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Role of ICT in effective curriculum transaction and evaluation

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Abstract
The main objective is to look at the role of ICT in primary and secondary education. It emphasizes computer technology and television media because of their availability in our schools and their great impact on teaching and learning processes. The objectives are to discuss the importance of ICT in education and their implication to the world of work; discuss effective pedagogical issues surrounding the use of ICT in the classroom; and highlight some changes ICT might have on the role of the teacher in the classroom.

Keywords: Curriculum transaction, Information and communication technology, manipulation, transmission

Introduction
The inclusion of Information and Communication Technology (ICT) issues in the curriculum and provision of these technologies in our schools have raised many issues of concern to educators, parents, and politicians. Some of the most important issues are the role of the ICT in the curriculum, and how these issues should be addressed in the curriculum, and most importantly how they impact teaching and learning. The other issue of concern is the impact of these technologies in terms of increasing access to quality education. Learners in our schools today will require considerable ICT knowledge, skills and awareness if they are to be successful in the future. The economy will depend on a high level of ICT capability from its people if it is to develop technologically and to compete internationally.

What is ICT?
ICT is an acronym that stands for "information communication technologies". Information and communication technologies are an umbrella term that includes all technologies for the manipulation and communication of information. ICT considers all the uses of digital technology that already exists to help individuals, business and organization. It is difficult to define ICT because it is difficult to keep up the changes they happen so fast. ICT is concern with the storage, retrieval, manipulation, transmission or receipt of digital data. The definition taken from the guidance in the QUA schemes of work for ICT is "ICTs are the computing and communication facilities and features that variously support teaching, learning and a range of activities in education."

The importance of ICT in learning
One of the most critical questions asked by educators is: What is the long term impact of the introduction of ICT in the curriculum? Computers, in particular, have positive effects on learning and are motivating for learners (Reeves, 1998). They are accepted by more teachers than other technologies and are widely supported by administrators, parents, politicians, and the public in general. Reeves argues that computers increase equity of access, and reduce the time needed to accomplish a given set of objectives. One of the goals of the Ministry of Education is equity of access to quality education for all; hence this technology is essential if we are to achieve this goal.
According to Reeves (1998) computer-based cognitive tools such as databases, spreadsheets, communication software, etc., have been intellectually developed to function as intellectual partners to enable and facilitate critical thinking and higher order learning.

When using these tools learners are able to represent and express what they know. They function as designers using the tools for analyzing the world, accessing and interpreting information, organizing their personal knowledge, and representing what they know to others.

Hunt (2004) argues that because of the phenomenal rate at which the volume of available information increases, and access to an increasing range of sources, it is becoming clearer than ever that the ability to find appropriate information and use it effectively is of greater value than being able to remember facts. The skills of locating, evaluating and using information effectively from a range of sources constitute the Information Skills which are needed for people to become Information Literate, enabling them to engage in effective decision making, problem-solving and research. Therefore the importance of ICT cannot be over emphasized as it offers the education process one of the most potentially powerful learning tools available. Not only can computers support learning across the whole curriculum, but communication networks also provide the learner with fast and searchable access to vast amounts of information. It also supports a wide range of broader educational objectives including independent learning, collaboration with others and communication skills (Hunt, 2004). It is thus of vital importance that all children in schools have adequate access to ICT and that they develop the necessary skills, taking advantage of the learning capabilities that ICT offers.

Primary schools on the other hand are ill-equipped with computers and other important technologies. Computers that are found in some schools were donations and are only used for administrative purposes. The Ministry of Communications, Science and Technology together with the Ministry of Education are embarking on a project of refurbishing obsolete and donating these to primary schools. Although this is a positive move towards providing quality education to pupils at this level, there are challenges in this endeavor. These are:

- **Physical barriers such as remoteness and lack of electricity supply:** Some primary schools are in very remote areas far away from the power lines. Computers, photocopiers, fax machines, etc. need electricity. The Ministry would have to find ways of providing these with power. One way is equipping such schools with generators. Generators which can supply enough power for these technologies are very expensive! Therefore a lot money running into a couple of millions would be needed.
- **Lack of funds:** Especially for maintenance
- **Lack of ICT skills for staff:** Primary school teachers have no skills whatsoever in ICT, let alone having basic training in computers. The challenge facing the Ministry if it were to include ICT issues in the primary school curriculum is to address lack of ICT skills by teachers.
- **Insufficient and inappropriate software:** Suitable software will have to be acquired if desired skills which are in line with curriculum needs are to be developed.

