Critical Technologist

Learning, Curriculum, Infrastructure and Support

Discussion Paper

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Introduction

This paper is a technology plan for a critical technologist assisting in community education through the use of Information and Communications Technology (ICT) in the developing world. Two of the UN's Millennium Development Goals (MDG) focuses on providing education. To meet these MDG educational goals between 14 and 22.5 million teachers need to be recruited, trained and provided with the right incentives in the next ten years (GCE, 2006). This paper introduces the theory of critical technology and the role of a critical technologist to help meet this huge need. Due to this paper being mostly theoretical it was important to define the learning and curriculum required within the community. A number of documents were reviewed to build what is believed to be the required learning and curriculum. An important step in the development of this technology plan would be to formally review the learning needs of the developing country targeted. To identify the resources and requirements of technology planning within the developing world the existing infrastructure of Telecentres and Community Learning Center (CLC) were drawn upon as reference. These resources and requirements were confirmed with review of ICT development reports and case studies.

In bringing an end to extreme poverty there is agreement by many leaders (Lewis, 2005; Sachs, 2005; UNDP, 2006; IIEP, 2004) that having a community focus rather than a region or nation focus is better suited for success. The idea that the community knows best and that every community has its differences is shared by many of these leaders. Jeffrey Sachs calls it clinical economics, IIEP calls it decentralization, UNDP calls in community ownership… Combine this with the incredible need for teachers and you create the role of the critical technologist. The critical technologist understands education, educational theory, international development and

ICT. Their role is to assist in identifying the learning needs of the community, assist in building up the ICT infrastructure, and assist in teaching the community to become a technically savvy self sufficient community of learners and teachers.

Table of Acronyms

CLC	Community Learning Center
CPAR	Canadian Physicians for Aid and Relief
GCE	Global Campaign for Education
ICT	Information and Communication Technology
IALS	International Adult Literacy Survey
IDRC	International Development Research Centre
IIEP	International Institute for educational planning
ISP	Internet Service Provider
MDG	Millennium Development Goals
NRC	National Research Council
SDC	Swiss Agency for Development and Cooperation
UNDP	United Nations Development Program
UNESCO	United Nations Educational, Scientific and Cultural Organization

Document Structure

This document has four main sections; first is a description of critical technology and the role of the critical technologist. Second, will be a description of the learning and curriculum for the technology plan. Third, will be a description of the technology infrastructure and support applied to the identified learning and curriculum. Fourth, is a table describing some of the learning goals, outcomes, activities, and technology required in introducing ICT into developing countries.

Critical Technology

Critical Technology is about being critical of educational technology. This criticality is twofold; it is about being critical of how technology is used in the classroom (or learning environment), it is also about being critical of the larger ideology intrinsic within the technology being made available. Critical pedagogy (Freire, 1972; McLaren, 1998; Kanpol, 1999) is the foundation of critical technology, though the focus is upon educational technology. Critical technology provides a theoretical foundation for the best approaches in creating and introducing educational technology into learning. Critical technology's focus is to provide a theoretical framework in which to approach the education required in the developing world to eliminate extreme poverty.

Critical Technologist

The critical technologist is an individual who has a wide variety of skills and knowledge well suited in helping with the attainment of the Millennium Development Goals (MDG). The educational objectives of the critical technologist further focuses their role on MDG goals two and three;

> Goal 2. Achieve universal primary education
>
> Goal 3. Promote gender equity and empower women

The critical technologist should be considered a partner within MDG 8; in particular target 18.

> Goal 8. Develop a global partnership for development
>
> > Target 18. In cooperation with the private sector, make available the benefits of new technologies, especially information and communications technologies.

The critical technologist needs to have two perspectives; one internally focused toward success in the classroom, the other externally focused upon the larger community and policy which drives successful national (and international) education. The critical technologist needs to be aware and

well informed of both the internal and external activities and nature of their role. Where each individual critical technologist falls within these two roles depends on the individual and the need. As an example; if the community has healthy well fed children, a well defined curriculum and good learning resources the critical technologists' greatest efforts would be in teaching at the classroom level and developing a local teacher population. If the community lacked healthy well fed children the critical technologist would focus their efforts on teaching the primary curriculum while also teaching and supporting the creation of a healthy community. It becomes the responsibility of the critical technologist to know themselves within these two roles and to request assignments best suited to their nature.

