

# Information Communication Technology (ICT) and Curriculum Development: The Challenges for Education for Sustainable Development

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## ABSTRACT:

Technological change has become a most stable factor and ICT has intertwined with knowledge, making it dependent upon the technology. Through this alliance abstract knowledge has become the centre of the world's political economy replacing traditional concrete products. ICTs provide a means for overcoming historically intractable problems of isolation and lack of access to information and knowledge, crucial impediments to educational and socioeconomic development. Despite these awesome impact of ICT on education particularly, many teachers still adopt a 'teacher-centred' approach and do not know how to apply IT into their subjects. If this is the case; the question is how can these teachers impart knowledge of contemporary issues that can assist in the attainment of education for sustainable development? It is noted that in the process of building and developing curriculum through the use ICT there are bound to be challenges. What are these challenges? Can these challenges hinder sustainable development? How can the challenges be dealt with in order to put in place education for sustainable development which the whole world is struggling to achieve. This study sought to provide answer to all these pertinent questions. It is expected that some of the ideas provided in the study will be contributing factors towards the attainment of education for sustainable development in Africa and beyond.

**Keywords-:** ICT, curriculum development, education for sustainable development.

## INTRODUCTION

Embedding the use of ICTs into the curriculum must be considered a key priority and part of national strategy for learning in an online world by every developing countries of the world. The reason for this is because we live in a technological world where information and communication technologies (ICT) are fundamental to most activities. The importance of ICT in society is emphasized in Enabling Our Future (Framework for the Future Steering Committee (Australia, 2003) which identifies ICT literate citizens as being central to economic and social goals, to improving productivity and efficiency, and to building innovative capacity and competitiveness. The importance of ICT in schooling cannot be overemphasized. A Performance Measurement and Reporting Taskforce (2005) adopted a definition of ICT Literacy as: The ability of individuals to use ICT appropriately to access, manage and evaluate information, develop new understandings, and communicate with others in order to participate effectively in society.

Using ICT as a tool for learning enables students to:

- "Efficiently and effectively access digital information to assist with investigating issues, solving problems and decision making

- Produce creative solutions to support learning and develop new understandings in areas of learning
- Communicate, share and work collaboratively in local and global environment understand the legal, ethical and health and safety implications of using ICT and their responsibilities as users and developers; and,
- Develop new thinking and learning skills to support learning”

Applying ICT as a tool for learning in curriculum areas enables all students to have the opportunity to become competent, discriminating, creative and productive users of ICT. They are better able to achieve curriculum outcomes through effective use of ICT. They develop the knowledge, skills and capacity to select and use ICT to inquire, develop new understandings, create, and communicate with others in order to participate effectively in society. Students should have the opportunity to understand the impact of ICT on society, including potential risks to health and safety.

ICTs provide a means for overcoming historically intractable problems of isolation and lack of access to information and knowledge, crucial impediments to educational and socioeconomic development. ICTs have reshaped the educational landscape by transforming the content and modes of delivery/acquisition of learning as well as how the educational institutions operate. No wonder, the implementation of ICT is inseparable from the process of curriculum reform and development. This is because ICT is a means to help achieving future curriculum goals by providing a learner-centered environment, as studies have shown. However, ICT is not really well integrated into the curriculum on daily teaching particularly in Africa (Gajendran, 2007).

Many teachers still adopt a ‘teacher-centered’ approach and do not know how to apply IT into the teaching of their subjects. If this is the case; the question is how can these teachers impart knowledge of contemporary issues that can assist in the attainment of education for sustainable development? It is noted that in the process of building and developing curriculum through the use ICT there are bound to be challenges. What are these challenges? Can these challenges hinder sustainable development? How can these challenges be dealt with in order to achieve education for sustainable development which the whole world is struggling to put in place. This study sought to provide answer to all these pertinent questions. It is expected that some of the ideas that provided in this paper will be contributing factors towards the attainment of education for sustainable development in Africa and beyond. Curriculum Development

In any educational system, the level of available resources places a restriction on the degree to which any new subject can be introduced into the school curriculum, especially where only the most basic facilities have so far been provided (UNESCO/IFIP, 2000). ICT is of such importance to the future industrial and commercial health of a country that invest in the equipment, teacher training and support services necessary for the effective delivery of an ICT-curriculum which is expected to rank high in any set of

government priorities. The curriculum proposed by any country in African need to take account of these resource issues and specifies minimum requirement for effective delivery in different circumstances.

Redefining education has become a powerful descriptor that helps administrators and educators at every level (i.e., nursery school through university) to understand the changes required for ESD (Ehlers, 2007). An appropriately reoriented basic education includes more principles, skills, perspectives, and values related to sustainability than are currently included in most education systems. Hence, it is not only a question of quantity of education, but also one of appropriateness and relevance. ESD encompasses a vision that integrates environment, economy, and society. Reorienting education also requires teaching and learning, knowledge, skills, perspectives, and values that will guide and motivate people to pursue sustainable livelihoods, to participate in a democratic society, and to live in a sustainable manner. In reorienting education to address sustainability, program developers need to balance looking forward to a more sustainable society with looking back to traditional ecological knowledge.