Other technologies

There are other technologies available in primary schools that could be taken advantage of, these are the television and video equipment. Primary schools were equipped with televisions, video cassette recorders, and satellite dishes through the Talk Back programme. Talk back is a one-hour programme aired on Botswana television on Tuesdays during school days. It aims to teach and equip teachers with knowledge and skills of infusing HIV and AIDS issues in the classroom. Since the equipment is available in schools teachers are at liberty to use it in their lessons to help them achieve some of the objectives in the syllabus. The advantages of television media are that it is audio-visual so learners tend to learn and retain more; and is able to show learners things that they would never experience in real life.

According to Seels *et al* (1996) most studies show that there are no significant differences in effectiveness between live teacher presentations and videos of teacher presentations. Johnson (1987) says there is strong evidence that television is used most effectively when it is intentionally designed for education and when teachers are involved in its selection, utilization, and integration into the curriculum. Since video recorders (VCRs) are available in schools teachers can record programmes related to their topics and use them whenever they like. Perhaps one of the challenges facing the Department of Teacher Training and Development is to equip primary school teachers with skills of selecting suitable video material, integrating and using this technology effectively in their lessons.

Effective pedagogical practices

It is one thing to provide schools with ICTs, and yet another to implement these, that is, use them effectively in teaching and learning to realize their impact. Teachers require more knowledge of, and confidence with ICT, and a better understanding of its potential to help pupils' learn. This suggests that further substantial support for continuing professional development is necessary in order that teachers integrate these technologies and infuse ICT issues in the teaching to improve pupil's attainment (Cox *et al*., 2003).

The pedagogical practices of teachers using ICT can range from only small enhancements of practices using what are essentially traditional methods, to more fundamental changes in their approach to teaching. According to Cox *et al* (2003) the most effective uses of ICT are those in which the teacher and the software can challenge pupils‟ understanding and thinking, either through whole-class discussions using an interactive whiteboard or through individual or paired work on a computer. If the teacher has the skills to organize and stimulate the ICT-based activity, then both whole-class and individual work can be equally effective. To effectively infuse and integrate ICT into teaching and learning teachers need to use a range of practices that are essential pedagogical frameworks (Cox *et al*., 2003). These are:

- Understanding the relationship between a range of ICT resources and the concepts, processes and skills in their subject
- using their subject expertise to select appropriate ICT resources which will help them meet the specific learning objectives; this includes subject-specific software as well as more generic resources
- being aware of the potential of ICT resources both in terms of their contribution to pupils‟ presentation skills, and their role in challenging pupils‟ thinking and extending their learning in a subject
- developing confidence in using a range of ICT resources, via frequent practice and use beyond one or two familiar applications

- appreciating that some uses of ICT will change the ways in which knowledge is represented, and the way the subject is presented to and engages pupils knowing how to prepare and plan lessons where ICT is used in ways which will challenge pupils‟ understanding and promote greater thinking and reflection
- Recognizing which kinds of class organization will be most effective for particular learning tasks with ICT, for example, when pupils should work on their own, how working in pairs and groups should be organized, and when to use ICT for whole-class teaching.

The role of the teacher in the use of ICT

The effective use of ICT has great impact on teaching and is definitely changing the role of the teacher in the classroom. According to Jenkins (1999) ICT changes teaching and learning through its potential as a source of knowledge, a medium to transmit content, a means of interaction and dialogue. The role played by these technologies in the classroom provides a challenge to teachers because they make them change the way they have been doing things. Teachers are now becoming facilitators of learning-organizing teamwork and managing classroom activities.

Jenkins highlights some of the changes in the teacher's role as,

a) Change in relationship with pupils
b) Change in the role to facilitators and managers who support learning
c) Change in the content and scope of teaching

Wheeler (2000) [8] argues that it is no longer sufficient for teachers to merely impart content knowledge. These technologies can actually do this part, and therefore it is crucial that for teachers to encourage critical thinking skills, promote information literacy, and nurture collaborative working practices to prepare children for a new world in which no job is guaranteed for life, and where people switch careers several times. The Internet enable students and teachers to communicate with each other, learn flexibly, and collaborate with others around the world. In other words, geographical distance is no longer a barrier, and 'borderless' provision of education to all can be achieved (THES, March 2000) [7]. Teaching strategies and resources can be shared through communication with other educators and may be integrated across the curriculum.