Two Perspectives

Success as a critical technologist includes the two perspectives; the internal and the external. Staying aware of, and active within, these two perspectives will ensure that learning is effective and continues through time. Table 1. Provides lists of the focuses for each the internal and external perspectives.

Internal

The internal perspectives are focused upon the students and the learning within the classroom and local community. Encouraging an environment where the students arrive to class well prepared for the days learning and having all the resources available throughout the day is paramount to the internal focus. The use of technology within the classroom is very dependent upon its availability and the infrastructure to support the technology.

External

The external perspectives are focused upon the local community's ability to utilize and influence the regional and national resources available for education.

Internal (Classroom)	External (Community & Policy)
Healthy Community	Readiness Indicators
Learning Outcomes	Curriculum Outcomes
Learning Plans	Community Learning Plan
Lesson Plans	Curriculum Resources / Repository
Readings list(s)	Available School Library
Assessment	National education standards
Classroom / School autonomy	National support infrastructure
Parent Involvement	Community Support
Professional Development	Development Policy & Funding
Local ICT	ICT Infrastructure
Classroom Resources	School Administration

Table 1. Critical Technology; Internal and external Perspectives

Endnote: Further development of the Critical Technology theory needs to be developed with a more complete inter-relationship between the theory and the Critical Technologist role. This further development should be considered beyond the scope of this paper.

Learning and Curriculum

Each of the internal and external perspectives will have their own learning goals and curriculum. The internal perspective will have curriculum for all the focuses, and within some of these focuses will have different lesson plans for both the child and adult. This difference is due to the different learning objectives for the child and adult. Continuing with the previous example; if community health was an issue, the children's curriculum would focus on basic health and nutrition with age appropriate lesson plans, where the adult curriculum would focus on health, nutrition and the community infrastructure to encourage continued health.

The external perspective will have curriculum for all the focuses with lesson plans for both the adult learners and the critical technologists. UNESCO (2004) has found that the trend for empowering the local communities with increased educational responsibilities has show positive results. These results are threefold; first, parents and communities are showing greater commitment; second, parents, teachers, inspectors and mayors believe in decentralization; third, much educational innovation is occurring within the communities.

Internal Perspectives

As mentioned previously, the internal perspectives are focused within the needs of the classroom and community learner. Each perspective will have curriculum and lesson plans for the children, adults and critical technologist. Each learner role will have learning needs within each perspective. Each perspective includes a brief description, and where appropriate, accompanied with the child and adult learning outcomes.

Healthy Community

To increase learning children need to have their basics needs met; clean water, nutrition, home, healthy family environment and time to study. Much of the work done by the critical technologist

will be in supporting the development of a healthy community. The educational needs of creating healthy communities will come first for the critical technologist.

Learning Outcomes

Well designed and epistemologically appropriate learning outcomes should be available. The learning outcomes should be age appropriate and as self-directed as possible. Learning should be encouraged to occur through self-study, student-student mentorship and student-teacher learning approaches.

Lesson Plans

Lesson plans should be available for all learning outcomes. These should be community source (2004, Wheeler) plans. If plans are not available from the national or international repository they should be created for the local community and submitted to the national and international lesson plan repository.

Personal Learning Plans

Personal learning plans should be created by all students with mentorship from teacher and / or critical technologist. Learning plans will be personalized to suit the individual needs of each learner. The learning plans follow the increasing need for lifelong learning as a key element for healthy communities (Delors, 1996; Longworth, 2002; Visser, 1996).

Readings list(s)

Reading lists to cover all learning areas should be made available. These lists should relate to what are both in the local library and what is available through the internet library. The lists

should cover all subject areas identified within the learning outcomes. The reading lists should be updated on an ongoing basis.

