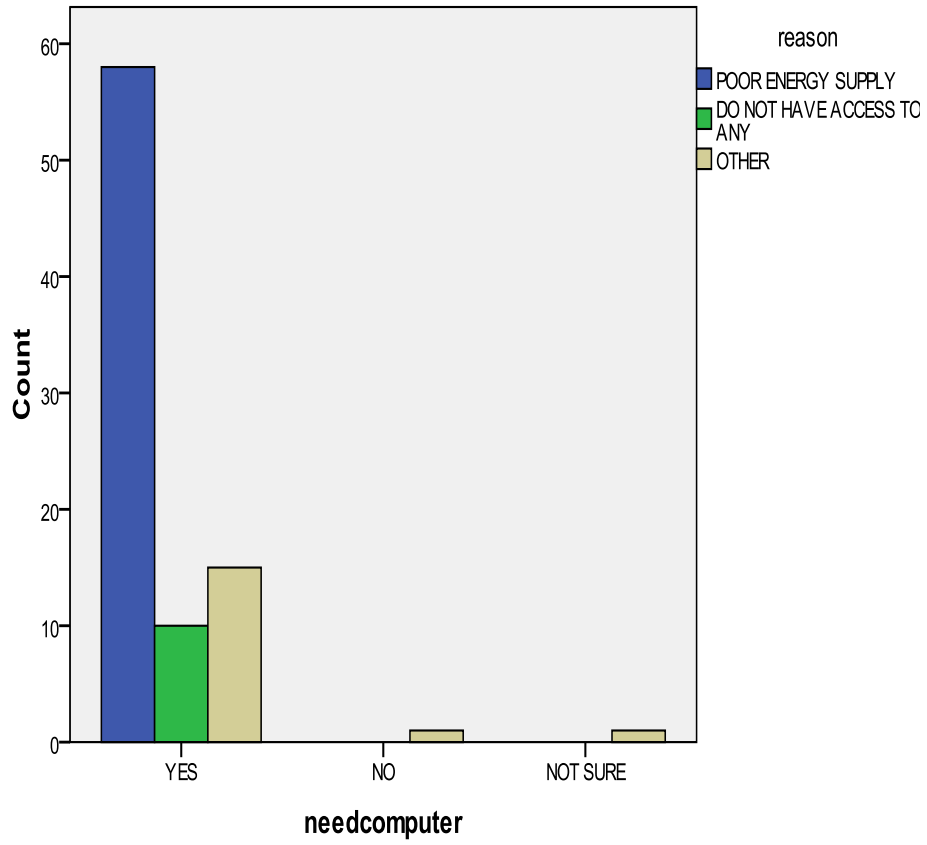


Source: Field Survey in Nigerian Higher Institutions of Learning, 2013

Proportion of students that have personal computers

Of all the population interviewed, 21.4 % used computer regularly as an interactive tool for learning in class, 44.3% do not use computer regularly in class, while, 34.3% do not use computer at all in class. Outside classroom environment, 45.0% use the computer regularly as an interactive tool for learning, 42.2% do not use it regularly, while 12.8% do not use it all. 67.8% had a personal computer, while, 32.2% had no personal computer. 56.8% gave unreliable energy supply as the reason for their irregular use of the computer, 33.5% claimed lack of access was a reason, while the remaining 9.7% gave other reasons such as lack of access to internet, not needing a computer, to avoid distraction etc. (Fig. 4).

Figure 4: Frequency distribution of responses to the need of computer for learning and respondents reasons for not using computer at all times either for personal use or lectures