Use of ICT in teaching

- Teaching at School as well as Higher Education, mostly, concentrates on giving information which is not the sole objective of Teaching. Along with giving information, the other objectives are:
- developing understanding and application of the concepts
- developing expression power
- developing reasoning and thinking power
- development of judgment and decision making ability
- improving comprehension, speed and vocabulary
- developing self-concept and value clarification
- developing proper study habits
- Developing tolerance and ambiguity, risk taking capacity, scientific temper, etc.

With the present infrastructure, class size, availability of teachers, quality of teachers, training of teachers, etc., it is difficult to achieve all the objectives. Further, most of the teachers use Lecture Method which does not have potentiality of achieving majority of above mentioned objectives. The objectives are multi-dimensional in nature, so for their achievement multiple methods should be used in an integrated fashion. At present ICT may be of some use. It is a well-known fact that not a single teacher is capable of giving up to date and complete information in his own subject. The ICT can fill this gap because it can provide access to different sources of information. It will provide correct information as comprehensive as possible in different formats with different examples. ICT provides online interaction facility. Students and teachers can exchange their ideas and views, and get clarification on any topic from different experts, practitioners, etc. It helps learners to broaden the information base. ICT provides variety in the presentation of content which helps learners in concentration, better understanding, and long retention of information which is not possible otherwise. The learners can get opportunity to work on any live project with learners and experts from other countries. The super highway and cyber space also help in qualitative improvement of Teaching – Learning Process. ICT provides flexibility to learners which are denied by the traditional process and method. Flexibility is a must for mastery learning and quality learning.

On INTERNET many websites are available freely which may be utilized by teachers and students for understanding different concepts, improving vocabulary, developing Reasoning & Thinking, etc. ICT can help in preparing students for SAT, GRE, TOEFL, etc.

Curriculum transaction

Curriculum transaction is effective implementation of lesson plans in classrooms. A lot of thought goes in planning and preparing the lesson plans. Children will benefit only if the implementation is strong, whether it be circle time, project work, subject time or music time; a teacher's effort should be to reach out effectively to each child in the group. Lesson plans are prepared much in advance and usually there is a gap between preparation and implementation.

Children listen to some teachers and are receptive, while the same group of children could respond differently to another teacher. This is also to do with meaningfully engaging children and stimulating their thought processes.

Some of the requirements of effective curriculum transaction are

- Planning
- Clarity of thought
- Organizing
- Knowing how we will transact
- Review of the work
- Team responsibility
- Clarity of communication
- Addressing different levels of children
- Knowing, observing and understanding children at all times
- Time management
- Alertness
- Material organization
- Room set up

- The way we reach out to the children
- Ready alternatives
- Always being watchful

ICT in schools

Why do we need ICT in schools? Was education not happening before computers came into existence? Why is this paradigm shift necessary? The shift is necessary because this is the age of information and technology, an age that requires that teachers facilitate the gathering of this information and not merely teach. Unfortunately, in India, ICT is largely associated with the use of computer and internet. What one uses ICT for and how one uses it, is not addressed sufficiently,

Use of specific ICT tools in education

A Knowledge Map on Information & Communication Technologies in Education

Guiding Questions

What is known about which ICTs are most useful to benefit education? What do we know about the usefulness, appropriateness and efficacy of specific ICTs (including radio television, handheld devices, computers, networked computers and the Internet) for educational purposes? What do we know about the use of open source and free software in education?