Assessment

Assessment is an ongoing component with learning and education. It shows individual, school and community progress. Assessment is an excellent way to both baseline and measure learning. Assessment results will become an essential tool for gaining further support and additional funding.

Child

Children's assessment, in most cases, will be standardized testing at the national level. The community should work together to create the learning environment where children can pass these standardized tests. Sachs (2005) describes the commitment of children who have the opportunity to participate in standardized exams, and in most cases these children will meet or exceed the exam requirements.

Adult

Assessment for adults should be twofold (Druine, 2000); first, the assessment should measure literacy based upon the national adult literacy standardized testing and the International Adult Literacy Survey (IALS). These tests measure literacy toward the "knowledge based" economy. Second, is the more socio-cultural assessment that considers indigenous knowledge and the learning required for the concrete learning practices people already have in their lives. Bring assessment back to the community level is critical for having the adult learners more engaged in their learning and therefore more involved in determining the type of community they are building (Druine, 2000).

Classroom / School autonomy

As described in the IIEP (2005) newsletter article regarding decentralization, it is favorable to have the community schools and classrooms to be decentralized from the national government. This autonomy allows each community school to set its own direction toward the learning most needed.

Parent Involvement

The ability for children to learn includes the parents supporting their learning. This includes such factors as having the time to attend school, having time to study, having their nutritional needs met and to not being required for household labour (Cockburn). Beyond only supporting their children's education parents should be encouraged to make a commitment to their own lifelong learning and increasing the overall family literacy (Chowdhury, 1994; Yero, 2001).

Professional Development

Ongoing professional development for all teachers is essential for the success of educational programs. This development needs to be made available to both the teaching community and all members of the community. Local citizens should be taught how to develop and execute their own learning strategies. Constructivist methods should be applied most frequently. The development should focus upon pedagogies that best suit the needs and learning outcomes of the community.

Localized Information and Communication Technology (ICT)

The ICT needs to be localized to the community. Issues such as phone and network access, availability of electricity, access to local radio, the ability to create a telecentre (Latchem &

Walker, 2001), the ability to gather and record indigenous knowledge, the ability to publish and duplicate documents, etc.

Classroom Resources

Having an exceptional understanding of the available classroom learning resources will allow the teachers and students to utilize what is available and know what could better their learning environment. The building of classroom resources should be an ongoing initiative for the CLC / telecentre.

External Perspectives

As mentioned previously the external perspectives are about influencing the factors outside the classroom. To a certain extent the external factors are about the critical technologist becoming an advocate. It is about building an understanding of all the factors that influence the ability to introduce ICT for community education. This list of external perspectives becomes the domain of the adults within the community. It is within the role of the critical technologist to build local understanding and assist in building the skills within the community to advocate for themselves within these domains.

Readiness Indicators

The ability to determine a community's readiness to adopt ICT is an essential part of bringing educational technology to the community. There are a number of credible sources for data regarding ICT readiness, these include; United Nations, UNESCO, NRC-CNRC, The Economist, IBM, and many others. One document from Sauvageot (1997) a member of UNESCO's International Institute of Educational Planning provides an excellent summary of what is an indicator and what should be measured. The critical technologists understanding of these indicators would assist in determining a community's readiness to adopt educational technologies.

Curriculum Outcomes

Learning outcomes from each countries national curriculum need to be confirmed against localized learning outcomes. If localized outcomes do not exist within the national curriculum this should be noted and the correct people notified. Localized outcomes should not be limited by the national curriculum outcomes.

Community Learning Plans

The community should identify what learning they need and work with the local school and government to create plans to develop the required skills and knowledge. The primary purpose of these plans is to develop the skills and knowledge to increase overall community health for the long-term and to create a resiliency to the inevitable future adversity.

Curriculum Resources / Repository

As curriculum resources are developed they should be stored in a common repository (Odom, 2005). This curriculum can come from many sources, including; international, national, regional, community and classroom. Available technology and accessibility will be an issue of how far reaching the curriculum repository will be. It may be as basic as a classroom or community library or it could be as rich as a national online repository.