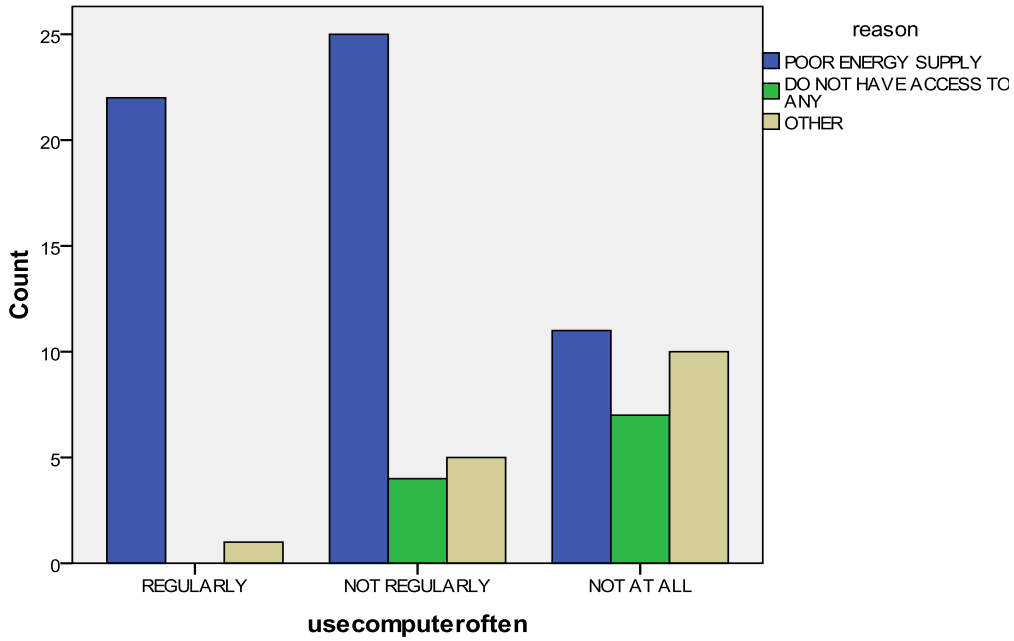


Source: Field Survey in Nigerian Higher Institutions of Learning, 2013

Students' Use of Computer

Fig. 5 shows the proportion that use computer regularly, not regularly and not at all. These three categories of users gave poor energy supply (Blue bar), do not have access to any and other reasons for not using the computer as much as they would have loved to.

Figure 5: Frequency distribution of respondents reasons for not using computer regularly, not regularly and at all



Source: Field Survey in Nigerian Higher Institutions of Learning, 2013

Number of hours battery last when there is no energy supply/Number of hours users wish battery should last

For the proportion that had personal computers, an investigation into the number of hours their battery last after being fully charged when there is no energy supply revealed the results displayed in Table 3. 44.1% had a battery life span below 2 hours, 33.1% had a battery life span between 2-4 hours, while 22.8% had a battery life span above 4 hours. .45.5% wished their battery life span last above 8 hours, 37.9% wished it last between 4-8 hours, 15.2% wished it last between 2-4 hours, while, 1.4% wished it last below 2 hours (Table 4). Respondents with different categories of existing battery computer life, ranging from less than 2 hours to above 4 hours, have a large proportion of users who wish for a battery life lasting above 8 hours (Fig. 6).

Table 3: Number of hours students' computer battery last when there is no energy supply

Hours	Frequency	Percent
< 2hours	64	44.1
2-4hours	48	33.1
> 4hours	33	22.8

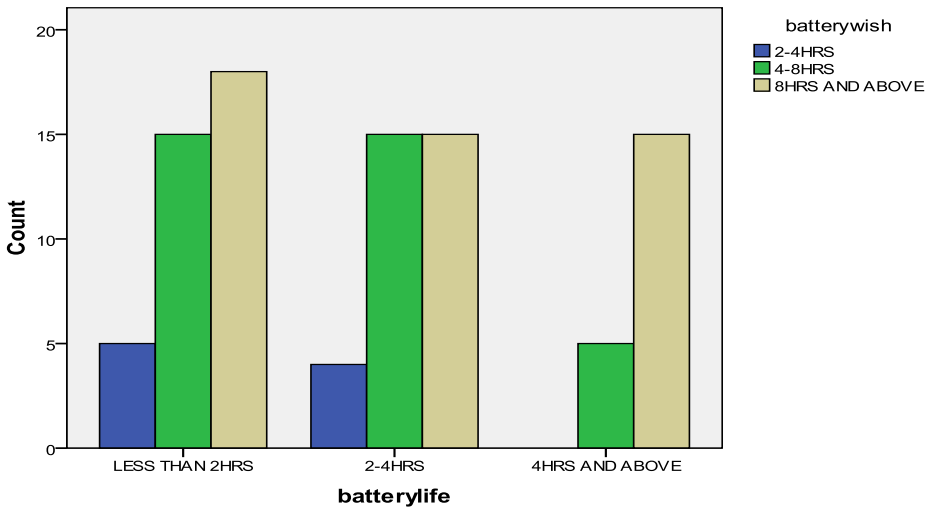
Source: Field Survey in Nigerian Higher Institutions of Learning, 2013

Table 4: Number of hours students wish battery should last in the presence of unreliable energy supply

