Integration of Information and Communication Technology (ICT) into Environmental Education: A Key to Promoting Sustainable Development

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Abstract

Nigeria is faced with environmental threats such as soil degradation, water contamination, air pollution, deforestation, harmful by-products of exploitation of natural resources, drought, desertification and improper solid waste disposal which lead to unsustainable development for the nation. To ensure sustainable development therefore, the paper emphasizes the integration of Information and Communication Technology(ICT) into the teaching and learning of Environmental Education as the key to the behavioural change needed. It therefore recommended among others that the government should provide adequate funds for the procurement and maintenance of the ICT facilities needed and continuous training and retraining of students and staff maintained to prepare them on the proper and effective utilization of the facilities.

Keywords: environmental threats, environmental education, integration, information and communication technology, transformation, sustainable development

1. Introduction

Nigeria like most countries of the world is faced with the issue of environmental abuse and management. Environmental abuse is contamination of the environment as a result of human activities (World Health Report, 1998). Stent (2006) stated that abuse of our environment arises from actions that cannot be sustained by nature. Nigeria's primary environmental problems are soil degradation, water contamination, deforestation and uncontrolled exploitation of natural resources (Gbamanja, 1999). Current research findings have revealed that Lagos rich wetlands for instance are still being degraded due to anthropogenic activities (Daily Sun, 2015).In addition are the issues of air pollution, solid waste disposal and desertification. Daily Sun (2015) also showed that Okuta-gbokutalori, a tourist site in Ekiti State reeks with offensive stench due to degradation from human wastes, dirt and refuse. Nigeria contributes 178 million tons of solid wastes to the global estimates of 720 billion tons annually and these are indiscriminately disposed in the environment (Akut, 2006). It has been observed (World Health Report, 1998) that the capacity of the biosphere to disperse, degrade and assimilate human wastes is in question.

Desertification reduces land available to individuals and leads to over-intensive utilization such as deforestation of land, erosion and low productivity. The absence of plants cause wind erosion and reduce oxygen production from devegetated areas. Biodiversity loss and other forms of industrial pollution are usually counterproductive in the management of the biosphere (Dike and Herbert, 2005). Threats from the environment due to mismanagement are a great challenge to meaningful and sustainable development in any society (Bello and Ballasa, 2005).

There is therefore a need for a fundamental change; a change to a more careful and more caring of the earth's resources to put the environment on the path towards sustainable future.Of particular importance is the need to integrate the ecological dimension into education and culture and that is where the role of qualitative Environmental Education (EE) in the behavioural change needed comes to mind. Adeniyi (1999) states that EE is capable of providing a specialized and general knowledge on the environment and helps to develop better public awareness of the need for a systematic approach to the resolution of environmental problems. For any meaningful teaching and learning about the environment and for the inculcation of rational attitude and behaviour towards it and the enhancement of environmental quality, there is also the need to integrate Information and Communication Technology(ICT) into the conventional teaching and learning of Environmental Education because one of the key areas identified as the effect of ICT on sustaining the environment is also its use as a tool for raising awareness and for knowledge sharing (Dzidanu, 2010). The need for the integration of the traditional method with ICT is also based on the premise that people learn in many different ways and at different times. There is a widespread belief that ICT can and will empower teachers and learners, transforming teaching and learning processes from being highly teacher-dominated to student-centered and that this transformation will result in increased learning gains for students, creating and allowing the opportunities for learners to develop their creativity, problem-solving abilities, informational reasoning skills, communication skills and other higher-order thinking skills; there appears to be general consensus that both teachers and students feel ICT use greatly contributes to student motivation for learning (infoDev, 2015). Nwabueze and Obaro (2011) showed that electronic communication devices specifically needed enhance students' engagement in class, active learning, group work, process continuity, higher level of

learning, information sharing and exchange and innovative and creativity skills.

2. Concept of Sustainability

The global concept of sustainability is articulated in the Brundtland report (WCED, 1987) and Agenda 21 of the UN conference on Environment and Development in 1992. The Bruntland Commission defined sustainable development as development that "meets the needs of the present without compromising the ability of future generations to meet their own needs". Dzidonu (2010) also related environmental sustainability to a pattern of resource use that aims to meet human needs while preserving the environment so that these needs can be met not only in the present but also for future generations. This concept emerged in response to a growing realization of the need to balance economic and social progress with concern for the environment and the stewardship of natural resources.Sustainable socio-economic growth relates to finding the right balance, ensuring we can continue to improve the quality of life of all citizens without harming our environment (Dzidonu, 2010).

Agenda 21 gave the role of education in pursuing the kind of development that would respect and nurture the environment. It focused on the process of orienting and re-orienting education in order to foster values and attitudes of respect for the environment and envisaged ways and means of doing so. Chapter 36 of Agenda 21 emphasized that education is critical for promoting sustainable development and improving the capacity of the people to address environmental and developmental issues. Okebukola (2007) further opined that education is a driving force for the change needed.