Available School Library

Having a school and / or community library is a strong asset in the education of any community. Whenever a library can be created it should.

National education standards

National education standards provide guidance and consistency to programmes. The availability of standards is complete in the developed countries of Europe and North America, though it should be noted that there is also a lack of standards in the developing countries. Without the availability of national standards the community and ICT should focus on what is required at the community level. Where possible the critical technologist or community member should advocate for the establishment of national standards.

National support infrastructure

All ICT that is made available should be supported by a national infrastructure where practical and possible. This can be difficult given the costs associated and the skills and knowledge required. Where ever possible local skills and knowledge should be developed to support the available infrastructure. The development of a national ICT strategy and the supporting skills and knowledge can have a significant impact upon poverty reduction (Hanna, 2003).

Community Support

Community support for the learning initiatives will aid in overall success. Support could come in many forms;

- Volunteers – to help with whatever they can.
- Food & Water – availability for committed families is critical for successful learning
- Agriculture and farming – provide additional resources for the committed families
- Assorted building construction – provide consistent and secure shared space to telecenters and community learning centers
- Financial – support well applied can provide needed learning resources
- Indigenous knowledge – should be gathered, utilized and never forgotten
- Others

Development Policy & Funding

National, regional and community development of education will be required to stay current within a globalized world. National and regional policies should be in place to encourage ongoing educational development. Funding sources should be found or created to support the educational development. Given the transient nature (Odom, 2005) of funding and funded

projects, wherever possible local citizens should be provided the skills and knowledge to continue their learning development on their own. Self sustainability for the learner should be the goal.

Information and Communication Technology Infrastructure

National, regional and community based ICT infrastructures should be developed in ways that ease their continued success. Wherever possible they should be simple and stable enough to be locally supported.

School Administration

The focus of the school administration should be in creating strong learning environments within the classroom. They should work with the teachers and all levels of government to “clear the way” for student learning. The strategy of decentralization (IIEP, 2004) has show positive results in having community schools become more effective.

Section Endnote: this list of internal and external perspectives will always evolve and change. It should always be considered a work in progress. Each of the perspectives needs further development and could become a document section in themselves.

Infrastructure

The ICT infrastructure available will vary greatly from country to country, from region to region and from community to community. Upon arrival to any location the critical technologist should determine the infrastructure available. It should be noted that the technology and infrastructure available in developing countries is quite different than what we have in North America. In North America we are struggling to have universal DSL access to every home. In Africa they are struggling to have universal telephone access. When there is telephone access it is sometimes a single phone for the whole community. Given this "digital divide"; assumptions for infrastructure needs to be prepared for each new location. An innovation known as Telecentres or Community Learning Centers (CLC) has occurred to fill the divide. The purpose of the telecentre of CLC is best described by Oestmann (2001);

> Telecentres have considerable potential for narrowing the "digital divide" in remote, rural and otherwise disadvantaged communities. They can be especially useful in helping developing countries and rural areas take advantage of the information economy, access education, government information, healthcare and other services, and develop socially and economically.

The list of infrastructure items provided here is compiled for two primary sources regarding telecentres and CLC's. A CPAR project report (Odom, 2005) from a CLC in Uganda and a comprehensive paper about telecentres developed in 2001 by the commonwealth of learning (Latchem & Walker, 2001). A detailed description of all these ICT infrastructure items can be found in the commonwealth of learning paper. Many items on this list should be considered nice to have, in some situations it will be difficult to get beyond having a radio and some published material.