Hours	Frequency	Percent
<2hours	2	1.4
2-4hours	22	15.2
4-8hours	55	37.9
>8hours	66	45.5

Source: Field Survey in Nigerian Higher Institutions of Learning, 2013

Figure 6: Frequency distribution of number of hours that respondents wish the battery life of computer should last in the presence of unreliable energy supply



Source: Field Survey in Nigerian Higher Institutions of Learning, 2013

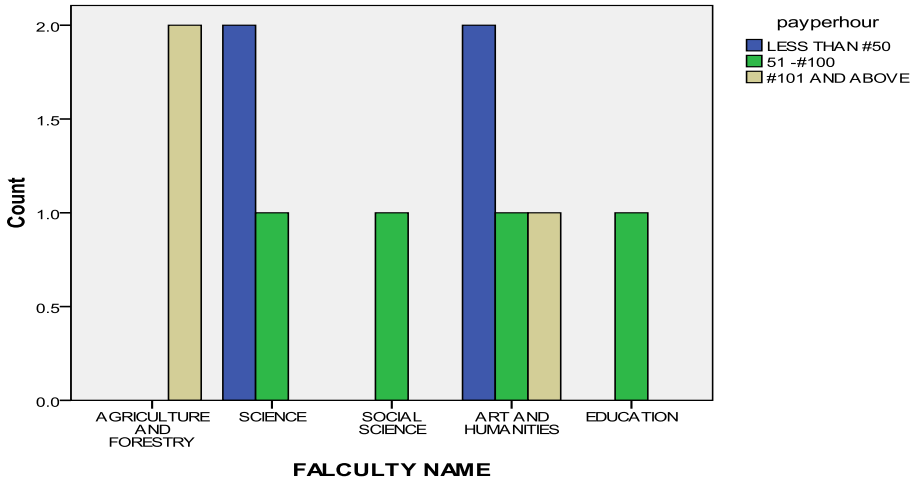
Reasons Some Students Do Not Have Computers

On the part of those that have no personal computers, 18.2% could afford, 74.2% could not afford, 1.5% claimed theirs was faulty and another 1.5% claimed it was stolen. While, 5.4% of respondents claimed they do not need a computer yet. 76.9% claimed reduced cost will increase their chance of having a personal computer. 16.9% said better features will make them possess computer, 1.5% claimed they will get one when the need arises, while the remaining 4.6% said an increase in personal income will help them get personal computers.

Sources/Costs of ICT for Students That Do Not Have Personal Computer

Investigations on how these people get to use computer when the need arises revealed the following. Two broad alternative sources were identified, the cyber cafe and borrowing from friends, colleagues or neighbours. 62.9% pay to use computer, while 37.1% do not have to pay. The number of hours spent on borrowed computers ranged between 1 to 9 hours on a weekly basis, while, the amount spent per hour ranged between #50 to #100 plus.(Fig. 7).

Figure 7: Cost of borrowing a computer based on responses of students from some faculties (in Naira)



Source: Field Survey in Nigerian Higher Institutions of Learning, 2013

Discussion

The African student is limited by the challenges of lack of access to computer and poor energy supply which discourage personal participation in educational activities that may be impossible in a normal traditional classroom setting. As a result, individuals and entities in the developing countries are denied access to the same information and educational activities available to their counterparts across the globe. Similar to the works of (Diebold, 1962; Parker and Dunn, 1972; Alavi and Vogel, 1997; Steinberg, 2010; Roberts, 2004), this study strongly supports the use of information communication technology in conjunction with traditional classroom teaching for promoting educational activities.

With similar household income and electricty access in developing countries (International Energy Agency 2010; Vivien and Briceno-Garmendia, 2010), the challenge of students will be similar across Africa. Apparently, most students in developing countries do not maximize the full potentials of the computer as a result of lack of access in class and/or as a personal asset. Majority of those that have access to a computer have poor energy supply as a reason for not using the computer as regularly as they ought to.

Therefore, the benefits of collaborative learning and teaching with multiple instructors, integration of external expertise and video conferencing system to create geographically distributed discussion of panels of experts is visibly not fully maximized in the studied area. Ultimately, the significant gain in economic productivity as a result of education which may be the most promising way to stimulate general economic growth is lost.

Conclusion

This study strongly recommends improved access to computers for the African students. In addition, the findings call for strategic planning by governments and stakeholders to ensure that educational activities are not hindered as a result of lack of access to information communication technology and poor energy supply.

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