Current knowledgebase

What we know, what we believe - and what we don't

General

- The Internet is not widely available in most LDCs; radio and TV are Broadcast technologies such as radio and television have a much greater penetration than the Internet throughout much of the developing world, and the substantial gap is not expected to be closed soon.
- Radio and TV can have high start-up costs, and reinforce existing pedagogical styles Educational initiatives that utilize radio and television typically have quite high initial start-up/capital costs, but once they are up and running, on-going maintenance and upgrade costs are much lower (making initiatives utilizing radio and TV for distance learning in the educations sector particularly appealing for donor support in many cases). One-to-many broadcast technologies like radio and television (as well as satellite distribution of electronic content) are seen as less 'revolutionary' ICTs in education, as their usage is seen as reinforcing of traditional instructor-centric learning models, unlike computers, which many see as important tools in fostering more learner-centric instructional models.
- Radio instruction has been used widely and is reasonably well studied Radio instruction in formal education has been well studied, especially the links between the use of radio in combination with school-based educational resources and a variety of pedagogical practices.
- TV has been used with success in a few places Television has been utilized successfully as a mechanism for reaching out-of-school youth in a number of countries, especially in Latin America and China, and the results of such projects have been widely disseminated.
- In some cases, where markets have been liberalized, ICTs are used to distribute educational content regionally within a country Market liberalization has in many countries allowed for the development of locally-(as opposed to centrally-) controlled distribution channels that utilize ICTs (like radio and the Internet, and to a lesser extent television) to create and broadcast educational content more targeted to the needs of specific communities, and as a result have a greater flexibility to employ local languages.
- CAI is not highly regarded by experts and in OECD countries, but still receives much interest in LDCs The usefulness of computer-aided instruction (CAI), in which computers are seen as simple replacements for teachers, has been largely discredited, although there appears to still be great interest in CAI in many LDCs where computers are being introduced.
- It is unclear where to place computers to make sure they are used most efficiently there is very little research on the most appropriate placement of computers in schools, or in the community, used to achieve various learning objectives.
- Multi-channel learning is a useful concept The emerging practice of 'multi-channel learning', which focuses on enriching the educational experience by engaging all resources that are available to help effect incremental change by coordinating the various ways to connect learners with information, knowledge, and stimulation, and to mediate those interactions, provides valuable insight into how blended learning approaches can be delivered and tailored in areas of great resource scarcity.
- Satellite is much hyped, but under-studied while satellite broadcasting of electronic educational resources is thought to hold much promise, there are few case studies of successful implementation of satellite broadcasting to small LDCs.
- New Internet technologies hold promise, but are not yet operational Emerging Internet technologies, especially recent and emerging wireless protocols (including 802.11, and shortly WiMax), are thought to hold much promise for providing connectivity to remoter areas, but projects utilizing such technologies are for the most part in pilot or planning stages, and face many regulatory hurdles.
- Mobile Internet centers (vans, etc.) are being deployed as a way to reach rural areas a number of educational initiatives utilizing mobile Internet centres have been piloted in the past decade, but little cost and impact data has emerged from such projects.
- Community telecasters are a hot topic, but successful, replicable models have not yet emerged Community telecasters (sometimes based in schools) have be touted as important tools to provide access to learners (including teachers engaged in personal enrichment and professional development opportunities) to ICTs outside of formal school settings.
- The use of handheld devices is just now receiving serious widespread attention Little research has been done on uses of handheld devices (including personal digital assistants and mobile phones) in education.
- 'Free software' holds promise, but costs and impact are still not well documented The uses of 'free' software is widely touted as a cost effective alternative to the uses

of proprietary software (especially Microsoft products), but research in this area is largely advocatory in nature.

ICT in evaluation

The introduction of Information and Communication Technologies (ICTs) in mainstream societies affects the way in which the societies interact, communicate, produce, assess, adapt and access vast amount of information at reduced costs. ICTs are not just about technologies, they are more about information transfer and communication. While poor countries grapple with the problem of high investment costs, it is widely acknowledged that convergence of 'old' and 'new' ICTs is still relevant to poor communities, which lack basic infrastructure such as road, water, electricity and telephones. However, there are arguments that with the rapid expansion of these technologies in the western world, the gap between the poor and the rich is widening. It is also recognized that even within the 'information poor' countries, the poor are further marginalized. Despite these arguments, attempts are being made at a global level to empower poor people with access to ICTs and enable them to cope up with the new challenges posed by the increasing competition through globalization. Small and medium enterprises (SMEs) have demonstrated their capabilities to use ICTs to advance their businesses in the recent years.

Since the experience of the SMEs is relatively new, it becomes very difficult for them to distance themselves from the ICTs and to study their impact in their day-to-day lives. Impact studies are often based on a simplistic comparison between the pre- and the post- situations of any intervention. The 'before-after' approach can be effective only when impact assessment methodologies are set with correct objectives. The approach otherwise will simply tell us the changes that occurred due to the introduction of the ICTs, but will not tell us how they have occurred and why. These reasons are very important if the impact assessment exercise is to inform policy formulation and decision making processes surrounding new projects involving ICTs. Thorough impact studies will help in devising new strategies for enhancing the role of ICTs in reducing poverty.