Technology	Purpose
Radio Station	Provides a sense of identity and focus to the community, preserving the local culture and language, providing emergency medical services, and delivering formal and non-formal education.
Radio / Tape / CD	Listening to News (local and national), educational programs and entertainment. The ability to listen to tapes and CDs for learning and entertainment
Recording equipment	Ability to record radio shows and interviews of community members
Telephone Lines	The basic set-up for a telecentre is usually three lines: one for voice, one for fax and one for Internet access. However, if the telecentre is small and phone services are not to be major part of its operation, it may be possible to start with a single phone line for voice, fax and Internet services.
Telephone	Communicating to other members of the community, audio conferencing, and personal calls.
Mobile Phone	Communicating to other members of the community & personal calls.
Fax	Communicating with government offices, sending and receiving documents and information.
Computer(s)	The telecentre computer(s) have many purposes, including; internet access, research, email, web publishing, desktop publishing, photo editing, podcasting, basic accounting, computer based training (CBT).
Internet / Web Access	Used for email, web research, web publishing, support.
Social Software	Wikis, Blogs, Content Managment
Modem	Provides dial-up access to internet. It is suggested that this be used only if an internet service provider (ISP) in a local call. Dial-up over long distance is too expensive.
Local Area Network	Computer Resource sharing allows the sharing of printers and storage. Could also allow sharing of internet connectivity. Wireless network can be less expensive due to wiring costs and could support multiple buildings.
Printers	Used for document creation and publishing.
Software	The basic software available within a telecentre would include; office productivity (word processing, spreadsheet, presentation, database) internet access (browser, email, connectivity, web publishing) computer training (typing, school curriculum, etc.)
Photocopier	Reproducing information for community learning. If the telecentre will need to do large print runs having a collator with the photocopier would be beneficial.
Binding Machine	Where there is demand for copying or printing booklets and reports, a binding machine is very useful and can have income-generating potential.
CD / DVD burner	With a burner/writer costing no more than US$200, a telecentre can record, store and distribute cultural, community and newsworthy events,

	archival material and musical CDs, and make back-ups, distribute Web sites, save databases and make copies of CD-ROMs.
Scanner	Having a flatbed scanner for scanning documents, photographs, maps and other such material can be very useful for publishing and reproducing material. Software for manipulating and editing scanned images and documents is also needed.
Paper shredder	A paper shredder will be needed where there is need to destroy confidential documents and client information.
Digital Camera	Digital cameras allow picture and video files to be copied from camera to PC to create documents, videos or e-mail attachments.
Television	Listening to and watching News, educational programs, documentaries and entertainment.
VCR	Playing and recording VHS tapes.
Drum	Calling group members for meetings or when there is a problem in the village.
Church Bell	Calling group members for meetings or when there is a problem in the community.

Before acquiring infrastructure equipment for the telecentre or CLC it is important to consider the following issues;

1. Users needs (with consideration of the community as a whole)
2. Available funding and income generating possibilities
3. Replacement fees, maintenance and ongoing costs
4. Technology compatibility issues

Support

Infrastructure support for the telecentres and community learning centres will come from three primary sources; the internet, national or regional support services, and locally developed support services.

Internet

There is an increase in the number of internet support services. There is a large movement aligned with the MDGs for telecentre support. This support is evidenced by the recent, and very successful, creation of http://www.telecentre.org. This web portal is well supported by Canada International Development Research Centre (IDRC), the Swiss Agency for Development and Cooperation (SDC) and Microsoft Corp. This portals focus is on supporting telecentres around the world. An increase in the number of online volunteer sites is also present. Getting support and mentorship from volunteers is becoming more available.

National or Regional

National and regional support should be made available from the national and regional governments. The school district should provide local support for the infrastructure they provide and recommend. It should be considered naïve to believe that the national or regional structures will provide support. Alternatives for support should be created so the community has the ability for their infrastructure to be self (or community) sustaining.

Local

Creating local skills and knowledge to support all the available ICT will be beneficial to the ongoing learning within the community. One of the main roles of the critical technologist will to

ensure that the community is self sufficient from an ICT standpoint. Getting the community to this level of self sufficiency is a part of the community learning plan mentioned earlier.

Information and Communication Technology Applied

The following table further develops the identified internal perspectives. The rightmost two columns identify the ICT that could be used to fulfill the learning outcomes and activities. The contents of this table could and should be changed for each community it is being applied. The purpose of this table is to identify all the potentially required ICT skills and knowledge.