3. Concept of Environmental Education

EnvironmentalEducationhas been seen as a form of education that plays a key role in promoting the development of values, attitudes and belief that are conducive to the enhancement of the quality of the environment (Adeniyi, 1999). Kola-Olusanya (2000) also stated that EE at all levels for all people is crucial; the more the knowledge the public has about the environment, the better, the more and the more effective decision makers can be, and will be; furthermore it is the cornerstone of long-term environment strategies for prevailing environmental problems, solving those which arise or have occurred and assuring environmentally sound, sustainable development.

3.1 Objectives of Environmental Education

Shenpam (2005) citing Obi (1993) stated that among formal objectives of EE are the desires to:
 i.   enlighten the citizenry on the components of the environment;
 ii.   inform about our dependence on environmental resources;
 iii.   enlighten about the change that have taken place in the environment over the years.
 iv.   create concern for environmental quality and conservation as well as foster understanding of man's relationship and interactions with the ecosphere;
 v.   alert about the consequences of human actions on the environment including their toll on other forms of life;
 vi.   develop personal, community and national sanitation and conservation ethics that will emphasize caring for nature;
 vii.   kindle a sense of responsibility that will motivate the ordinary citizen to seek and acquire more knowledge about the environment and its problems, and propagate such knowledge to others in the community; and
 viii. awaken appreciation of the aesthetic quality of nature in order to encourage its use for recreation.

The objectives as stated above provide the framework for selecting and organizing EE themes, concepts, ideas and skills that are capable of bringing about the achievement of the EE goals and resolution of the problems affecting the environment. Incidentally, an analysis of the current EE curriculum for the secondary school in Nigeria for instance, reveals such topics as the biodiversity conservation, desert encroachment and control, deforestation and desertification, overgrazing to mention but a few, which are some of the major current threats to the environment.

3.2 Current Formal Teaching and Learning of Environmental Education

In formal environmental pedagogical approach, student learning is the ultimate goal. Effective learning means creating learning environment where students are actively engaged in the materials that are crucial to student learning.Students are more likely to learn and retain what is learnt if they are asked to more than learn information. Unfortunately as observed by Dike (2011a), the developing countries (including Nigeria) still use the old fashioned 'stand-and-deliver' method where students in all levels of education would sit in their seats and passively receive information from their teachers. The teachers and students are struggling to teach and learn with antiquated technologies, more often than not, some of the information the teachers deliver are old because they lack the necessary resources to obtain current information and as a result, the students work much harder to obtain current information. It is obvious that this traditional pedagogical approach is not meeting the needs of these young

learners and the objectives of Environmental Education. International Telecommunication Union (2008) identified a number of ways to address the management of the environment and these include the use of ICTs to facilitate its learning.

3.3 Current Non-Formal Teaching and Learning of Environmental Education
Non-formal EE targets the working class individuals. This group of who have no time to waste; they are juggling jobs/business and families and would want to learn whenever they can, how they can and from anywhere they are (Dike, 2011b). This group also involves children and adults who for one reason or the other such as the financial implications cannot go to formal school,retirees etc.Presently non-formal EE is not properly organized in Nigeria and perhaps in other developing and under developed countries. Flexibility is required in this non-conventional teaching and learning and achieving the objectives of EE with this approach will be possible alsoonly with the application of ICTs.

4.Integrating ICTs in the Teaching and Learning of Environmental Education
For decades, the application of ICTs in teaching and learning has been the trend in education in developed nations. ICTs are changing the ways by which students, teachers and educational institutions communicate and interact with one another and how they learn (Dike, 2011a). The ICTs ideal for teaching and learning, that is, the electronic communication devices include computers, telephones, cell/mobile phones, facsimile (fax) machines, Personal Digital Assistants (PDA's), network equipment and infrastructure, software, information services, peripherals, flash drives, data media (Madumere-Obike and Nwabueze, 2012), projectors, radio, television etc. Thus multimedia is one of the most powerful means for realizing the progression from the 'agentive' uses of technology where the technology merely replicates traditional pedagogical methods towards 'instrumental' uses where technology serves new functions in new pedagogical contexts (Patrikis, 1997) and is therefore ideal in realizing the objectives of EE for sustainable development.

4.1 E-learning, Virtual Library and Web-based/Internet-Based Learning
The world is intractably linked to and depends on computer networks which are open to everyone. Since web technology has democratized education and learning, there are countless 'learning portals' as well as digital libraries on the internet (Bonk, 2009). Teachers therefore use the internet as a resource for making discipline specific information available to students to supplement 'traditional' classes (Pollock *et al*, 2002). It also enables teachers to upload their courses, curricula and lesson plans online (Bonk, 2009) and students are encouraged to do their home work/assignment and tests online and also share digital information.