The need to evaluate the impact of ICTs in enterprise development can be broadly classified into the following areas:

- At the national and international level, there is a growing concern and need for demonstrating the usefulness of these technologies so that policy-makers can frame policies that encourage utilization of ICTs in developmental efforts. This should result in improved connectivity, reduced costs and in increased access to ICTs by all sections of the population.
- At the managerial level, NGOs, medium and small-scale enterprises (MSMEs) and IT organizations are very keen to assess the acceptance level of ICTs among the users so that they can develop a better understanding of the business dimensions of these technologies.
- At the user level, the need for assessing the impact is established by the fact that ICTs do not just affect the enterprises, but also the external agencies and communities around them.
- Designers of information systems need to have a thorough understanding of user behavior to ensure that the technologies and information systems are appropriate to the context in which they are to be used.

Any approach to analyzing the use of ICTs must start with overall development goals and an understanding of the role of information to meet those goals, and only then go on to see how ICTs and other technologies might help.

The following questions have been formulated as the basis of an impact assessment of ICTs and their role in enhancing livelihood opportunities and enterprise development among the poor women and men.

- How can poor people's knowledge and concerns inform global decision-making?
- How can global knowledge and resources support poor people's grassroots initiatives, social and economic entrepreneurship?
- How can poor communities connect and form alliances that support co-operation among them and enable knowledge sharing and sustainable enterprise development?
- How can development agencies, the private sector, and governments learn more about poor communities needs and concerns through use of ICTs?
- Answers to these questions will address the above-mentioned four types of concerns expressed by organizations that are working with the poor.

The following participatory evaluation framework can be incorporated into ICT programmes for enterprises development with necessary arrangements by programme staff and their collaborators, including government offices, NGOs and community members. It may consist of four basic principles:

1. Pre-planning and preparation
2. Generating evaluation questions
3. Data-gathering and analysis
4. Reflection and action

SL Framework for Impact Assessment

Sustainable livelihoods is a systematic approach that links issues of poverty reduction, sustainability and empowerment process such as participation, gender empowerment, human rights and good governance.

The attractiveness of this approach lies in its applicability to different contexts, and situations of uncertainty, and in its capacity as a consultative and participatory process for the cross-fertilization of ideas and strategies between various stakeholders, be it in enterprise development or poverty alleviation.

Conclusion

It has been observed that ICT has a significant role to play in improving the standards in education hence its inclusion in the curriculum is a step in the right direction. Learners in schools should acquire ICT knowledge, skills, and awareness if they are to be successful in their futures. Botswana being a developing country will in future depend on a high level of ICT capability from its people if it is to develop technologically and compete internationally. As discussed in this paper ICT has the potential of promoting jobs and entrepreneurship, improving lives of women, and contributing towards the socio-economic development of the country as a whole.

Amongst the ICTs computers are the most preferred because they have positive effects on learning and are motivating to learners. Computers are capable of increasing equity of

access to quality education which the Ministry of Education aspire to achieve, and also reduce the time needed to accomplish a given set of objectives. Computers support learning across the curriculum and communication networks provide learners with searchable access to vast amounts of information. It also supports a wide range of broader educational objectives including independent learning, collaboration with others and communication skills.

Although primary schools are ill-equipped with computers, the television and video equipment available can be utilized in the teaching and learning processes. Teachers can record programmes related to their topics and use them in the classroom. Studies also show that there are no significant differences in effectiveness between live teacher presentations and videos of teacher's presentations (Seels *et al*, 1996).

The Ministry of Education policy says ICT should be infused/integrated across the curriculum so as to develop learners‟ ICT capability and provide them with a range of knowledge, skills and attitudes applicable across the curriculum. This paper argues that in order for teacher to effectively infuse and integrate ICT into teaching and learning they need to understand the relationship between a range of ICT resources and the concepts, processes and skills in their subject; use their subject expertise to select appropriate ICT resources; develop confidence in using a range of ICT resources; and know how to prepare and plan lessons where ICT is used in ways which will challenge pupils‟ understanding and promote greater thinking and reflection.

This therefore challenges the Department of Teacher Training and Development to ensure that teachers in the field are equipped with these skills. The role of a teacher in the classroom is bound to change when ICT learning resources are used in schools. Since these resources can be sources of knowledge, a medium to transmit content, and a means of interaction and dialogue, teachers will become facilitators of learning.

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