Redefining curriculum supposes that the curriculum should be designed for both teachers and students to improve their knowledge and skill in ICT. The design according to (UNESCO/IFIP, 2000) supplies four curriculum areas tied with the four stages of teaching and learning:

**ICT Literacy:** This covers the use of ICT in daily life in a competent and intelligent way. Topics include: basic concepts of ICT, using computers and managing files, word processing, spreadsheets, databases, creating presentations, finding information and communicating with ICT, social and ethical issues, and jobs using ICT. The European Computer Driving License (1997) was used as a reference in organizing this area.

**Application of ICT in Subject Areas:** This covers the application of ICT-tools work within specific subject areas including languages, natural sciences, mathematics, social sciences, and art. The topics include: measurement, modeling and simulation, robots and feedback devices, statistics, creating graphics, spreadsheet design, and database design.

**Integration of ICT across the Curriculum:** This is described to demonstrate the use of ICT to combine subject areas to work on real-world projects and solve real problems. There are some examples to show how within one course ICT can help students to integrate several areas, such as math, science and art. There are also examples to show larger projects that include several courses and several schools integrating ICT in community or global projects.

**ICT Specialization:** Here the designed is for students who plan to go into professions that use ICT such as engineering, business, and computer science, or who plan to advance to higher education. These modules cover the use of advanced tools and techniques for ICT specialist. Topics include: basic and advancing programming, planning information systems, designing process control systems, and project management.

## **EDUCATION FOR SUSTAINABLE DEVELOPMENT (ESD)**

Education is seen as key in the process of achieving sustainable development. However, in order for formal education to contribute to sustainability, traditional systems and methodologies need to be re-oriented and re-engineered (Tilbury et al., 2002; Huckle & Sterling, 1996; UNESCO, 2003). Research (Aston, 2002; Roschelle et al., 2007; Paas & Creech, 2008) have shown that even in developed countries, where technological levels are high, the education system has not succeeded in influencing choices and behaviours that would support sustainable development.

UNESCO (2003:5) points out that “this vision of education emphasizes a holistic, interdisciplinary approach to developing the knowledge and skills needed for a sustainable future as well as changes in values, behavior, and lifestyles.” A research conducted by Paas (2004) finds that many changes called for in ESD could be supported through greater integration of ICTs in the learning environment. The next section briefly traces the history of technological advances and technology policy as drivers for using ICTs in education.

## **ICT AND EDUCATION FOR SUSTAINABLE DEVELOPMENT .**

Paas & Creech (2008) emphasizes that ICTs play an important role in advancing ESD in two ways:

- By increasing access to educational materials about sustainability (e.g., via distance learning, educational networks and databases); and
- By helping to promote new ways of interacting in order to facilitate the learning called for in ESD that emphasizes not just knowledge, but choices, values and actions. Explaining these two ways, Paas & Creech put forward that at their most basic level, ICTs enable the presentation of course content using multimedia (images, text and sound) and facilitate archiving of that content.

But they also provide new means of interactivity and simulation, thereby offering opportunities to improve learning and making new ways of understanding possible. The use of new technologies, thus, can offer exciting new possibilities to promote the changes in education methodologies called for in ESD. Furthermore, (Paas & Creech, 2008) indicates that current uses of ICTs in ESD fall into three broad categories:

1. Information resources, tools and portals for educators;
2. Supplements to classroom-based activities; and
3. Tools for distance/online learning.

**Information resource tools and portals for educators-** Web provides extensive links to information on ICTs in education; platforms for educators to exchange knowledge, read and publish articles and lesson plans; and connections to support materials for ESD. However, when looking specifically for research on the use of ICTs in Education for Sustainable Development, including educational policies, pedagogical approaches and classroom uses of ICTs for ESD, there is not much available to date. This may be

because ESD has grown from the tradition of environmental/outdoor education, which aimed at getting learners outside to experience and learn about the natural world.

**ICTs as a supplement to classroom-based activities-** ICTs applications are being designed to promote collaboration, connectivity, “real-world,” experience based learning, and systems thinking, which are emerging as key pedagogical methods conducive to education for sustainability. Examples provided are from primary as well as in universities. These include: collaboration and connectivity, real time real world learning, system thinking, etc.

**Distance/open learning, e-learning and online learning-** ICTs are currently most applied in “distance learning” (DL). Originally distance learning was delivered principally via print, and later gradually including telephone/fax support, audio/video broadcasting, audio/video teleconferencing, and computer-aided instruction (via CD-ROMs & Software). DL finds itself in the current generation of being delivered in online learning environments (Moore & Kearsy, 1997). It is now common to find terms such as distributed learning, virtual learning, online learning, e-learning, open learning, virtual learning, collaborative learning, mobile learning and distance education being used interchangeably, although these terms represent applications that can differ widely in target audience, pedagogical/administrative structure and combinations of learning tools provided.