Goals	Outcomes	Activities	ICT Required	Skills Development
Recognize the importance of living in a **Healthy Community.**	Describe the attributes of a clean water source	1. Investigate different water sources (lakes, rivers, wells, water collection) 2. Investigate sources of water source contamination (environmental, animal, etc.)	• Video Recorder • Internet (Wiki, WebQuest, Web Search) • Computer with projector • Digital Camera	• Video creation • Internet & Wiki use • WebQuest creation • Presentation Software • Digital Camera
	Identify basics of nutrition and healthy eating	3. Describe essential food groups 4. Create schedule of healthy eating	• Drawing, charting and graphics • Wiki • Computer with projector	• CAD and graphics software • Internet & Wiki use • Office Software (Spreadsheet) • Presentation Software
	Describe strong and healthy families	5. Write a story describing a strong and healthy family.	• Reading • Web Searching • Radio • VCR • Paper & Pencil	• Web searching techniques • Recording & Broadcasting
	Describe the importance of study and play time for success in school and life	6. Organize all the daily activities into chores, study and play. 7. Describe play time	• Web Searching • Wiki • Radio Broadcasting • VCR • Concept mapping	• Web searching techniques • Recording & Broadcasting • Concept mapping
	Discuss the issues regarding localized agriculture and farming	8. Organize available agriculture and farming information. 9. Find local weather reports. 10. Describe local agriculture. 11. Discuss farming and livestock.	• Radio Broadcasting • Web searching • VCR • Digital Camera	• Video creation • Web searching and book marking techniques • Digital Camera • Recording & Broadcasting
	Demonstrate basic carpentry skills	12. Discuss carpentry with local experts 13. Diagram building	• Recording equipment • Scanner • Photocopier	• Recording & Broadcasting • Scanner

Goals	Outcomes	Activities	ICT Required	Skills Development
		techniques 14. Update library with building techniques 15. Assist in local building projects	• Computer • Library search • Digital Camera	• Photocopier • Computer • Digital Camera
To have **Learning Outcomes** designed for the local community needs.	Prepare primary level education for all children	1. Quickly determine grade levels of all community members 2. Discuss learning outcomes with community "elders" 3. Organize learning outcomes for community need 4. Record and reference learning outcomes with national curriculum	• Photocopier • Computer • Office Software (Spreadsheet & Database) • Web Site • Web publishing • Radio Show	• Internet & Web use • Office Software (Spreadsheet & Database) • Web Publishing • Recording & Broadcasting
	Prepare adult education	5. Prepare community specific learning outcomes.	• Photocopier • Computer • Office Software (Spreadsheet & Database) • Web Site • Web publishing	• Internet & Web use • Office Software (Spreadsheet & Database) • Web Publishing
To create **Lesson Plans** for all community learning outcomes	Search for Lesson Plans	1. Organize community and primary education learning outcomes 2. Compile available lesson plans for identified outcomes	• Office Software (Spreadsheet & Database)	• Office Software (Spreadsheet & Database)
	Create Lesson Plans	3. Write lesson plans to fulfill remaining outcomes. 4. Update lesson plan repository.	• Office Software (Spreadsheet & Database) • Web publishing • Digital Camera	• Office Software (Spreadsheet & Database) • Web publishing • Digital Camera
To have whole community create personalized **Learning Plans**	Understand your individual learning style	1. Describe learning styles as presented by Kolb and Garner. 2. Determine your style as; Vision, Auditory, and Kinesthetic. 3. Write description of personal learning style.	• Computer • Internet Access • Blogging software (personal journal)	• Computer • Blogging • Digital Camera
	Encourage learning to be based upon accomplishment.	4. Discuss the benefits and drawbacks of age based learning.	• Presentation software • Computer with projector	• Presentation software • Computer with projector
	For Children: Create learning plans to keep learning aligned with their goals and the national curriculum outcomes	5. Design a personal learning plan that fulfills the next year's national curriculum outcomes.	• Computer • Office Software (Spreadsheet & Database) • Internet Access • Concept Mapping • Blogging software (personal journal)	• Computer • Office Software (Spreadsheet & Database) • Inspiration (concept mapping) • Blogging • Digital Camera
	For Adults: Create Yearly learning plans to develop the skills	6. Design a personal learning plan that builds skills and	• Computer • Office Software (Spreadsheet &	• Computer • Office Software (Spreadsheet &