Internet based learning provides more opportunities for different categories of people and should be utilized in the teaching and learning of Environmental Education. While formal/conventional classroom teaching is intended for full time students only, internet based learning has the potential to reach not only the full time students that are physically present but a wider segment of people such as those with disabilities or illness that may not physically be able to attend lectures (Suleaimon, 2008). It has also the potential to reach those that may be participating in non-formal education such as the full time workers, retires, parents with small children and children/youths that cannot attend school or have dropped out. Radio and television are however more likely to widen access to environmental issues to some of these groups of individuals than the internet which may not be available to them.

4.2 Social Media (Facebook, Twitter, My Space, You Tube, iPods, E-mail, cell phone etc)
Social networking improves students' learning.Zanamwe*et al*.(2013) citing Goldfarb(2011) pointed out that it enriches the learning environment by early recognition of student needs and formative assessment, establishment of classroom community, student engagement, increased sense of student achievement, information management and access to marginalized students.Social networking allows for increased accessibility to the information relevant to any course, provide for a more pedagogically sound 'interactions with the information by students, encourage more thoughtful discussion by students about the information in the class, provide more equal participation in classroom discussion, enhance student interaction outside the class, provide a unique classroom assessment technique, enhance ability to archive and retrieve students' work and provide increased structure of information (Suraya *et al*, 2009). Social networking sites are also effective in developing essential skills such as creating knowledge in user-defined or negotiated contexts; selecting relevant information, critically interpreting and analyzing the socio-cultural context; negotiating in horizontal contexts, avoiding hierarchial connections and exchanges of knowledge (Romero-Frias and Montano).

Social media sites allow the young learners to accomplish many other online social tasks such as staying connected with friends and family, making new friends, sharing pictures and exchanging ideas which in turn can create an intimacy among them and also allow for collaboration across geographical boundaries. The students also use their web connector to e-mail other students, use chat rooms and video conference links to communicate on

various issues.

Mobile phones can be used as part of a drive to increase the performance of academic under achievers. Udezi (2008) citing Hasselbalch (2005) reported that learners in Danish schools are encouraged to use their cell phones to make notes in lessons. As part of their home work, they are also asked to send messages to other pupils using short message servicing (SMS) text messages and this has motivated learners that have difficulty in reading and writing. Thus social media breed flexibility that is made possible only through the effective integration of web technology and social media into teaching and learning and should be integrated in EE to create awareness in different categories of people on any environmental issue.

4.3 Projector, Microphone, Power Points, Laiser Beam
The use of multimedia such as the projector, microphone, power points, laiserbeam etc. will go a long way in support of conveying environmental information particularly to a large targeted audience in a non-formal setting and large classes in a conventional EE setting which is obtainable in both our secondary and tertiary institutions.

4.4 Constraints in Electronic Communication Device Usage
Despite the fact that the trend in the application of ICTs in teaching and learning in developed nations is becoming more complex by the day and rendering previous gadgets obsolete (Dike, 2011c), they have not widely diffused into the shores of the developing nations including Nigeria due to some constraints. Inadequate funding of the educational institutions has been a major constraint in the procurement and maintenance of the electronic communication devices such as the computers and internet facilities needed to improve teaching and learning.Even those that have acquired their own computers do not have access to a stable broadband internet connection due to also its financial implications. As rightly observed by Sulaiman (2008), the level of computer literacy in Nigeria (and perhaps in other developing nations) is still very low; skilled and qualified personnel in computer science and engineering are very few.

There is also the problem of availability of electricity supply in most villages and even in the urban communities, power supply is erratic and these devices cannot function properly without adequate power supply.

Some of these technology-related activities are disruptive and often distract students from their class activities or school works. With increasing in online education, some students will spend more hours than is necessary in "Googlization of Learning" (Bonk, 2009). Dike (2011c) reported that the youth in particular are easily distracted by the computers, the internet and the social media gadget in the classrooms. They often surf the internet during lectures, access their e-mails, talk on their cell phones and send out text messages, use their cell phone cameras and hang out with their friends online. Some even use the e-mails and the online social networks to dupe people and play different kinds of foul games; some use their cell phones for pornographic pictures and videos while some use them for hooking up with men and prostitute around their environments (Madumere-Obike and Nwabueze, 2012). The youth also would just download other people's work from the internet and convert them to their own without minding the consequences of plagiarism (Dike, 2011a).

5. Conclusion and Recommendations
If man is to be knowledgeable and concerned about the environment, he must be aware of the problems he contributes as well as his own role in environmental management. The better he is able to look after his environment, the higher the quality of life he enjoys and perhaps the longer his life span. The use of ICTs (electronic communication devices) should be embraced to deliver qualitative Environmental Education through formal and non-formal approaches to change the unsustainable lifestyles of man in other to achieve sustainable development. To this end, it is recommended that:
   i.   government should provide adequate funds for the procurement of computers/internet facilities and other ICT equipment needed;
   ii. schools should ensure that the facilities when provided are maintained regularly to avoid system failure;
   iii. school libraries should provide guaranteed access to the internet for students and teachers and
   iv. Continuous training and retraining of all students and staff should be maintained to prepare them on the proper and effective utilization of the multimedia particularly the computer/internet.

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