### **CHALLENGES OF INTRODUCING ICT INTO THE CURRICULUM AND THE WAY FORWARD**

There are many challenges confronting the introduction of ICT into the curriculum in many developing countries particularly in Africa. These include among others: human resources, lack of policies, language, information filtering and reliability, plagiarism, etc. These are now discussed in turn here.

**Human resources-** Human resources are lacking not only with respect to technical capacity to develop and use ICTs but also in terms of the capacity to utilize information for the purpose of sustainable development. Several countries have, in the past years, re-adjusted their education curricula to include learning programmes tailored directly, at secondary level, to ICT knowledge and, at tertiary level, to the ICT market segment. However, a vision that facilitates an education model responsive to the development of ICT is often missing. Plans and predictions are based more on past or present requirements than on dynamic, forward-looking strategies. One area where this is most evident, and as a result needs substantial capacity-building efforts, is the development of ICT expertrates able to tackle ICT projects successfully in both the private and public sector.

**Problems of developing learning activities that uses tools to leverage student motivation and learning-** In terms of using new social networking tools and environments as a supplement to current classroom teaching, one of the initial challenges will be to develop learning activities that use these tools

to leverage student motivation and learning. This is made more challenging as children of the “digital age” have different needs than previous learners (Seely Brown, 2002; Schrum & Solomon, 2007; Green & Hannon, 2007). To solve this particular problem, teachers of the new curriculum need to be retrained on the use of ICTs to create and develop different activities to cater for different needs of the learners.

**Policy-** It should be noted that the benefits of sound liberalization policies are not yet clearly understood by many African governments. The root cause for this is attributable to the monopoly that Ministries of Telecommunication held on an industry that has traditionally brought in much needed foreign currency. Opening up the doors to private investment and management of new and existing infrastructure is still not perceived as a favorable proposition. This issue need to be considered by allow opportunity for private investment thereby broken the monopoly by ministries of telecommunication.

**Language-**Language usage also plays an important role. Although some regional information mechanisms have been created and are being maintained today, the languages used are primarily English and French, with other languages developed to a much lesser extent. This exacerbates the hub-and-spoke effect. A number of initiatives are taking place to facilitate the use of ICTs in the other languages. They have not yet, however, acquired a substantial critical mass in order to mainstream those languages and culture through the Internet in a more pervasive fashion. Lack of standardization limits the use of such languages. It is worth noting that China for example faced similar challenges in terms of language content and infrastructure in 1998. A large effort was then made to boost Internet connectivity and encourage the creation of content in Chinese. This somewhat decreased the demand for international access and increased domestic exchanges (Accascina, 2006).

**Reliability of Information/Information filters-** More online content and tools also create a heightened need for people to understand what resources are reliable and authoritative and where to find them (Paas & Creech, 2008). The social bookmarking tools and new data mining software agents will increasingly be used to help educators keep abreast of new developments in ESD. Users will deploy these types of tools to find information according to evaluations of its quality and relevance (Paas & Creech, 2008).

**Plagiarism-** This is another challenge that is already arising from Web 2.0 technologies in education. It has to do with the easy re-use of information, or “remix” to create new information, and to what degree this should be considered copying or plagiarism, or if it is indeed; this will constitutes a new form of creativity and social learning. The solution to this problem calls for creativity on the part of everybody, learners, teachers, corporate world so that there will not be too much dependency on lesser information made available by people who are creative thinker and producer of knowledge.

**Content organization-** The greatest challenge of organizing appropriate content, devising activities and learning environments which promote the kind of thinking and understanding required to live sustainably. This means devising courses that don't just teach about sustainability but teach for sustainability.

## **CONCLUSION**

This study has so far look at a very important, current and concern issue of curriculum development with the use of ICT for the achievement of education for sustainable development. The paper has also explored discussion on the challenges of integrating ICT into the curriculum to achieve sustainable development. In conclusion, the ultimate aim of ICT adoption now is to facilitate effective transformation of learning. Any plan of implementation which deviates from this aim is likely to result in futility. Integration of ICT with learning should be curriculum driven instead of technology driven in view of future curriculum reform. One thing that is observed nowadays is that many programs design at all education levels are for the purpose of contributing to the attainment of sustainable development. The implementation of these programs should entails building a culture among people. It must be a matter of inculcating values and shaping of attitudes and impartation of knowledge and development of skills. Basically, therefore, emphasis should be placed on the effectiveness ICT in promoting sustainable education at all levels. To overcome challenges identified in this paper particularly in Africa, development of ICT experts who are able to tackle ICT projects successfully in both the private and public sector is highly necessary. The need has arisen for teachers of the new curriculum to be retrained in the use of ICTs to create and develop different activities to cater for different needs of individual learners.

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