Goals	Outcomes	Activities	ICT Required	Skills Development
	and knowledge they require to stay with the community learning plan	knowledge toward the community learning plan	Database) • Internet Access • Concept Mapping • Blogging software	Database) • Inspiration (concept mapping) • Blogging
To have up to date **Reading List(s)**	How to find appropriate readings	1. Search and review available reading lists. 2. Critique reading lists against learning outcomes.	• Computer • Internet Access • Office Software (Spreadsheet & Database)	• Computer • Internet Access • Office Software (Spreadsheet & Database)
	How to add to the community reading lists	3. Add sources to reading lists	• Wiki	• Internet & Wiki use
To have our children excel at national standards **assessment**. To meet or exceed or community learning plan.	Understand the importance of National assessment standards	1. Review national testing standards. 2. Discuss strength and weakness of standards	• Computer with projector	• Internet • Presentation software
	Understand improvement and self assessment	3. Discuss improvement and self assessment. 4. Compile list of standards applicable to personal learning plan.	• Video Recorder • Office Software (Spreadsheet & Database) • Internet (Wiki, WebQuest, Web Search)	• Video creation • Internet & Wiki use • WebQuest creation
	Create a good home study and learning environment	5. Discuss what is required for a good home study environment. 6. Design a plan for creating a good home study environment.	• Video Recorder • Office Software (Spreadsheet & Database)	• Video creation • Internet • Office Software
Build a strong and sustaining **classroom and school autonomy**	Outline the responsibilities of the school and classroom	1. Create **school** responsibilities "manifest" 2. Create **classroom** responsibilities "manifest"	• Internet (Website & Wiki) • Web Publishing	• Internet & Web use • Web Publishing
	Plan the approach to have all students succeed with the national exams	3. Discuss student exam strategy. 4. Design student success strategy.	• Internet • Office Software (Spreadsheet & Database) • Concept Mapping	• Office Software (Spreadsheet & Database) • Inspiration
	Determine the community involvement with the school	5. Coordinate community planning for school involvement. 6. Plan for community resource availability and usage	• Computer with projector • Video Recorder • Web Publishing • Photocopying	• Video creation • Web Publishing • Office Software
Have high levels of **parent involvement** with children's education	Discuss what is important in being successful at school	1. Discuss the importance of children's education. 2. Describe what parents can to do encourage children's study.	• Video Recorder • Computer with projector	• Video creation • Presentation software
	Manage study time within a schedule	3. Review children's home study plan. 4. Encourage children's	• Video Recorder • Web Site • Computer with	• Video creation • Web Publishing • Presentation software

Goals	Outcomes	Activities	ICT Required	Skills Development
		study	projector	
Have **professional development** for teachers and community members.	Analyze community learning needs	1. Perform GAP analysis on community needs vs. current teacher skills and knowledge. 2. Identify community members interested in teaching.	• Office Software (Spreadsheet & Database) • Internet (Web & Wiki)	• Office Software (Spreadsheet & Database) • Wiki • Web Publishing
	Identify resources for professional development	3. Source out learning materials. 4. Determine funding sources for materials and development.	• Web • Office Software (Spreadsheet & Database)	• Web
	Prepare materials for self learning	5. Assemble learning materials to fulfill learning plan	• Internet (web) • Photocopy	• Web searching • photocopy
	Develop learning portfolio	6. Review example learning portfolios. 7. Discuss learning portfolios. 8. Create personal learning portfolios.	• Internet (blogs, wikis, websites) • Computer	• Internet (blogs, wikis, websites) • Computer
Create a localized **Information and Communication Technology (ICT)** infrastructure	Inventory community radio availability	1.Discuss learning possibilities of radio. 2.Count number of available radios.	• Video Recorder • Office Software (Spreadsheet & Database)	• Office Software (Spreadsheet & Database)
	Determine need for local radio station	3.Determine interest in community radio station. 4.Conduct feasibility study for local radio.	• Office Software (Spreadsheet & Database)	• Office Software (Spreadsheet & Database)
	Produce plan for electricity	5.Determine availability of electrical source 6.Create plan for consistent electricity.	• Office Software (Spreadsheet & Database) • Diagramming	• Office Software (Spreadsheet & Database) • Diagramming
	Create plan for community telephony and network access	7.Perform feasibility study for introduction of telephony and internet access 8.Create plan to bring telephony and internet access to community.	• Office Software (Spreadsheet & Database) • Diagramming • Computer with projector • Digital Camera	• Office Software (Spreadsheet & Database) • Diagramming • Presentation software • Digital Camera
	Determine schedule for creating a community telecentre	9.Perform feasibility study for community telecentre 10. Create a telecentre development plan. 11. Execute plan	• Office Software (Spreadsheet & Database) • Diagramming	• Office Software (Spreadsheet & Database) • Diagramming
	Identify sources of local knowledge	12. Develop community inventory of indigenous knowledge 13. Record indigenous knowledge	• Internet (Blogging, Wiki & Podcast) • Office Software • Radio / Podcast • Recording equipment	• Internet (Blogging, Wiki & Podcast) • Office Software • Recording equipment
Create a growing number of **classroom resources**	Identify all available learning resources	1.Define community learning resources. 2.Inventory resources	• Library / Books • Internet (Wiki & Website)	• Internet (Wiki & Website) • Office Software

Goals	Outcomes	Activities	ICT Required	Skills Development
		3. Publish inventory	• Office Software (Spreadsheet & Database)	(Spreadsheet & Database) • Web Publishing
	Discuss learning strategies given the available resources	4. Review available learning resources. 5. Perform GAP analysis on available resources vs. required resources.	• Office Software (Spreadsheet & Database)	• Office Software (Spreadsheet & Database)

It is important to recognize that each culture and community will understand learning differently. It therefore becomes important to create the learning goals, activities and applied ICT with input from the community in which the critical technologist is working. This localization of learning is one of the main reasons a critical pedagogical approach is used in the development of critical technology.

Personal Inventory

From the previous list of identified ICT skills and knowledge comes an inventory of skills required for each of the technologies described. For many of these technologies both proprietary and open source options have been considered. To be successful as a critical technologist having skills and knowledge with both is recommended.

ICT Skill	**Beginning**	**Developing**	**Accomplished**
Recording equipment		✓	
Radio broadcasting	✓		
Podcasting			✓
Video creation		✓	
VCR			✓
Telephone			✓
Digital Camera			✓
Internet searching			✓
Website development			✓
Wiki creation and use			✓
Blogging creation and use			✓
WebQuest planning creation		✓	
Concept Mapping (Inspiration / CMapTools)			✓
Computer operation (Microsoft & OpenSource)		✓	
WAN & LAN Networking (Microsoft & OpenSource)		✓	
Scanner / Photocopier			✓
Art supplies and software (Microsoft & OpenSource)		✓	
Diagramming software (Microsoft & OpenSource)		✓	
Office Software (Word Processor Spreadsheet, Database)		✓	
Presentation Software			✓

Conclusion

This document provides a discussion paper regarding the ICT skills and knowledge required for educators wanting to work toward the United Nations' Millennium Development Goals. This paper introduces the role of the critical technologist. The people who fulfill this role will base there work on a number of themes;

1. the national educational initiatives of the countries they are working,
2. the ICT resources available from community, national and international organizations,
3. the experience of those who have performed similar roles before,
4. the theory of critical technology,
5. the experience of the people implementing telecentres in developing countries.

The role of well prepared, technically savvy educators (critical technologists) has a part to play in meeting the MDG by 2015.

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